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The Pocket Bo

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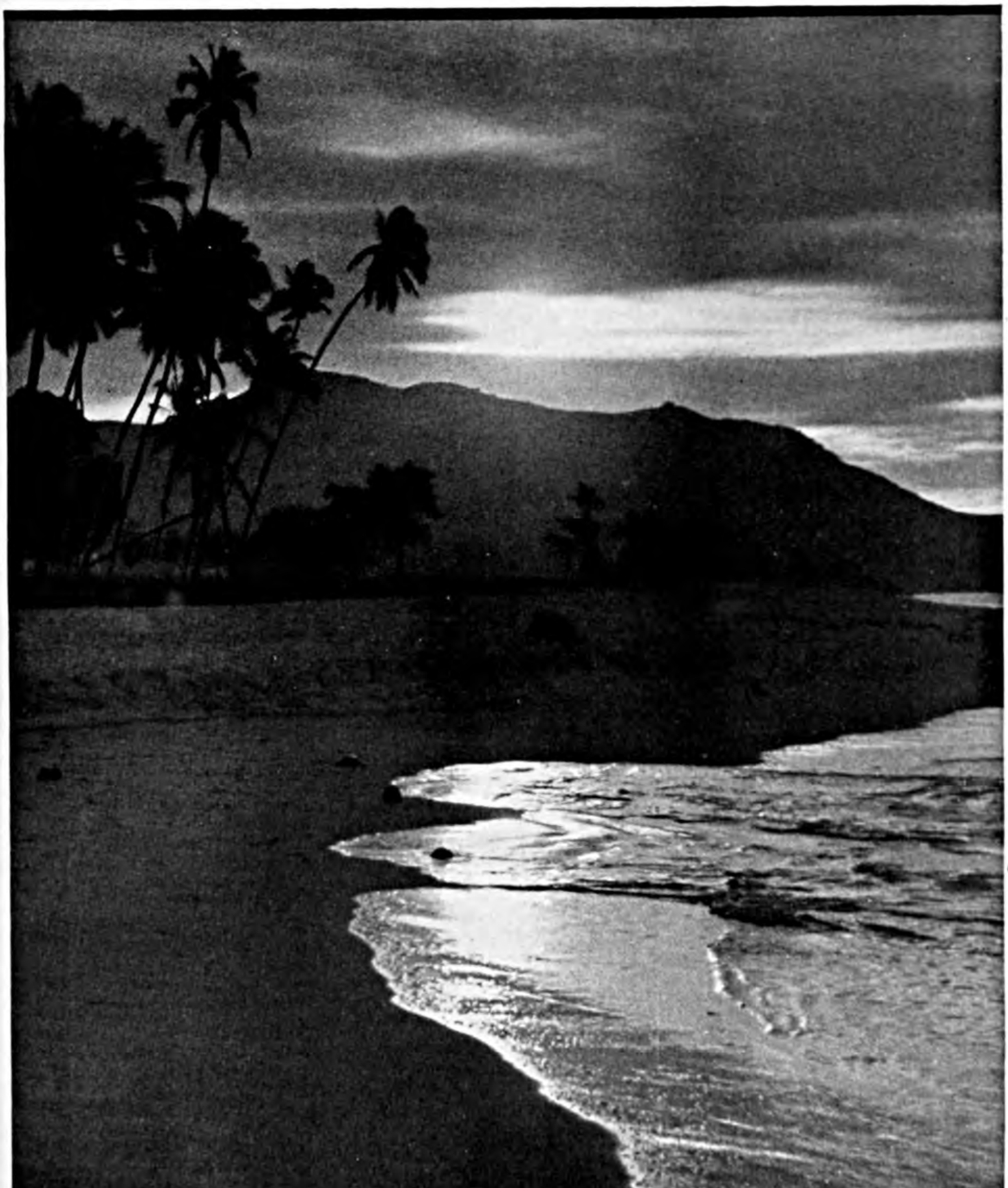

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Better Crops with PLANT FOOD

The Whole Truth—Not Selected Truth

R. H. Stinchfield, *Editor*

Editorial Office: Investment Bldg., Washington, D. C.

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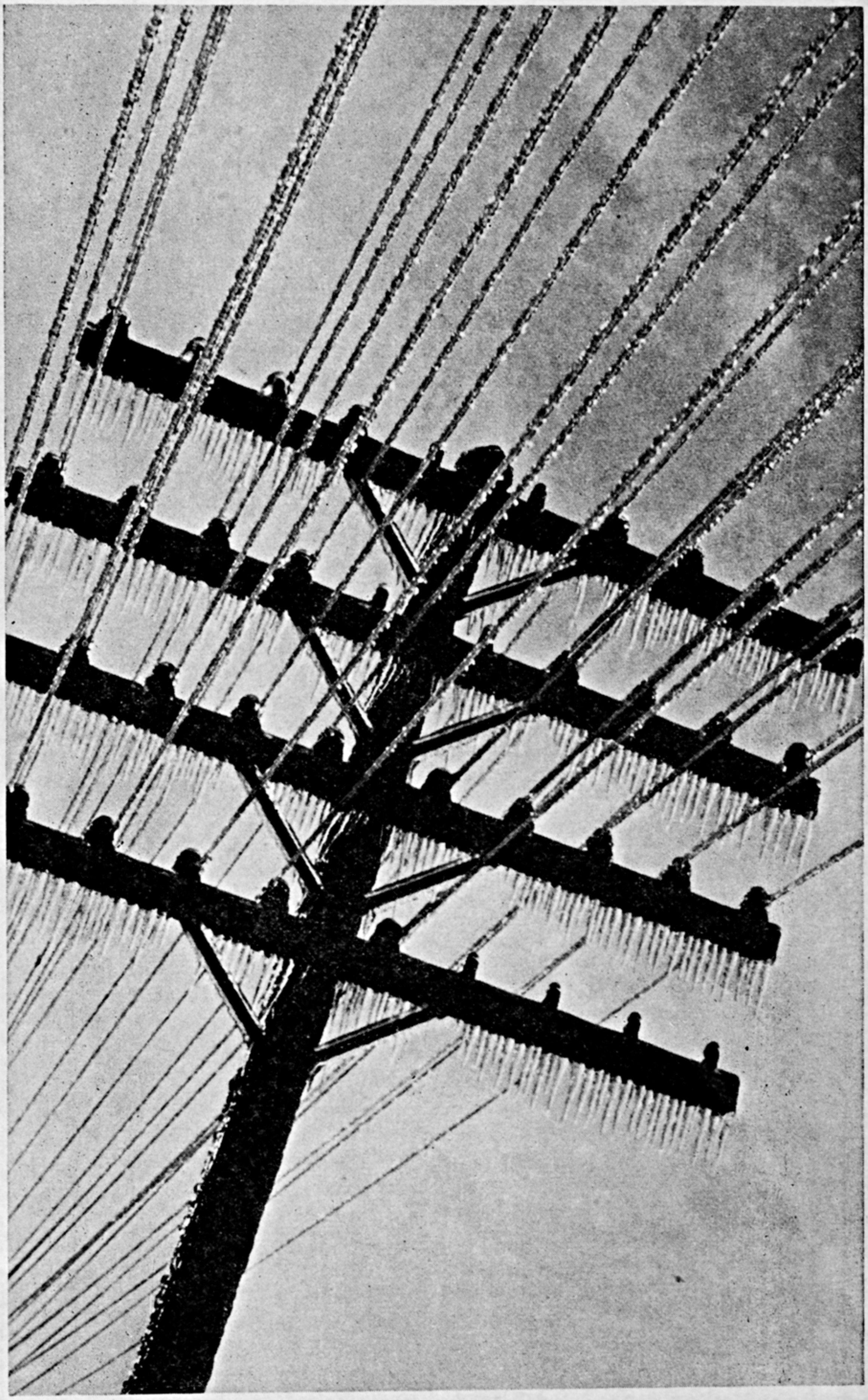

SEASON'S STYLE NOTE: WHITE FRINGE AND CRYSTAL BEADS

Better Crops with PLANT FOOD

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VOL. XXII WASHINGTON, D. C., JANUARY 1938 No. 1

Jeff stalks old frontiers for—

Hunch Hunters

Jeff McDermid

WE COME once more to the annual overture period, when young folks make commendable resolutions and the rest of us smile in retrospect and wish we had the gumption to do likewise. I presume the ones who take least notice of this seasonal burst of ambition are really those who are naturally so full of brilliant ideas and productive energy that they need no signal to start them on the course.

Discovery and conquest of any new frontier, whether by physical toil and deprivation or studious thinking and marvelous ingenuity, have but one logical objective. This objective is to fill human wants and to have the mass of people able to acquire and use that new force, that new luxury, or that new knowledge. Those who produce must ever consider the plight of those who consume, which ought to promote both selfishness and unselfishness in delightful balance.

Today the materialistic planner and the scientific promoter of this machine-power age are about to join forces in a finer way with their brethren of the "lesser sciences," the dreamers and hopers of sociology, philosophy, and economics, not only to discover new frontiers but to make those frontiers practical, useful, and habitable. Their desire is to end the paradox of living in an era of marvels without means to end misery; of dwelling near a bulging granary on half rations; and of having prosperity halted because we can't afford to pay for it. We have found that commercialism does best with a mixture of altruism. We must prove that plenty can prevail without sacrifice of production or profits.

WE have tried hard to attain a fuller life in America, first by bold individualism, and later by persistent pressure groups when individual effort lagged. Neither has sufficed to meet our needs completely, albeit we have corrected some glaring errors and solved some tremendous problems. Perhaps with a little reflective review we may come closer to the reason for some of our frustration.

We may set down some axioms which have proven historically true. First, the man who wants least in the world is usually of the least consequence and will perform the least for mankind. To be satisfied may mean stagnation.

Each age discovers things according to its lights, and no doubt the Indians who invented arrowheads, canoes, wigwams, and stone implements served their generation well. The early whites had relatively few wants beyond meager subsistence, but they refined the savage tools into iron plows, spinning wheels, dash churns, and candle molds. After the fall of Rome and up to the eighteenth century, feudalism and slavery hatched few worthwhile inventions. On a ruined Roman bath-pipe men found raised letters and characters, yet no Roman got the idea to put ink on them for printing. In colonial America our fathers had wood handicraft mostly, which gave way to keen New England invention when tariffs, transportation, and internal improvements got under way. Demand plus practical utility spurs the onward march of progress, with the masses looking to the individual for leadership.

Inventors are reformers too, and sometimes that hurts somebody, except in the field of social betterment, where folks like Peter Cooper of Cooper Union, Jane Addams of Hull House, and Booker T. Washington of Tuskegee stand forth like beacons to urge the union of mind and heart.

Second, personal creative selfishness and pride in achievement have been the means of the greatest discoveries and are a living proof that brilliant and talented leadership finds the road to new civilizations and expanding opportunity. Witness that the patent system as we use it today grew out of the English statute of monopolies of 1623, and in itself fosters a kind of monopoly under limits and restrictions. True, some of our broad-minded scientists, chiefly in agriculture and medicine, have rejected all pretense at monopoly themselves, but their unselfishness has not always been imitated by those who later on developed their original discoveries.

RELIABLE sources say that the chief industrial lands of the world with patent systems have accumulated some 5,000,000 separate ideas in their archives, of which our own blessed Yankee-land has stacked up fully 2,000,000 alone. It doesn't matter how many are unworkable or not ready to spring on the populace. In this country the palm for patents belongs to the little State of Connecticut, with a high record of one patent for every 700 citizens and an average of one to 1,000 citizens, against one to 3,000 for the average State.

Maybe it began when wooden nutmegs sold so well. But we think the reason for Yankee inventiveness is their descent from the middle class British who led the industrial revolution. There were no vast plantations there and landed gentry were few, water power was abundant and small factories the rule. Clocks by Eli Terry and Seth Thomas; Ed Pattison of Berlin and his original tinware peddlers; Elisha Root, the farm boy genius, some of whose intricate turret lathes and drop hammers are working today; David Bushnell, first submarine maker in the Revolution; John Fitch,

whose first steamboat went 20 miles an hour on the Delaware in 1790; Charles Goodyear, pioneer caoutchouc or gum elastic student, who found a way to make rubber goods more useful by vulcanization. Then from the genius and energy of Connecticut came the great inventors and designers of firearms, notably Christian Sharps and his first breech-loader, followed by Daniel Marlin, Horace Smith and David Wesson.

Third, invention and discovery feed upon themselves and breed more new ideas and wider opportunities.

TWO early movements which illustrate this tendency are found in the development of interchangeable parts on the one hand and specialized machine tools on the other. To cheapen the cost of manufacture of arms, Eli Whitney and Simeon North of Connecticut learned to standardize machine tool parts by means of "jigs" or devices to shape parts equally so they would fit anywhere. Afterwards this system was used with clocks and watches. It meant that old handicraft was giving away to speedier and lower cost production, which in turn enabled poor folks to buy the new inventions. It also spelled the rise of such huge armories as Col. Sam Colt erected at New Haven, and paved the way for the bicycle, camera, farm implement, and automobile.

Machine tools invented by the eastern wizards grew into vast and intricate webs of mechanical marvels, including bevel gear cutters, multiple spindle lathes, bolt headers, thread rollers, die cutters, power looms, and stamping machines. Without the use of machine tools we would not have today any generated light and power, rapid transportation, agricultural equipment, and the processes of printing, textile making, and laboratory science.

SIMILARLY rural-minded genius was not asleep while all these industrial waves were rising, for on the borders of the factory zones lay the ambitious farmers who also desire to lessen their labor and enhance their profits. Notably in Cayuga County, New York, there seems to have arisen a flock of active minded gentry, eager to serve the husbandman by means of interchangeable parts and machine-tool craftsmanship.

In 1885 a student of that county wrote in tribute to the enterprise of his fellow citizens that since the patent act of 1836 there had been 475 patent rights granted there. The leading devices on which their time was spent were harvesters, carriage axles, plows, knife grinders, clothes wringers, threshing machinery, and stump pullers. W. A. Kirby brought forth a reaper of some prominence; Avery Babbit invented a new carpet loom; and finally the chief of them all, Cyrenus Wheeler, made and sold thousands of the famous line of Cayuga Chief rakes, reapers, and mowers.

Combinations of brains and talent worked wonders. In 1842 Ezra Cornell, father of the great college of farm fame, was solicitor and agent for a plow factory in Connecticut. One day in his call on a farm paper editor in Maine, he found that worthy trying to explain his idea of a new dirt scraper to a manufacturer. The editor had secured the contract for laying the pipe to hold the first telegraph line from Washington to Baltimore, so that the wonderful scheme of the young artist, Samuel F. B. Morse, might be given its initial test. After a scornful survey of the scraper on paper, Cornell informed the editor-contractor that he would guarantee to design a machine to open the ground, deposit the pipe, and cover it over in one job with yokes of oxen. Within 10 days Ezra had perfected his idea and had laid a hundred feet of piping all buried nicely in regulation fashion in less than twenty minutes. Somehow Morse's plan failed to work well despite this zeal, and it was Cornell who saved the day finally by erecting poles with wire fastened to them, well insulated.

EVER since Columbus' day and age one bright hunch has led to others. You remember that prior to the Italian's vision of a new world to be won by sailing west, Toscanelli, the astronomer, had stated his firm belief that the world was round, and the travels of Maffeo and Nicolo Polo and the latter's son, Marco, fired the imagination of Columbus with tales of the Tartar kings.

Likewise in our subsequent history of invention hundreds of cases arise where a new lead opens the trail to a wonderland of treasures. In all cases, of course, the need of humanity is there to spur onward the zealot in his independent conquests. Two outstanding examples besides the automobile and the radio establish this truth in history—the sewing machine and the piano. After Elias Howe, eccentric Civil War hero and Massachusetts inventor, perfected the first sewing machine, others came to "infringe" upon him or to go him one better in pleasing the seamstress. Isaac M. Singer, one-time concert hall and theatrical manager, seized upon such a chance and made good. Other additional patents were added by Grover & Baker, Wheeler & Wilson, and Wilcox & Gibbs, all for the benefit of the masses in making home garments and improving factory output.

TAKING the commonplace piano on which our youngsters practice with such martyrdom, it too shows the prolific spirit of repeated invention and improvement, all to find quicker response from music lovers. The piano, as such, originated with Cristofali of Florence in 1710, but long before it arrived succeeding musicians had done their best with the muse on the cithara, psaltery, dulcimer, clavichord, spinet, and harpsichord, pointing to each as the last word in excellence. After Cristofali passed away, the genius of later years kept on, and under the magic of Sebastian Erard, John Broadwood, and Jonas Chickering, the piano as we know it today slowly emerged from the brain and work bench.

And no case of this order is complete without the names of airship planners and perfectors, such as the Wright Brothers and Curtiss, or the brilliance of Ford and Ketterling in the motor field. And who could mention a word of invention and superpower appliances and omit the names of Edison and his co-worker, Frank Sprague? It only multiplies the case for self-confidence, a sort of superselfishness, and the hot scent of those bent on further creations to satisfy humanity.

We see how the simpler tools of the middle ages enabled men to make a start in creative effort once the industrial revolt began in earnest. In those early days men had ships, forges, gears, belts and pulleys, gun powder, bal-

(*Turn to page* 47)

Raising Pure-bred Seed For the South

By A. B. Bryan

Editor, Agricultural Extension Service, Clemson, South Carolina

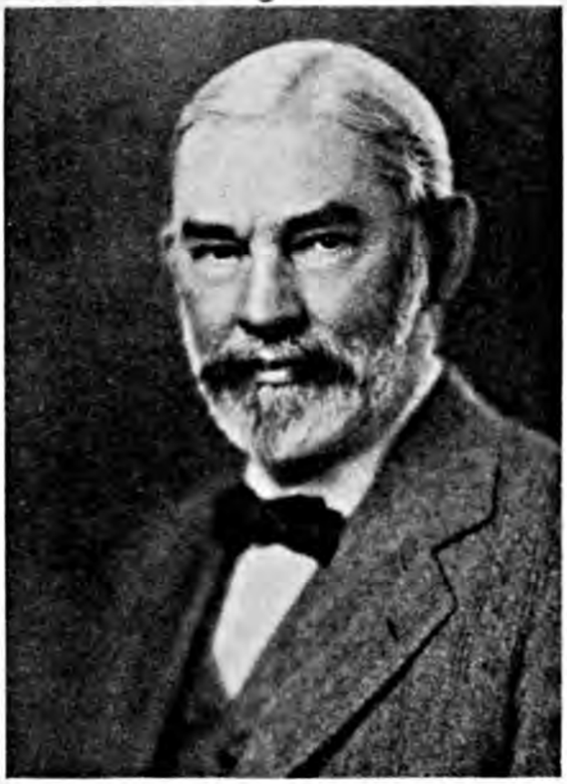
ON GOOD soil properly handled, with well-bred seed and intelligent methods of fertilization and cultivation, hundreds of farmers in South Carolina and other Southern States make one to two bales of high-quality cotton per acre, 800 to 1,200 pounds of superior tobacco per acre, 30 to 60 bushels of excellent oats per acre, and so on. Such yields mean profits to the growers and a basis for permanent agriculture.

Yet farming in the South as generally practiced has not been profitable and prosperous, and there has been a long-felt need to bolster this section's agriculture in any and every way that will give it a greater stability. As for the South's principal cash crop, cotton, especially in the eastern half of the Cotton Belt, it has become more evident in recent years that high-quality lint at low cost per pound is the only solution. The Southeastern farmer who produces less than a half bale per acre of good lint is now a hopeless misfit.

The plight of the agricultural South, as analyzed by various leaders in farming and business, is the result of various factors, economic, social, and personal. Without attempting a scientific analysis of these factors, some of the elements of the situation may be enumerated here.

The South depends too largely on its two big money crops, cotton and tobacco, for its cash income.

It sends away too much of its cash for foods and feeds, much of which could be produced at home to advantage.



David Robert Coker, master mind of Coker's Pedigreed Seed Company.

It has let too much of its soil wash away through erosion.

It plants too many acres of land which will not produce profitable yields—acres which should go back into trees.

Its cropping system suffers from lack of rotation and cover crops.

It pays too little attention to production of high yields per acre for lower unit cost, and to superior quality of products for higher market value.

It heeds too little what is known of the scientific facts and methods of production, processing, and marketing.

It does not take full advantage of its climatic conditions favoring double cropping, intercropping, and winter farming for soil building and for market.

It has not developed livestock farming to go hand in hand with crop farming, for home consumption, soil improvement, and supplementary cash.

For Better Farming

Steps leading up to a higher plane of farming are, of course, statesmanlike leadership toward intelligent farming policies, wiser land-use planning and practices, purebred seed and livestock as fundamental to better yields and higher quality products, and improved methods based on scientific facts and experience.

Let's hear the words of competent authorities directing the way out.

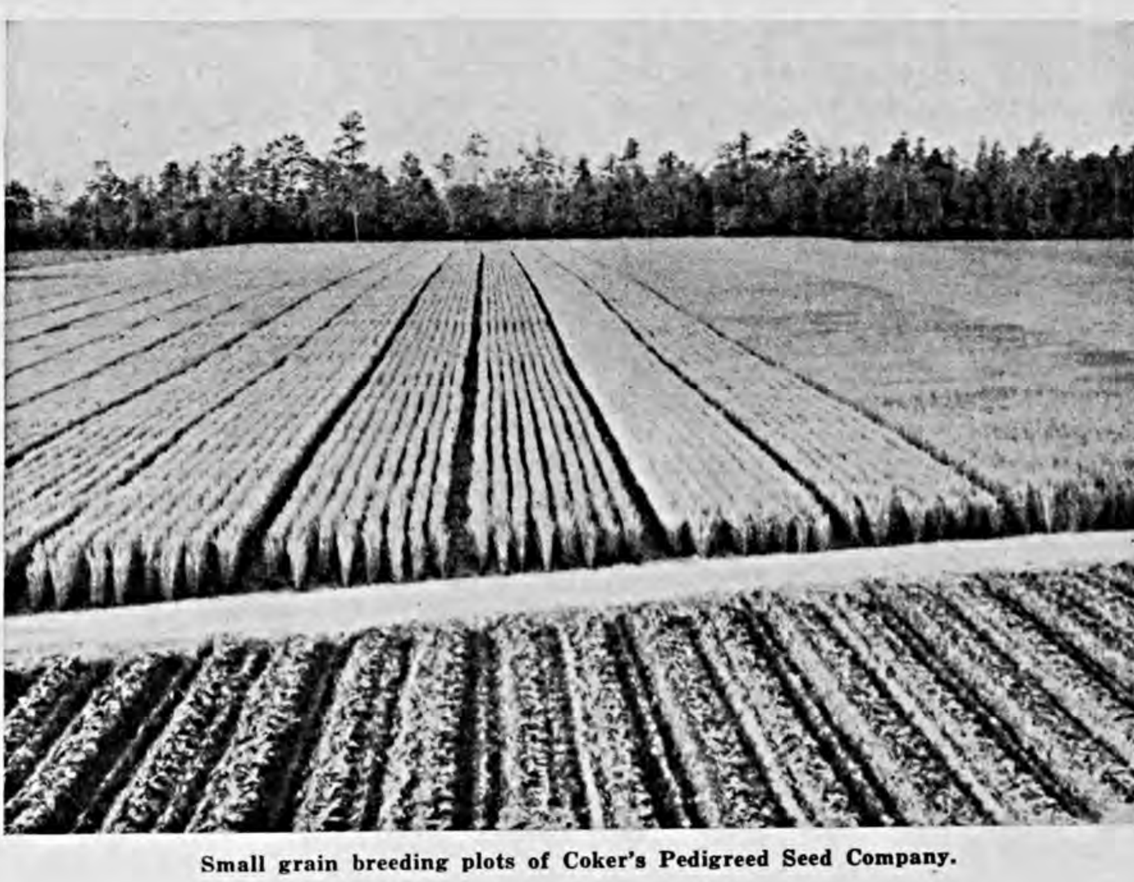
"A sound and continuing national policy on agriculture is necessary to promote the general welfare as well as the security of millions of farm people," says Director D. W. Watkins of South Carolina's Agricultural Extension Service.

"Proper preparation of soil, correct cultivation, adequate fertilization, and high quality seed are certain to bring to farmers the greatest reward for their efforts," says a successful scientific and practical farmer in South Carolina.

"I believe that the use of scrub seeds causes perhaps a greater loss to the farmer than any other single factor in production. The cost of producing a crop is practically the same whether purebred seed of high quality or a common run of seed is used," says former Governor Max Gardner of North Carolina.

"The South will be prosperous when all her fields are green in winter," says Hugh MacRae, a North Carolina owner of large holdings who practices his faith and keeps his soil prime.

"We must add animal production



Small grain breeding plots of Coker's Pedigreed Seed Company.

to plant production," says Dr. Clarence Poe, editor of *The Progressive Farmer,* "get adequate profits from producing livestock, dairy and poultry products, as well as crops, and we must add live-at-home farming to money-crop farming."

"I don't believe that much can be done to help the farmer unless he uses the best methods that science and experience have revealed. The universal and regular use of scientifically bred seed for all crops is one of the most important and necessary steps for the restoration of stability of agriculture," says D. R. Coker, a widely known and honored Southern plant breeder and large farmer.

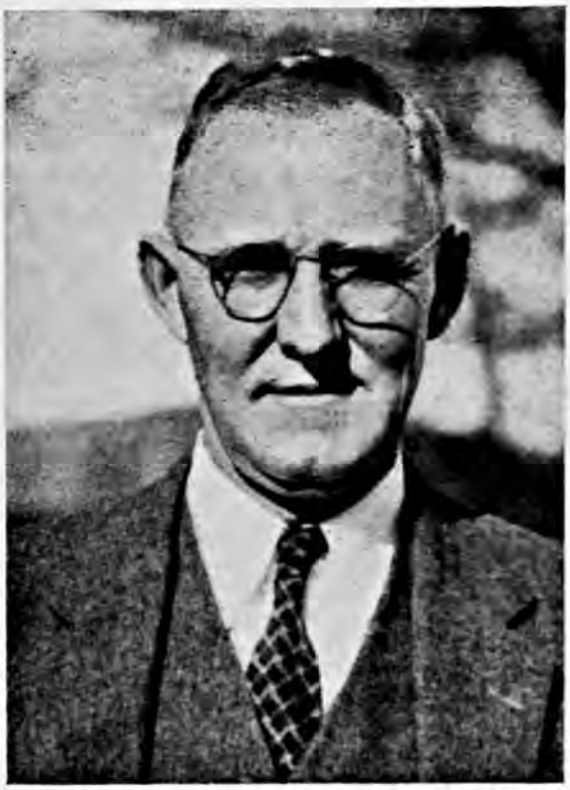
If these things be true and if it be true, as has been said, that "The net profit of the farmer is the raw material of general prosperity," it is fortunate for general prosperity that the South has leaders and agencies that are helping to put into operation these various factors which are raising the plane of Southern farming and rural life.

Personal Patriotism

Among these are, of course, the agricultural colleges, with their researches into the sciences fundamental to agriculture, their resident teaching, and their extension services to carry the gospel of better farming to the remotest citizens. There are, also, leading farmers whose intelligent practices support or supplement the work of the colleges; and there are commercial and private organizations whose patriotism as well as their self-interest lead them to work in the interests of the public.

All of which brings us now to the central theme of this story—namely, the importance of purebred seed in better farming, and the value of the services of an outstanding Southern seed-breeding organization — Coker's Pedigreed Seed Company of Hartsville, South Carolina.

South Carolina and the South are



George J. Wilds, plant-breeding manager of the company.

fortunate, indeed, in having many worthy seed breeders, whose careful scientific labors have been of great value to farming, even though not always successful financially. The same might be said, too, of pioneer livestock breeders whose work has helped farmers to know and appreciate purebred livestock.

Coker's Pedigreed Seed Company, because of its completely scientific organization, its wide range of plant-breeding operations, its long-established status, its large practical-farming demonstrations of its seed-breeding and other good-farming principles, and its far-flung service to Southern agriculture, merits special attention.

First and fundamental in profitable farming anywhere—not forgetting the soil itself—is the need for good seed.

Dr. Seaman A. Knapp, founder of our agricultural demonstration work, once said that the productive power of the average Southern farmer could be increased 50 per cent by better seed. If that seems a rather large increase from better seed, we can at least accept Coker's very modest estimate of 10 per cent increase. He says:

"Our long experience convinces us that if every grower of cotton and grain in the South would adopt a systematic plan of securing purebred seed from scientific sources year by year, his gross farm returns would be improved by at least 10 per cent, *and this 10 per cent would mean not less than twice the net return that most farmers have been realizing.*

Compare Costs

"The average cost per acre of seed for Southern farms is the smallest of any of the indispensable items of crop production. It need not cost more than one dollar per acre for seed of the highest reliability and producing power as against several dollars per acre for each of the other important factors, such as land, preparation, fertilization, harvesting; and yet the difference in cost of only a few cents per acre between the most reliable varieties ot scientific breeding and the average nondescript seed will frequently make a difference between conspicuous success and miserable failure."

Messrs. D. R. Coker and J. F. Clyburn inspecting a field of April-planted Coker-100. Final yield, 821 lbs. lint per acre, average staple 1⅛.

These words, it must be kept in mind, are the words of a scientist whose large farming operations bear eloquent practical testimony to the truth of his preaching and whose unselfish service to agriculture and society leave no room for question that he puts service ahead of self.

For a full generation, since 1902, Coker's Pedigreed Seed Company has served its generation—without any "nature-faking" but on the established principles of breeding—always seeking to sell people on plant breeding rather than trying to sell them seed, and seeking to demonstrate that pedigreed seed will make money for the farmers rather than for the plant breeders.

David Robert Coker, founder of Coker's Pedigreed Seed Company, is the son of the late Major James Lide Coker, in his day a large farmer and business man whose public-spirited service was conspicuous.

A graduate of the University of South Carolina, with a scientifically trained mind, David Coker has done further honor to the family name and has had shown him by the people such honors and trusts as these: Chairman of the South Carolina Council for Defense, 1917-19; Federal Food Administrator, 1917; member of the National Agricultural Commission to Europe in 1918; director of the Federal Reserve Bank of Richmond; trustee of the University of South Carolina.

An Idea Materializes

Coker's interest in plant breeding began in 1902 when his attention was attracted to the cotton breeding work carried on by Dr. H. J. Webber of the Bureau of Plant Industry, United States Department of Agriculture, who had started a series of breeding tests in 1898 to improve the staple and quality of upland cottons. With seeds which came originally from selected plants of short staple cotton on the Hartsville plantation, Mr. Coker began breeding on his own account. He used from the first the scientifically accurate plant-to-row method of testing. This method, while fundamentally simple and approved by all authorities, requires unremitting labor, endless patience, and expert knowledge of cottons on the part of the breeder who uses it.

In its essentials, the plant-to-row method of selection merely assists Nature in propagating those plants exhibiting the traits which the breeder wishes to transmit to the plant's product. In the case of his cottons, it was Mr. Coker's task to select season after season from his breeding fields those plants which bore lint of the greatest length and best quality and which had other visible characters of unusual merit. The seed from such selected plants were planted the following season in a row to themselves, the uniformity, vitality, and earliness observed, and the comparative yields accurately determined. The lint produced by each row was carefully tested and the degree in which each selected plant possessed the ability to transmit to its offspring those desirable qualities which had led to its selection, in the first instance, determined whether its progeny should be selected for increase.

In 1914 Mr. Coker and his associates formed Coker's Pedigreed Seed Company at Hartsville, South Carolina. This company has continued the momentous work for the staple cotton industry and has extended its activities to include plant breeding with tobacco, grains, asparagus, cantaloupes, watermelons, etc. It now includes also dairy cattle breeding and extensive practical-farming operations. For a period of years the company had, as the valuable director of its plant breeding, Dr. H. J. Webber, whose ideals and example first stimulated David Coker and led to the establishment of the business.

Steady Progress

As years have passed, the work of the Pedigreed Seed Company has made steady progress in extending its service over many States, though there have been times when operations were at heavy financial loss and many thousands of extra capital were necessary to maintain the ideal and the service. Meanwhile the organization has of necessity grown until it has a large staff of scientific and business workers, with David R. Coker the directing head, and George J. Wilds, a thoroughly trained and experienced scientist, as plant-breeding manager.

The value of plant breeding, not too well appreciated by most people, may be stated thus:

The recognition, propagation, and utilization of valuable plant variations bear exactly the same relation to profitable plant production that the recog-

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Commercial Fertilizers In Grape Growing

By F. E. Gladwin

Vineyard Laboratory, New York Agricultural Experiment Station, Fredonia, New York

IN 1909 the New York Agricultural Experiment Station began testing the three principal elements of plant food, nitrogen, phosphorus, and potassium, in their relationships to Concord grape production on a 30-acre farm located in the heart of the Chautauqua and Lake Erie Grape Belt. Three distinct soil types are represented in the area, namely, Dunkirk gravelly loam, Dunkirk silt loam, and Dunkirk shale loam.

The experiment about to be discussed is located on the Dunkirk gravelly loam. Chemical analyses of the soil are shown in Table I. Both the surface 7 inches and the subsoil to a depth of 14 inches show an abundance of potassium. The phosphorus content of both the surface and subsoil is low. The nitrogen sampled from both strata is likewise low, there being about twice as much in the surface soil as in the subsoil. If soil analyses alone could solve the fertility problem, it would seem that it would only be necessary to apply nitrogen to these vines to secure a pronounced response, but as will be shown later, more than chemical analyses are necessary to evaluate the soil needs in commercial practice.

The vineyard chosen for this particular test had been planted about 18 years when the experiment started, and the vines therein had been subject to the same care that commercial vineyards in the section were receiving. Rather close examination showed that they were nearly normal vines for this soil type. Approximately a third of the vineyards in the Lake Erie Valley are on soils very similar to this on which the test was made. It is considered an outstanding soil for grapes because of its depth, its texture, and the good drainage which permits it to be tilled within a few hours after a heavy rain. Since this type of soil is easy to cultivate and because but little farm manure is made in the region, the amount of humus has been reduced to much below the requirements for optimum vine growth and production.

Humus Depleted

The use of green manures in the region was the exception. The reduction of humus has been going on year after year for a long period, and it has required many years of this experiment to put back an amount anywhere near proportional to that which had been removed. It is believed, however, that the humus content is now at the point where commercial applications of nitrogen, phosphorus, and potassium will be even more effective than the figures herein presented show. Since no manure nor commercial fertilizers had been applied to these vines for at least 10 years previous to the beginning of the experiment, there could have been no accumulation of plant-food reserves in the soil.

The area allotted to the test was divided into 11 plats, each consisting of from 111 to 114 vines, all Concord. Each plat was separated from every other by a buffer row of vines. Five fertilizer treatments were made namely, nitrogen, phosphorus, potassium, and lime every third year; nitrogen, phosphorus, and potassium; nitrogen and phosphorus; nitrogen and potassium; and phosphorus and potassium. These plats were duplicated. In the exact center of the area the check or control plat was located. This also included about 111 vines.

The source of nitrogen for most of the 25-year period has been from nitrate of soda, which was applied at the rate of 250 lbs. per acre annually. Phosphorus was derived from superphosphate carrying 16 per cent phosphoric acid. Three hundred pounds of it have been the annual acre application. The potassium was carried in muriate of potash which was put on at the rate of 200 lbs. to the acre. The superphosphate and muriate of potash were broadcast over the surface of the soil in early spring and either disked or plowed in the soil as deeply as the grape roots would permit. The nitrate of soda was applied shortly after the buds began to break. Green manures, principally rye, have been sown annually in late July, and either disked or plowed under the following spring when they had attained a height of approximately 2 feet.

The tillage given these vines has been no different than that given to thousands of acres of grapes in this region. The number of cultivations has depended on the frequency of rainfall as it influenced weed growth. Hence for about 2 months of each year the soil under the trellis wires and between the rows has been practically free from weed growths.

In gauging the results in these tests, the effects on quantity and quality of the fruit should receive first consideration. Next in importance are the relationships between the treatments and growth of leaf and cane. Other possible effects have been looked for from time to time. During a period of 25 years many extremes of weather have been experienced, as hot and dry summers, followed by those cold and wet. Winters with mild temperatures and little snow cover have followed those with extreme low temperatures and heavy snowfall. The relationship be-

This plat received applications of nitrogen, phosphorus, and potash and averaged 61 per cent more grapes than the check.

tween fertilizers, if any, and their effect on fruit and cane maturity, and the effect of the different food elements on resistance to winter cold have received attention. Have any of the materials affected the time of leaf fall or that of foliation in the spring? The sugar-acid ratio of the grape has a most important bearing on the palatability of the fruit, either when eaten fresh or when taken as a beverage. These studies have hence included any possible relationship between the sugar content of the grape and any of the treatments.

The recorded data for fruit yields show that the vines fertilized with nitrogen, phosphorus, and potassium, with a lime application every third year, have averaged 50 per cent more grapes than the check; the nitrogen, phosphorus, potassium plats 61 per cent more; the nitrogen and phosphorus plats 43 per cent more; the nitrogen and potassium plats 57 per cent more: while the phosphorus and potassium plats were 27 per cent greater. Since the check plat yielded a total of 53 tons of fruit per acre during the life of the experiment, an increase of 27 per cent is an important gain — if the cost of obtaining it was not too great. All treatments that include nitrogen have averaged 53 per cent greater yields for the period than the check, and 26 per cent more than the phosphorus and potassium combination.

TABLE I. Chemical Analysis of the Dunkirk Gravelly Loam Soil Upon Which This Experiment Is located.

Depth of Sampling in Inches	K_2O	K.	P_2O_5	P.	CaO	Ca.	MgO	Mg.	N.
	Pounds per acre								
0-7	44,600	36.800	3,940	1,720	12,800	9,000	16,200	9,600	3,200
7-14	47,400	39,200	2,860	1,240	14,400	10,200	18,400	11,000	1,700

During the first 15 years of the experiment the fruit from each plat and the pruned canes therefrom were weighed collectively. For the last 10 of the 25 years, the weights of both fruit and wood have been recorded from each vine of each plat.

Compactness, size of cluster, size of berry, and general appearance of the fruit are all important characters in the marketing of grapes to the best advantage. The first three of these are also reflected in the poundage produced, but general appearance or attractiveness is not subject to mathematical determination.

Irrespective of injury from cold, high yield with the grape in any year is likely to be followed by a medium or low return the following one. Conversely, low yields are often followed by high ones if growing conditions are at all favorable. In 9 of the 25 years of this experiment, yields and growth were affected adversely by unfavorable weather. Hence any beneficial effects that might have come from the fertilizers were nullified in the seasons following, so far as fruit yields were concerned.

Results With Potash

Potassium has been of greater value when combined with nitrogen than has phosphorus. When the increase of 61 per cent for the nitrogen, phosphorus, and potassium plats is compared with that of 57 per cent for the nitrogen-potassium plats, phosphorus does not seem particularly effective, at least so far as fruit production is concerned. The role of phosphorus is further lowered when it is noted that the nitrogen-potassium plats averaged 14 per cent greater yields than the nitrogen-phosphorus plats.

The highest quality fruit came from those plats that had nitrogen either in combination with phosphorus or potassium or both. Next in the scale was the fruit from the phosphorus-

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Peanuts Win Their Sit-down Strike

By P. H. DeHart

Agricultural Experiment Station, Blacksburg, Virginia

THE peanut was introduced into the United States during early days of colonization, but did not become of commercial importance as a farm crop until after 1870. Peanuts are at present an important money crop in at least eight southern States, especially in those regions infested by the cotton boll-weevil. The total production in the United States has increased from about one-half billion pounds in 1909 to almost a billion and a quarter pounds in recent years. The average yield per acre for the United States is approximately 700 pounds of farmers stock peanuts per acre. In the Virginia-North Carolina area where the large type peanuts are grown, the average yield is around 1,000 pounds per acre.

The peanut, sometimes called "goober" or "goober pea," is a pea rather than a nut, differing from other plants of the pea family by blooming above ground and maturing its fruit or pod beneath the surface of the soil. The flowers are produced at the joints where the leaves are attached to the stems, and as soon as pollination takes place, the "peg" elongates and goes into the ground, where the pod develops. Due to this habit of growth it is essential that the crop be produced on a soil where a loose surface can be maintained.

The peanut crop was treated as an orphan child on the peanut farms for many years. The opinion of the grower was that, if the other crops in the rotation were fertilized, the peanut had some unusual power that would enable it to thrive on the nutrients left by the other crops. The peanut accepted this treatment for many years, but with the establishment of the principle of equality and the realization of the needs of the "forgotten man," the peanut challenged the constitutionality of the maltreatment of the past and pulled a "sit down strike" on yields, with a request to be given a fair and equal part of the fertilizers used on the farm. In order to settle the "strike" on manv farms at present and to prevent it from spreading to other farms, evidence and "pleas" for a favorable decision will be given herewith.

Consider All Angles

In order to present this case, it will be necessary to consider it from the standpoint of the soil, the farming system, plant-food removal of the crops grown in the rotation, and the response the peanut made when a few farmers and experiment station men recognized the needs of the "forgotten man" and broke all customs of the past by taking the peanut off a starvation diet and placing it on a balanced and abundant ration.

The soil should be the first thing to consider when determining the fertilizer needs of any crop, because the soil is the store-house of the raw materials that are used in the processing of crops. If the supply is low, it must be increased by the use of commercial fertilizers and good farming practices, if the processing done on the farm is to be economical and profitable.

In order to produce peanuts with a bright hull, they must be grown on a sandy or light sandy type of soil. The dark, heavy, and poorly drained soils usually stain the hulls, which is objectionable, and results in a lower price per pound. If peanuts are grown primarily for oil or shelling stock, stained pods are not objectionable. Since the peanut in Virginia must be grown on the sandy type soil, and since the sandy soils of Virginia are marine soils, the majority of the nutrients that are soluble and available to plants have been lost through the thousands of years of leaching and about a hundred years of the cash-crop system of farming that gave little or no consideration to the maintenance of soil fertility.

Soil Deficiencies

A chemical analysis of the Onslow fine sandy loam soil shows it to contain .026 per cent potash and .04 per cent phosphoric acid or a total of 520 pounds of potash and 800 pounds of phosphoric acid in the first 6 inches of the top soil, as compared to 18,200 pounds of K_2O and 3,200 pounds of phosphoric acid in the Hagerstown silt loam in a limestone section. Since a soil is considered deficient in potash when the percentage of K_2O is .25 per cent or less and phosphoric acid .1 per cent or less, the need for liberal applications of fertilizer can easily be seen.

In addition to being naturally low in plant nutrients, the open nature of the soil, large annual precipitation, lack of cover crops, and in general a favorable temperature for bacterial action tend to increase the loss of the more soluble nutrients, such as potash, calcium, and nitrogen, that may have been in the soil or may have been added in the form of fertilizers. The low content of the nutrients of such soils and the climatic and soil conditions that encourage leaching make it necessary to apply heavy applications of fertilizers on all crops of this area in order to insure an abundant supply of plant nutrients in the soil for economical crop production.

TABLE I. Annual Loss of Nutrients by Percolation.

	Pounds per Acre			
Soil Condition	N	P_2O_5	K_2O	CaO
Bare	69.0	Trace	86.8	557.2
Rotation	7.8	Trace	69.1	322.0
Grass	2.5	Trace	74.5	364.0

The actual pounds of nutrients lost per acre from the clay soil given in Table I (from Lyon and Buckman's Nature and Properties of Soils) can not be used to indicate the losses from a sandy soil, because most sandy soils have been leached over such a long period of years that at present they do not contain enough nutrients to permit such a heavy loss. The information in this table will give a good indication of the relative solubility of the nutrients and the loss that may be expected from a sandy soil when the nutrient content has been increased through additions of commercial fertilizers. In fact, the loss would be greater from the sand than from the clay, if both soils contained the same amount of nutrients. One significant point in this table is the reduction in the loss of nitrogen from 69.0 pounds per acre from a bare soil to 2.5 pounds per acre where grass was used, while the loss of potash was only reduced from 86.8 pounds to 74.5 pounds per acre under the same conditions.

The farming system used will materially affect the response from the use of fertilizers on peanuts. If a system of farming has been one that gave little or no consideration to maintaining the organic matter and nutrients by proper rotation, no system of fertilization will give maximum returns. A few farmers have tried to make fertilizers pay in a 1-crop system of farming, which is about as difficult to do as running an automobile that is out of time. If the above system has been used, the first thing to do is to work out a sound farm management program that includes lime, legumes, green manure crops, rotation of crops, and the use of liberal applications of fertilizers to all crops in the rotation. If the legumes are fertilized, they will make a better growth which will add more organic matter and nitrogen to the soil, and the phosphorus and potash in the fertilizers will assist in correcting the deficiencies of these elements. When a system that included lime, legumes, and crop rotation has been used, the main problem is to use sufficient fertilizers in the rotation to replace the nutrients removed by the crops and that lost through leaching.

For best results, peanuts require a sandy or light sandy type of soil with plenty of available plant food.

The following table calculated from information obtained in Henry and Morrison's "Feeds and Feeding" gives the approximate pounds of a few of the nutrients removed by various crops commonly grown in the peanut belt.

The plant nutrients removed per acre by the crops grown in a rotation of cotton followed by crimson clover as a winter cover crop, second year corn, third year soybeans, and fourth year peanuts may be determined from the figures given in Table II. Since the peanut is a legume, and if the rotation includes at least one legume as a green manure crop, the nitrogen

TABLE II. Plant Nutrient Removal in Pounds per Acre.

Crop	Yield		Nitrogen	P_2O_5	K_2O
Cotton	1	bale	39.5	15.6	15
Corn (grain)	50	bu.	50.0	19.5	11.4
Stover and Cobs	1.7	tons	33	17.2	52.8
Peanuts	1,500	lbs.	59.7	10.2	18.3
Peanut Hay	1	ton	31.0	6	30.2
Peanuts total			80.7	16.2	48.5
Soybeans (seed)	1,200	lbs.	70.8	16.6	29.4
Soybean Hay	2	tons	94.8	23	39.3
Lespedeza	2	tons	85.6	16.5	43.2
Crimson Clover	1½	tons	67.8	13.8	66.9

needs of the peanut will usually be satisfied, and for that reason only phosphorus and potash will be considered. A total of 121.9 pounds of P_2O_5 and 263.3 pounds of K_2O would be removed from 1 acre in 4 years by the crops grown in the above rotation, provided sufficient plant nutrients were present to produce the yields given in the table. The poor yields on the majority of the peanut farms are due to the lack of sufficient nutrients.

Manure Is Insufficient

The information in Table II considered the removal, and in order to arrive at a fertilizer program, it is necessary to consider the nutrients that are returned through crop residue and manure. The use of manure will be of considerable help in reducing the fertilizer needed, but we cannot expect it to supply all of the needs in the peanut belt because of the small number of animal units on the farms and the loss due to improper handling. The following table contains some information on the nutrients recovered from feed in manure and the losses that may be expected.

.5 per cent N, .2 per cent P_2O_5, and .5 per cent K_2O when properly cared for and is worthy of consideration from a plant-food standpoint, but due to the small number of animal units and the rapid loss of the nutrients manure cannot be expected to supply all of the plant-nutrient needs of the peanut.

When this information is condensed into a "Balance Sheet" for plant nutrients, showing the amount removed from the soil and the amount returned through crop residue and manure, the difference between the outgo and income must be made up by the use of commercial fertilizers, if profitable yields are expected to continue.

The amount returned was figured by assuming that 60 per cent of the nutrients in the clover and 50 per cent of the nutrients in corn, soybeans, and peanut hay were returned through crop residue or farm manure.

When it is assumed that the legumes and nitrogenous fertilizers used on other crops in the rotation will supply the nitrogen needs of the peanut, and only phosphorus and potash are considered, we find that 56.8 lbs. of P_2O_5 and 116 lbs. of K_2O must be added in order to balance the outgo from crop removal with the income. When the leaching losses are considered, the amount of potash needed would be much greater. The use of 300 lbs. of 2-12-4 per acre on corn, 600 lbs. of 4-8-6 per acre on cotton at planting, and a side-dressing of 12 lbs. of K_2O would supply sufficient phosphorus to make up the loss, but only 60 lbs. of K_2O would be applied,

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TABLE III. Nutrients Recovered from Feed in Manure and the Loss When Exposed 3 Months.

Nutrients Recovered	Per Cent	Solids	Liquids	Loss When Exposed 3 Mo.
Nitrogen	80.3	35.5	44.8	22.5
Phosphorus ...	73.3	72.3	1.0	35.6
Potash	76	16.7	59.3	51.0

The information in Table III, taken from Hughes & Henson's "Crop Production," is given to bring out the fact that the majority of the potash is recovered in the liquid part of the manure, and 51 per cent of the total potash will be lost when the manure is exposed for 3 months. On the average peanut farm, due to the lack of proper bedding and storage facilities for manure, a greater part of the potash will be lost before the manure is spread on the soil for use by the crop. Manure usually contains about

Ben B. Barber (seated right) talks over with the owner and his family some of the problems involved in feeding a retail milk-route herd near Duluth.

Ben Barber Shaves Cow Costs

By E. R. McIntyre
Madison, Wisconsin

AN independent "free-lance" cow tester named Ben B. Barber, operating in the sparsely settled cut-over-land, pioneer dairy centers in five counties of the well-known Arrowhead region of Minnesota adjacent to Duluth, is probably doing as valuable and constructive service to small herd owners as any regularly organized co-operative dairy herd improvement association in the Northwest. He is rapidly becoming a one-man extension department in all things pertaining to dairy and soil management, and doing a thorough and conscientious job.

Behind the splendid achievement of Mr. Barber in his reasonably priced services to these small farmers lies the zealous interest of George W. Kelley, farm editor of the Duluth News-Tribune, who launched the independent cow-testing unit after it was clear that an association could not be organized in the area on the usual terms, and when there were but two herds in St. Louis county left in active association work. Material for this recital of Barber's busy career comes from Mr. Kelley's first-hand knowledge of conditions there.

It was their idea that a particular type of service at nominal cost without sacrifice of quality, and with much sustained energy and enthusiasm behind it, was needed to make the system lasting and practical for that section, where newly cleared plots average 25 acres or so. It was believed that the time to start testing was in the pioneer stage of herd building, and not after men grow careless and indifferent to details as their incomes gain. The plan has been highly successful, both to the farmers who pay 90 cents a year per cow enrolled for 6 bi-monthly tests, and also for Mr. Barber who handles 5,000 cows per year at that rate and renders a job equal to many of the best performed elsewhere.

Plans Expansion

Although Barber has been at the work only 2 years, many farmers have him to thank for rapid progress. One small farm up in the State forest area north of Duluth was able to send a son to the State university because the tests and the tester's market service brought the owner $125 to $150 for good proven cows that otherwise might have been grabbed up by a touring jockey for $50 each or less.

Next spring Barber plans to do more things to put thrift money into the jeans of the settlers, especially through the organization of a soil-mapping and fertilizer-consultation service route, which like the present cow-testing service, will be paid for in fees and run along modern, recommended formulas. For this new side-line Barber will take on a specialist who has the recognized qualifications for soil advisory work. At present Barber works alone at a prodigious amount of detail, ably assisted by his wife in keeping books and records and "balancing the barn books" for his 500 scattered membership.

As Barber is his own boss in an administrative sense, (although catering to 500 farm bosses meanwhile) this has meant that certain problems had to be faced and met in regard to the issuing of barn tally sheets and herd books, and in avoiding the payment of costly postage on the return of the latter. (Government-sponsored, official herd books are carried postage free.) The Duluth News-Tribune printed the first set of barn sheets and herd records and furnished Barber with a good camera. The herd books are distributed back and forth through the cooperation of stores, banks, the newspaper office, creameries, and neighbors. Barber gets a lot of publicity and fact-finding letters and pictures galore to his membership through the Duluth newspaper. Last month the 4-H dairy project was celebrated with a vim in Duluth by the community where Barber tests, and the State extension service workers cooperated in the program, in which vocational agriculture teachers have also had a part.

The idea of a free-lance tester is decidedly new to many old hands at the dairy promotion game, but they are admitting it to be a success when handled by men with Barber's energy and ability. This work must not be confused with the mail-order scheme of cooperative testing, a plan which depended on a central testing laboratory and which lacked the vital contacts that the Barber type of dairy leader always provides.

Numerous Duties

Like other good testers, Barber does not stop when he "reads the Babcock fat column." He advises on rations; he sees that the herds of his members are headed with good, pure-bred sires with good production records back of them. He finds a market for the better bulls and a large number of the young heifers. He keeps records on the bulls and their daughters and makes dam-daughter comparisons, watches bacteria counts, and sees that suspicious symptoms in the milk or cream are promptly checked through the local health service. He keeps a wary eye glued to the current feed markets and notifies his patrons of any changes in the prices which may reflect to their advantage.

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Fertilizer Placement Influences Profit

By Lewis P. Watson

North Carolina College of Agriculture, Raleigh, North Carolina

WHEN fertilizer is placed so it will not injure the sprouting seed or the root system of a plant, yet is readily accessible to the feeder roots, stands will be better and yields higher. This was definitely proven to hold true for certain Irish potato growers in North Carolina under the 1937 conditions. In six fertilizer placement demonstrations with Irish potatoes in eastern North Carolina, the fertilizer was placed by the band method to each side and slightly below the seed-piece level. This was done with a fertilizer-placement machine furnished through the cooperation of an implement manufacturing concern. The average increase was at the rate of 15.2 barrels of No. 1's per acre over the check plot, which was fertilized by the old method of placing the fertilizer in the drill and mixing it with the soil before planting the seed.

The six demonstrations were located in Beaufort, Camden, Currituck, and Pitt Counties and were under the supervision of the county agricultural agent in each county. Since proper placement was the point to be emphasized in these demonstrations, no effort was made to get the growers to use a uniform amount and formula of fertilizer. The grower used the amount and mixture which he had found to be most satisfactory for po-

W. L. McGahey, County Agent of Beaufort County, inspects the demonstration plot on the farm of one of his growers. The potatoes in front of him were fertilized according to the old method, those in back of him, by the band method.

tatoes under his conditions. The same fertilizer and the same amount was applied, however, to the demonstration plot and the check plot in each instance.

The plots were an acre in size, and the grower applied the fertilizer to the check plot according to his own practice. This was done by putting the fertilizer out in the drill with a distributor and then mixing it with a plow, followed by bedding. On the demonstration plot the land was flat broke and dragged, leaving the land level. The machine was set to space the rows the same distance as the grower had used on the check plot, and to apply the same amount of fertilizer in 2-inch bands, 2 inches to each side and slightly below the seed piece. The machine planted the seed, placed the fertilizer, and threw up the bed on the demonstration plot in one operation. It was also used to plant the seed on the check plot so that the quantity of seed and the depth of planting would be uniform on the two plots. The fertilizer distributor was disconnected for this operation on the check plot.

Improved Stand

In a majority of the demonstrations and in other fields where placement was practiced, there was a definite improvement in the way the potatoes came up. The stand was more uniform in coming through and was definitely better when the fertilizer was placed to each side and below the seed piece. Where actual counts were made, the stands on the demonstration plots were from 10 to 15 per cent better than on the check. This can be observed in the accompanying photograph of one of the demonstrations in Beaufort County. County Agent McGahey is standing at the dividing line between the two plots. On the rows in front of him the fertilizer was put out by the old method. Behind him the fertilizer was placed as previously described.

The yields were as definitely improved as the stands. On placement plots the yields of No. 1 potatoes were increased from 4.2 barrels on the demonstration in Camden County to 26.4 barrels on one demonstration in Pitt County. The largest yield recorded was in Camden County on the placement plot, where the yield was at the rate of 94.8 barrels of No. 1's per acre. On the check plot 90.6 barrels were produced. The most outstanding increase of the demonstration plot over the check plot was in Pitt County, where the production was at the rate of 52.8 barrels of No. 1's on the check plot and 79.2 barrels of No. 1's on the demonstration plot.

Fertilizers Used

In Camden County, where the highest yield was made, Mr. H. C. Ferebee used 2,200 pounds of 7-5-5 per acre and planted in 3-foot rows. At the County Prison Farm in Pitt County, where the most significant increase was made, the grower used 2,000 pounds of 5-7-5 per acre and also planted in 3-foot rows. The accompanying chart graphically illustrates the results of each demonstration.

The average yield of No. 1's on all the check plots was 58.2 barrels. On the demonstration plots the average yield was 73.4. This is an average increase of 15.2 barrels of No. 1 potatoes. In all cases a barrel was figured at 165 pounds net. This is an exceptional increase, and over a period of years the results probably would not be so significant. But results from other States definitely bear out the fact that with quite a number of crops, yields can be increased by proper placement of fertilizer. In some instances the efficiency of the fertilizer can be doubled if it is applied so as not to injure the root system of the plant and yet be readily available to the feeder roots.

There is a definite, increased interest in fertilizer placement being shown by

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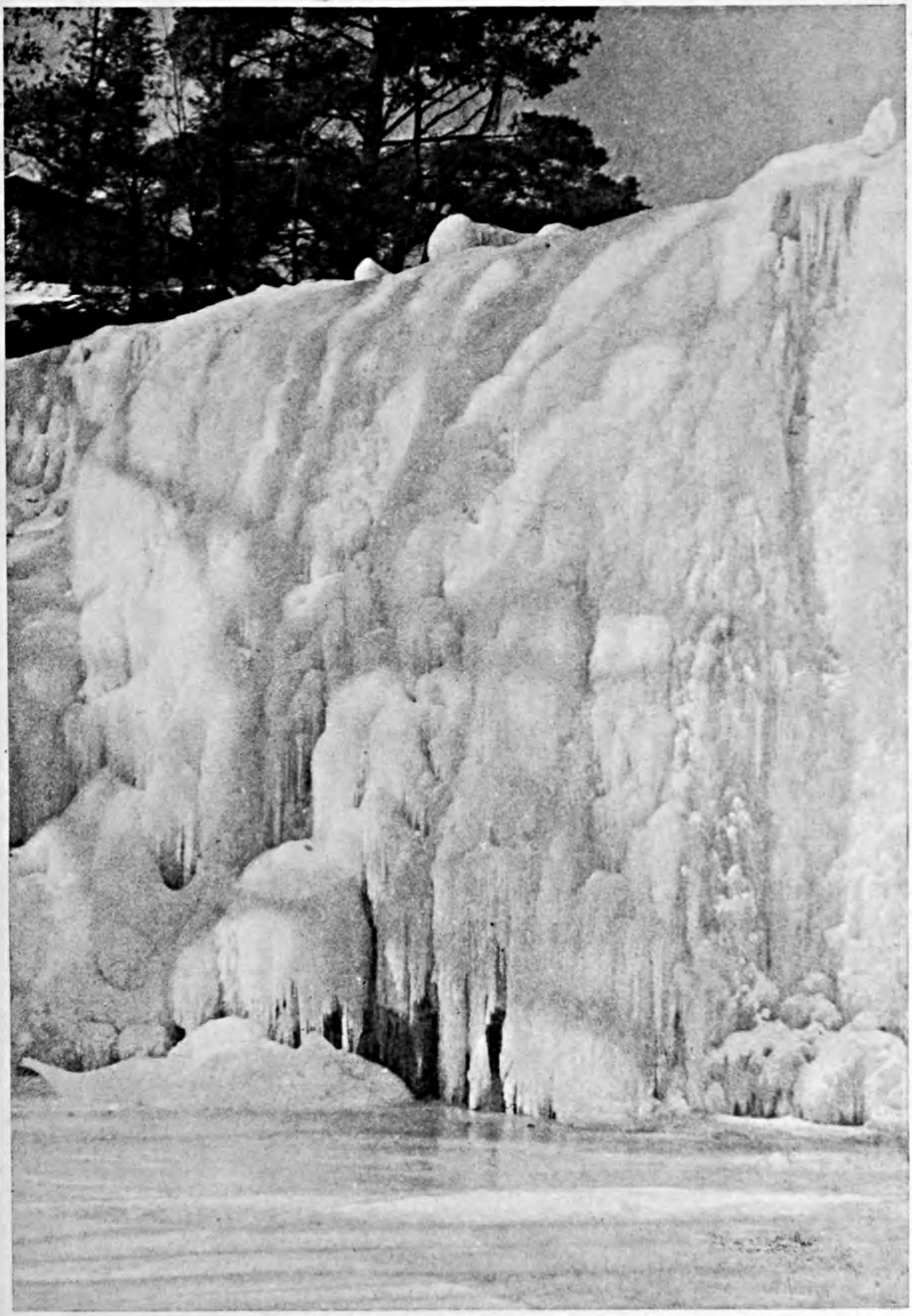
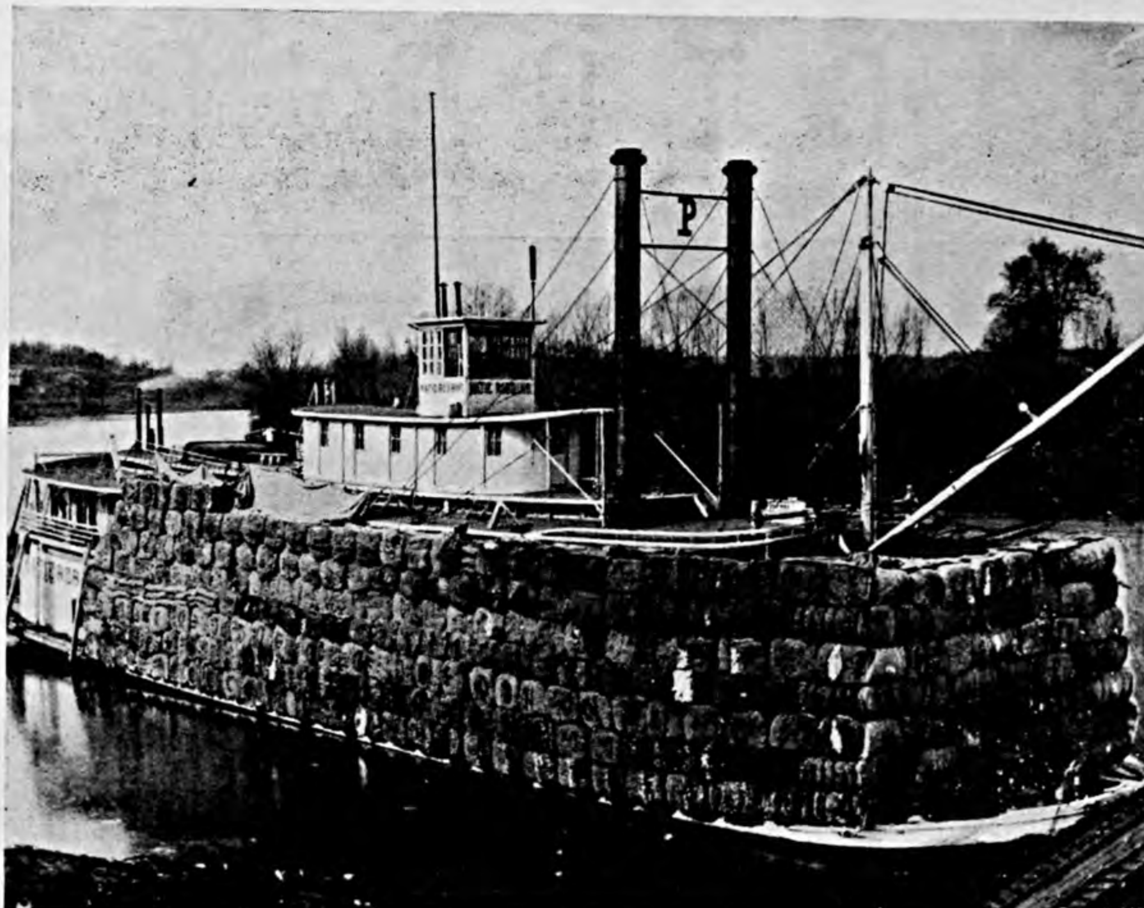
PICTORIAL



CAUGHT ON THE WAY DOWN.



By water or by land, transportation to market is an important consideration in profit determination.

Whether you're vagabonding or taking your winter vacation seriously, the fewer the rules the better.

Sand or snow, calm or blow, children enjoy life.

The Editors Talk

Looking Ahead

Since it is open season for forecasting, and it appears that nearly everyone is taking advantage of the opportunity, in order to be in the economic swing we are going to dust off our crystal ball and oil up the "if-ometer" with a view to adding our ten cents' worth to the vast pile of economic information. In spite of the fact that it has recently been said by a prominent economist that a pessimist is one who must live with an optimist, we still prefer to be listed under the optimist column.

Our economic mechanism, like an automobile going up a long, hard incline, often finds it necessary to back up and get a better start. It still appears that the present recession in business conditions is of the nature of an automobile backing up to get a better start. The big question is, Will it be necessary to back clear down to the foot of the hill and start over again? There seems to be plenty of evidence at the present time that we have backed about as far as is necessary and are again ready to resume the ascent.

We trust that a slight note of optimism in our opinion will not add materially to the list of confirmed bears. In this connection, it might be suggested to the economic planners that an open season on bears might turn out to be one of the best means of ending our present economic advance to the rear. It appears that most everyone has been convinced by this time that a recession is in order, and that everyone should do his part to help it along. To accurately predict the course of business over the coming year would be to forecast the trend in business psychology and Federal economic programs, two problems for which our outmoded crystal ball and "if-ometer" are not constructed to handle.

Seriously, however, in view of the slowing down in industrial production and its influence on payrolls, it must be expected that the demand for agricultural products will be less during the first half of 1938 than it was last year. Offsetting in part, at least, this decrease in consumer income is the reduction that has taken place in farm prices. This in turn may be construed to mean a big reduction in farm purchasing power. However, when considered in the light of agricultural production during the past season, the net result is a slight increase in the purchasing power of farmers. In November farm income began to show the results of restricted volume of marketings and lower prices and was about 5 per cent under 1936. Although prices paid by farmers receded somewhat from the high levels of last summer, they are still little, if any, under last year. It remains to be seen now if the increased volume of livestock, cotton, and corn to be marketed during the months to come will maintain farm income at levels comparable to last year.

To some extent the prophecies of those who dared to venture an optimistic opinion during the last weeks of 1937 are being realized. The index of production has risen gradually since the first of the year, the rate of activity in steel mills has increased about 10 points, while prices of some of the so-called sensitive commodities have advanced. Buying has been surprisingly active in textiles, and the retail volume is better than anticipated. The biggest fly in the ointment at the present time seems to be heavy inventories. Encouraged by steadily increasing prices and active trade, purchasing agents bought heavily during the early months of 1937 and built up large supplies of merchandise. During the last quarter of 1937, according to the available statistics, the volume of retail sales was considerably greater than the volume of production. Just how far this condition has gone in reducing inventories is hard to say. However, it certainly cannot be denied that considerable reduction has taken place.

In spite of the many comments to the contrary, we are still of the opinion that business is statistically in a position to continue its upward movement, and while farm income in 1938 may be lower than 1937, it will still be comfortably higher than the depression levels; and while business activities may be less than in 1937, the volume will still be a healthy one. The year 1938 has better than an even break to wind up traveling in the opposite direction to 1937. Anyway, that's what our "if-ometer" says, and for the lack of better information, we'll stick to it.

Agriculture—The Greatest Research

The almost unbelievable number and scope of research projects being conducted by the State agricultural experiment stations with funds and under the general coordinating direction of the U. S. Department of Agriculture are shown by the Report on the Agricultural Experiment Stations, 1936, prepared by the staff of the Office of Experiment Stations, of the Department. Results being obtained in a large number of projects are briefly summarized. Much of the work naturally relates directly to agricultural problems, such as the development of improved varieties of crops, improved fertilization of crops on different soils, disease and pest control of plants and animals, the nutrition and management of farm animals, marketing of agricultural products, improvement in agricultural implements, etc. However, many projects deal with problems which aid the urban as well as the rural population such as food preparation and preservation, nutritional values, nutrition and health of children, energy requirements of women, textile and clothing selection, household equipment, and related subjects. Economic and social problems relating to rural welfare also are investigated. When it is considered that all these projects in the State experiment stations are added to the work directly carried on by the Department, it is not hard to believe the statement frequently made that our national agriculture employs the world's greatest research agencies.

The men whom I have seen succeed have always been cheerful and hopeful, who went about their business with a smile on their faces and took the changes and chances of this mortal life like men.—*Charles Kingsley.*

REVIEWS

This section contains a short review of some of the msot practical and important bulletins, and lists all recent publications of the United States Department of Agriculture and the State Experiment Stations relating to Fertilizers, Soils, Crops, and Economics. A file of this department of BETTER CROPS WITH PLANT FOOD would provide a complete index covering all publications from these sources on the particular subjects named.

Fertilizers

¶ Following the renewed interest in asparagus production some years ago owing to the consumer demand for this vegetable and the introduction of rust-resistant asparagus varieties, Long Island, N. Y., shared a noticeable increase in acreage devoted to this crop along with other important producing areas. Extensive asparagus fertilizer investigations were begun at the Long Island Vegetable Research Farm near Riverhead to aid the growers in determining the most suitable fertilizers for the crop. Based on their nine years' research, P. H. Wessels and H. C. Thompson, in Cornell University (N. Y.) Agricultural Experiment Station Bulletin 678, entitled "Asparagus Fertilizer Experiment on Long Island," give essential information that should particularly benefit producers of this area. The asparagus fertilizer for the Sassafras silt loam soil similar to that found at the experiment farm should supply approximately 100 pounds of nitrogen, 125 pounds of phosphoric acid (P_2O_5), and 160 pounds of potash (K_2O) per acre annually for the first five years. The authors point out that this can be applied by using 2,000 pounds of 5-6-8 per acre. If double-strength mixtures, such as 10-12-16 or similar analyses, are used the amount might be cut in half. After the first five years the quantity of fertilizer could probably be reduced slightly without reducing the yield. Manure for asparagus is not recommended unless it is available at relatively low cost, not to exceed $2 a ton. It is believed, however, that the manure could better be utilized on crops preceding asparagus, applying a complete fertilizer each year to the asparagus bed.

"Fertilizer Rates and Analysis Test—Cotton—Cooperative Tests with Junior Colleges," Agr. Exp. Sta., State College, Miss., Inf. Sheet 122, Nov. 1937, J. R. Ricks, Director.

"Corn Fertilization—Cooperative Tests with Junior Colleges and Smith-Hughes Instructors," Agr. Exp. Sta., State College, Miss., Inf. Sheet 123, Nov. 1937, J. R. Ricks, Director.

"Fertilizer Rates and Analysis Tests—Cotton," Agr. Exp. Sta., State College, Miss., Inf. Sheet 124, Nov. 1937, J. R. Ricks, Director.

"Results of 1937 Lime, Fertilizer, and Organic Matter Plots on Tomatoes," Agr. Exp. Sta., New Brunswick, N. J., V. A. Tiedjens and L. G. Schermerhorn.

"Relation of Fertilization and Selling Price to Profitableness in Cotton Production," Agr. Exp. Sta., Raleigh, N. C., Bul, 313, Nov. 1937, C. B. Williams.

Soils

¶ The use of rapid chemical tests on soils to determine their available nutrient contents, and fertilizer and lime needs has become well established in many places. The tests have earned their position by the helpful and practical information they have given the users, which ultimately benefits the farmer by enabling him to use the fertilizer and lime in the analysis and amount which are likely to produce most profitable results under his own particular conditions. An excellent example of how these tests can be used to advantage, the results they give, and detailed instructions as to making them are given in Virginia

Truck Experiment Station Bulletin 95, entitled "Rapid Chemical Tests for Coastal Plain Soils," by J. B. Hester, J. M. Blume, and F. A. Shelton. The authors show how varying soil and cropping conditions will influence the results of the test, and also their interpretation, an important factor sometimes overlooked.

Results of work on the available supplies of phosphates and potash in the various cropped and virgin soils in the vicinity of Norfolk show that total and available phosphorus is low in nearly all virgin soils, and that fertilization has increased the total but not the available phosphate supply in many cases. Total potash was high in many soils, but the available potash was low in most of them. Very interesting and important relationships between availability of nutrients and fertilizer and lime additions are brought out which should be kept in mind when using these materials. For example, it is shown that as the soil becomes more acid, the availability of the phosphates decreases, due to fixation of the phosphates by the iron and aluminum combining with them under acid conditions. However, if the soil becomes alkaline, or too sweet, the plant cannot seem to utilize the phosphates as well, showing the importance of correct liming, that is, not too much or too little.

Potash is absorbed by most soils to a greater or less extent, and as the potash supply decreases below certain levels, the soil absorbs the potash so tightly that the plant cannot get it. Obviously, enough potash must be applied to take care of the soil's absorbing power and the plant requirements beside, if good results are to be obtained from the fertilization. It is also shown that if calcium or lime is present in large quantities it prevents the plants from taking up potash, even if it is present.

Brief consideration is given to other nutrients, such as nitrates, calcium, magnesium, and also organic matter. The latter part of the bulletin is devoted to a detailed description of conducting the individual soil tests, preparation of reagents, standards, interpretation of readings, and precautions to be observed. Tests for acidity, phosphate, potash, ammonia, magnesium, aluminum, nitrates, manganese, calcium, chlorides, organic matter, and texture are given. A number of literature references on the subject also are included. The bulletin will be of interest to all who are concerned in the testing of soils to determine their lime and fertilizer needs.

¶ Many of the publications of the Soil Conservation Service are notable departures from the usual run of bulletin. Full advantage is taken of the striking facts and conditions existing in various parts of the country to present in a somewhat dramatic fashion their seriousness, and judging from the results obtained this has been effective as well as justified. Three recent publications are good examples of the type issued, namely, "Conserving Corn Belt Soil" by Glenn K. Rule, U. S. Department of Agriculture Farmers' Bulletin No. 1795, "Soil Conservation Districts for Erosion Control," prepared by the Soil Conservation Service, U. S. D. A. Miscellaneous Publication No. 293, and "Erosion Control in the Northeast," also prepared by the service, as an unnumbered publication. All these bulletins contain much practical and thought-provoking information on soil erosion and its control. The remarkably good illustrations not only enhance the messages contained in the text, but add greatly to the attractiveness and attention value of the publications. While they are regional, as implied by their titles, the basic facts they contain will apply over large areas of the country.

"Alkali Soils—Origin, Examination, and Management," Agr. Exp. Sta., Berkeley, Calif., Cir. 292, June 1925 (Revised July 1937). P. L. Hibbard.

"Influence of Crop Rotation and Soil Treatments Upon the Yield of Crops on Porter's Loam Soils," Agr. Exp. Sta., Raleigh, N. C., Bul. 315, Nov. 1937, C. B. Williams, W. H. Rankin, and S. C. Clapp.

"Human and Physical Resources of Tennessee, Chapter VII, Land Utilization, Chapter VIII, Land Drainage," Col. of Agr., Knoxville, Tenn., Monograph 48, June 24, 1937, Charles E. Allred, Samuel W. Atkins, and William E. Hendrix.

"Soil Survey of Southampton County, Virginia," U. S. D. A., Washington, D. C., Series 1933, No. 6, July 1937, R. E. Devereux and Edward Shulkcum.

"Soil Survey of Chatham County, North Carolina," U. S. D. A., Washington, D. C., Series 1933, No. 7, Aug. 1937, R. C. Jurney, J. T. Miller, and S. Rankin Bacon.

"Soil Survey of the Barstow Area, California," U. S. D. A., Washington, D. C., Series 1933, No. 8, Aug. 1937, R. Earl Storie and D. F. Trussell.

"The 1938 Agricultural Conservation Program in the Northeast," U. S. D. A., Washington, D. C., NER Leaf. 201.

Crops

¶ Suggestions to assist farmers in the difficult problem of controlling Fusarium wilt in cotton are given in the 49th Annual Report of the Georgia Experiment Station for the Year 1936-37. The problem is particularly troublesome in the Piedmont, where wilt infestation occurs in small scattered areas, making it impracticable to use wilt-resistant varieties. In these areas, it is recommended that wet portions of the field be drained and muriate of potash up to 100 pounds per acre used. It has been found that these practices will reduce loss from wilt. In the Coastal Plain areas, it is recommended that wilt-resistant varieties be planted and enough potash applied to control cotton rust. In fertilizing cotton under average conditions, it is recommended that 32 pounds each of nitrogen, phosphoric acid, and potash be applied. These amounts may be furnished by the use of 500-600 pounds of 6-6-6 fertilizer, or 400 pounds of 4-8-8 per acre, side-dressed with a nitrogen material to furnish about 16 pounds of nitrogen per acre. The inauguration of new and interesting pasture investigations, breeding work with cotton and other field and horticultural crops, and many other lines of work too numerous to be mentioned here are also described.

¶ Tomato growers, not only in California but in other sections, will find much material of interest and value in California Agricultural Extension Service Circular 104, "The Production of Tomatoes in California," by D. R. Porter and John H. MacGillivray. This comprehensive publication gives information on suitable locations, cropping systems, fertilizers and manures, growing the plants, field operations, staking and pruning, harvesting, varieties, insects and diseases and their control, and in addition other information of more interest to local growers, such as irrigation, etc. In discussing fertilization, the grower is advised to consult with his local agricultural adviser, since the best fertilizer to use will vary considerably with soil and cropping conditions. Proper placement of the fertilizer in the soil with respect to the plant is also discussed briefly.

¶ With the increasing importance being attached to organic matter in orchards, the problem of growing cover crops is constantly arising. The emphasis recently given to soil conservation makes this question all the more important. A good discussion of cover crops is given by N. L. Partridge and Walter Toenjes in Michigan State College Agricultural Experiment Station Circular Bulletin 163 entitled "Annual Cover Crops for Michigan Orchards." Comparative advantages of sod and cultivation, the value and kinds of orchard cover crops, the best time to seed them, their handling to avoid undue competition between the trees, and the cover crop for soil moisture are briefly discussed. In growing cover crops, the authors point out the importance of proper fertilizing if good growth is to be made.

Lime and complete fertilizers are recommended, as needed.

¶ It is coming along to the time of the year when it is pleasant to sit down with those most optimistic and alluring of publications, the seed catalogs, and plan the garden for the coming year. This can be highly profitable as well as pleasant, if the planning is carefully done, and followed up with proper cultural practices. An excellent publication which will greatly aid in producing vegetables approaching the illustrations in the catalogs is Connecticut State College Extension Service Bulletin 242, 4-H Vegetable Gardens, by Garry A. Miles. While written for 4-H Club work, this publication contains much practical information of use to all growing a vegetable garden. Among the subjects covered in the bulletin are, locating the garden, selection of crops and amounts of each to grow, tools, soil preparation and fertilization, early indoor and outdoor planting, transplanting, cultivating, watering, pest control, harvesting, storing, canning, varieties, seeding rates, growing period, and a section on the growing and storing of herbs.

"Experiments with Hay Crops in Alabama," Agr. Exp. Sta., Auburn, Ala., Cir. 79, Oct. 1937, D. G. Sturkie.

"Growing Annual Flowers," Agr. Ext. Serv., Gainesville, Fla., Bul. 92, Oct. 1937, John V. Watkins.

"Cold Storage Studies of Florida Citrus Fruits, III The Relation of Storage Atmosphere to the Keeping Quality of Citrus Fruit in Cold Storage," Agr. Exp. Sta., Gainesville, Fla., Bul. 316, Oct. 1937, Arthur L. Stahl and John C. Cain.

"Forest Planting on Illinois Farms," Agr. Ext. Serv., Urbana, Ill., Cir. 477, Sept. 1937, J. E. Davis.

"Corn Project for 4-H Clubs," Agr. Ext. Serv., Lexington, Ky., Cir. 82 (Revised), Mar. 1937, E. J. Kinney and E. E. Fish.

"Dark-Tobacco Project for 4-H Clubs," Agr. Ext. Serv., Lexington, Ky., Cir. 290, Feb. 1937, E. J. Kinney.

"Twenty-second Annual Report University of Maryland Extension Service for the Year 1936," Agr. Ext. Serv., College Park, Md., T. B. Symons, Director.

"Sweet Potato Certification," Agr. Ext. Serv., College Park, Md., Cir. 122, Aug. 1937, R. A. Jehle.

"Growing Triumph Sweet Potatoes for Starch Manufacture," Agr. Exp. Sta., State College, Miss., Inform. Sheet 120, May 1937, W. S. Anderson.

"The Effect of Winter Storage on the Palatability and Vitamin Content of Potatoes Grown in Montana," Agr. Exp. Sta., Bozeman, Mont., Bul. 346, Sept. 1937, Helen L. Mayfield, Jessie E. Richardson, Ruth J. Davis, and Erlene J. Andes.

"Rape," Agr. Ext. Serv., Corvallis, Orez., Ext. Bul. 499, Feb. 1937, G. R. Hyslop and H. A. Schoth.

"Strawberry Varieties in Southwest Texas," Agr. Exp. Sta., College Station, Brazos County, Tex., Bul. 556, Oct. 1937, E. Mortensen.

"Sorghums Varietal Tests in Utah," Agr. Exp. Sta., Logan, Utah, Bul 281, July 1937, R. W. Woodward, D. C. Tingey, and R. J. Evans.

"Spring Wheat Production and Varieties for Wyoming," Agr. Exp. Sta., Laramie, Wyo., Bul. 224, Oct. 1937, Glen Hartman.

"The Response of Government to Agriculture," U. S. D. A., Washington, D. C., Nov. 1937, Arthur P. Chew.

"Planting and Care of Shelterbelts on the Northern Great Plains," U. S. D. A., Washington, D. C., Farmers' Bul. 1603, Revised Aug. 1937, Robert Wilson and Ernest J. George.

"Report of the Chief of the Office of Experiment Stations, 1937," U. S. D. A., Washington, D. C., Sept. 15, 1937, James T. Jardine.

Economics

¶ Of special interest to all those interested in American agriculture is the U. S. D. A. Miscellaneous Publication No. 266, "A Graphic Summary of the Number, Size, and Type of Farm, and Value of Products," by O. E. Baker, Bureau of Agricultural Economics. The compilation is based largely on the census of agriculture for 1930 and 1935. It is the last volume of a series prepared under the direction of Dr. Baker and brings up to date the Graphic Summary of American Agriculture published in 1931 as Miscellaneous Publication 105. The first of the series appeared in 1915, and the second in 1921.

In addition to the many interesting graphic maps, the author comments on the changes that have occurred in American agriculture and offers some suggestion as to why they have taken place. For 20 years preceding 1930 the trend in number of farms was downward. The economic depression seems temporarily at least, to have reversed that trend. Prior to the depression the rapid progress made in agricultural technique stimulated the production of more efficient types of livestock, that is, livestock that is more efficient in the utilization of feeds, such as dairy cows, hogs, and poultry. The less efficient types, sheep and beef cattle, remained about stationary or declined in numbers. Largely responsible for this increase in the number of the more efficient types was the releasing of about 30,000,000 acres of crop land for the production of marketable livestock which had previously been devoted to the production of feed for horses and mules which have been replaced by the tractor and other forms of power machinery.

The trend at the same time was from the less productive toward the more productive crops per acre, principally from corn toward cotton, from wheat toward corn along the northwestern margin of the corn belt, and in other sections from grain and hay toward fruit and vegetables, particularly in such areas as California.

In addition to these, other efficiency measures that have been instigated were the improvements in feeding practices and methods of producing livestock which resulted in increased production of animal products per unit of feed consumed. Largely because of these factors agricultural production registered approximately an 18 per cent increase between the period 1915-20 and 1925-30. This increase was more rapid than the increase in population.

The factor which largely contributed to the reduction in number of farms in the eastern half of the United States was the relative prosperity of the cities and the high wages available prior to the depression. With the depression, however, lack of work as well as the extremely low wage rate which prevailed in some sections resulted in migration of unemployed people to farm land. At the time of the census of 1935 it was estimated that about 2,000,000 of the "back-to-the-land people" were still living on farms. In addition to the number who migrated from the cities to the farms were a large number of young potential employes who were backed up on the farms due to their inability to secure work in the city. The recent improvement in urban conditions has again stimulated the migration of farm youth to the cities, and in 1934 and 1935 the net movement apparently exceeded about half the predepression magnitude and undoubtedly the movement in 1936 and 1937 is larger than in 1935. It may now be possible that the number of farms has again reached a stationary condition, but at a new and higher level.

During the period of the depression and the migration to the farms, approximately an increase of 500,000 farms occurred. This increase took place largely in poor and hilly farming areas and near the large cities, particularly in the manufacturing areas of the Northeast. In contrast, there was a decrease in farms in the more highly commercialized cotton belt and practically no change in the richer corn belt. The effect of this movement of city people to the farm on per capita production was to decrease the output per worker and to cause a general lowering of the level of living.

An analysis of the distribution of wealth, size of farm, and production discloses that there still exists a rather wide range among farmers in the areas of land farmed and in wealth. In 1930 about 60 per cent of the farms were under 100 acres in size. But in this 60 per cent were included only 16 per cent of the total land in farms and less than 24 per cent of the crop land harvested and less than 29 per cent of the value of land and buildings. In contrast to this 20 per cent of all the farms were 174 acres or larger but in this 20 per cent were included 66 per cent of all the farm land, over 53 per cent of the crop land harvested, and over 47 per cent of the value of land and buildings. Another important point that must be considered in this connection is that of the farms under 100 acres in area about one-half were operated by tenants, whereas, a little over one-third of the farms exceeding 174 acres in area were farmed by tenants.

During the depression the number of small farms, that is, 3 to 9 acres, increased nearly 70 per cent and farms from 10 to 19 acres increased 22 per cent. The number of farms from 20 to 49 acres remained about stationary. Those in all the larger groups up to 1,000 acres increased roughly 5 per cent, and those larger than 1,000 acres about 10 per cent. Dr. Baker notes in this connection, "Apparently, the differences in area farmed, and probably in the wealth of farmers, was not diminished during the depression."

In commenting upon the value of farm products produced per farm in the United States, it is noted that about one-half of the farms in 1929 produced less than $1,000 worth of products, including those consumed by the farm family. "This less productive half of the farms produced only about 11 per cent of the products sold or traded to use the census phrase. Probably the more productive half of the farms in a few years could be brought to the point of producing this remaining 11 per cent if prices of farm products afforded encouragement. Half of the farms of the Nation are not needed to feed and clothe the non-farm people. But these less productive farms, measured in food and fibers, are contributing an increasing proportion of the citizens of the future, for the birth-rate of the people on these farms is high.

It is further noted that one-fourth of the farms of the Nation in 1929 produced an average of less than $600 worth of products. The typical peasant farm of northern Europe produces more than this—probably nearer $1,000 worth of products. Fifteen per cent of the farms, nearly 1,000,000, produced less than $400 worth of products. This is approaching the Chinese level of production. Less than 200,000 of these were part-time farms.

In contrast to the above figures, 19 per cent of the farms produced over $2,500 worth of products. This one-fifth of the farms produced over three-fifths of the products sold or traded. These better farms are located mostly in the dairy belt, the corn belt, the wheat regions, and the valleys of the far West, with a few in Texas and Oklahoma.

One of the best ways, from the reader's standpoint, to acquire a quick and comprehensive understanding of economic problems is through graphic presentation. It is because of this that the bulletin with its large number of maps and charts picturing the economic development of American agriculture is especially valuable. Each graph is accompanied by a paragraph of brief description and explanation.

¶ According to the latest report from the North Carolina Department of Agriculture at Raleigh, N. C., "Fertilizers Sold in North Carolina During the Period January 1, 1937 to June 30, 1937," fertilizer sales in the first half of 1937 amounted to 871,484 tons of mixed goods and 116,480 tons of nitrogenous materials, 53,820 tons of phosphatic materials, 25,400 tons of potassic materials, and 2,815 tons of customer's mixtures, or a total of 1,069,999 tons. For some time North Carolina has published their fertilizer statistics in this excellent form. In addition to the above-mentioned tonnages, the quality of each grade sold in the State is given. The 3-8-3 is still the dominating single analysis, representing 316,864 tons, which is followed by 3-8-5 with 199,378 tons.

Other important analyses include 5-7-5, 4-10-4, 4-12-4, 6-6-5, 2-10-6, 2-9-3, and 4-8-4. It is especially interesting to note the trend for higher analysis fertilizers in this State. In 1935 the leading grades were 3-8-3, 3-8-5, 4-8-4, and 5-7-5. In that year 3-8-3 represented 46.7 per cent of the total mixtures; 3-8-5 represented 18.7 per cent; 4-8-4, 6.3 per cent; and 5-7-5, 3.9 per cent. In the first half of 1937 3-8-3 represented only 26.3 per cent of the total tonnage of mixed goods, while 3-8-5 had increased to 23 per cent, 4-8-4 to 8.3 percent; and 5-7-5 to 5 per cent.

"Fertilizer and Fertilizer Material," Dept. of Agr. and Indus., Montgomery, Ala., Bul. 36, *Fiscal Year* 1936-37, *Geo. H. Marsh.*

"1936 *Orange County Avocado Production Cost Analysis," (Seven-Year Summary* 1930-1936), *Agr. Ext. Serv., Berkeley, Calif.*

"Extracts from the Agricultural Code of California, Pertaining to General Provisions and Fertilizing Materials," Div. V, Chap. 7, *Art.* 2 *(Revised Aug.* 27, 1937), *St. Dept. of Agr., Sacramento, Calif.*

"Commercial Fertilizers Report for 1937," *Agr. Exp. Sta., New Haven, Conn., Bul.* 404, *Oct.* 1937.

"Florida Citrus Prices, 1," *Agr. Exp. Sta., Gainesville, Fla., Bul.* 315, *Sept.* 1937, *A. H. Spurlock and Marvin A. Brooker.*

"Agricultural Outlook for Illinois 1938," *Agr. Ext. Serv., Urbana, Ill., Cir.* 480, *Dec.* 1, 1937.

"Illinois Farm Economics," Agr. Ext. Serv., Urbana, Ill., Nos. 30 *and* 31, *Nov. and Dec.* 1937.

"Indiana Crops and Livestock," Agr. Exp. Sta., West Lafayette, Ind., No. 146, *Nov.* 1, 1937.

"Marketing Potatoes in Michigan," Agr. Exp. Sta., East Lansing, Mich., Sp. Bul. 288, *Nov.* 1937, *G. N. Motts.*

"Minnesota Farm Business Notes. Farm Income in Minnesota," Agr. Ext. Serv., St. Paul, Minn., Mimeo. 180, *Dec.* 20, 1937, *Warren C. Waite.*

"Mississippi Type of Farming Areas," Coordinated with Type of Farming Areas of the United States 1935, *Agr. Exp. Sta., State College, Miss.*

"Present Uses of Land in Mississippi 1935," *State Land Planning Specialist, State College, Miss.,* 1937.

"Problem Area Map and Supplementary Report," State Land Planning Specialist, State College, Miss., Aug. 31, 1936.

"Approximate Land Area of Minor Civil Divisions in Mississippi with Key State Map," State Land Planning Specialist, State College, Miss., Dec. 1, 1936.

"Assessment of Montana Farm Lands," Agr. Exp. Sta., Bozeman, Mont., Bul. 348, *Oct.* 1937, *R. R. Renne and H. H. Lord.*

"A Statistical Study of Agricultural and Related Trends in South Carolina," Agr. Exp. Sta., Clemson, S. C., Bul. 312, *Oct.* 1937, *J. L. Fulmer.*

"Biennial Report of the Department of Agriculture to the Governor, 1935-1936," *O. E. Van Cleave, Com. of Agr., Nashville, Tenn.*

"Statistics of Texas Agriculture," Agr. Exp. Sta., College Station, Brazos County, Tex., Cir. 80, *Oct.* 1937, *L. P. Gabbard and C. A. Bonnen.*

"Biennial Report, Department of Agriculture and Markets, 1935-1936," *Wis. Dept. of Agr. and Markets, Madison, Wis., Bul.* 178, *Oct.* 1936, *Walter H. Ebling, E. Smith Kimball, W. D. Bormuth, and F. J. Graham.*

"1937 *Cotton Price Adjustment Payment Plan," U. S. D. A., AAA, Washington, D. C., CAP-*102, *Nov.* 1, 1937.

*"The Dairyman's Place in Farm Solidarity," U. S. D. A., AAA, Washington, D. C., G-*79, *Gen. Inf. Series, Nov.* 1937.

*"The Ever-normal Granary: What Can It Do for the Corn Belt and the Nation?" U. S. D. A., AAA, Washington, D. C., G-*80 *Gen. Inf. Series, Nov.* 1937.

*"A National Program for Wheat," U. S. D. A., AAA, Washington, D. C., G-*81, *Gen. Inf. Series, Dec.* 1937.

"Determination of Fair and Reasonable Wage Rates for Harvesting of the 1937 *Crop of Louisiana Sugarcane, Pursuant to the Sugar Act of* 1937," *U. S. D. A., AAA, Washington, D. C., S. D. No.* 12, *Nov.* 12, 1937, *H. A. Wallace, Sec. of Agr.*

"Report of the Solicitor, 1937," *U. S. D. A., Washington, D. C., Martin G. White, Solicitor.*

Golfer (far off in the rough): "Say, caddy, why do you keep looking at your watch?"

Caddy: "This isn't a watch, sir, it's a compass."

"How's the wife, George?"

"Not so well, old boy. She's just had quinsy."

"Gosh! How many is that you've got now?"

Soil Treatment Effects

THE plant does more than merely store what it takes from the soil. It uses these soil supplies as a help in running its plant machinery, and in manufacturing the more complex nutritional compounds as carbohydrates, proteins, fats, and vitamins not taken from the soil but yet so essential as animal feeds.

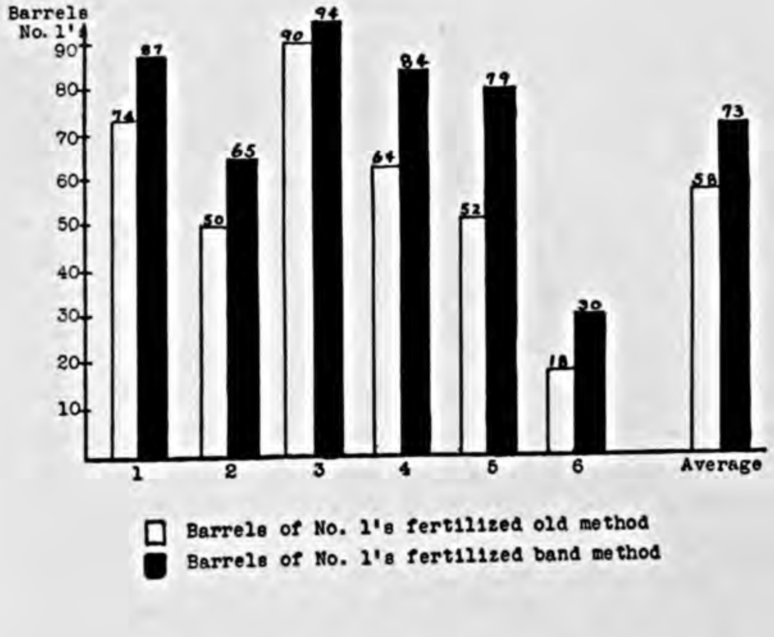
Lime treatment on soybeans doubled the harvest of protein per acre and almost doubled their content of this nutrient. To get a pound of protein a cow needed to eat but 7 pounds of hay from limed land, but was compelled to take 12 pounds for a pound of protein in hay grown on unlimed soil. When feeding on hay from limed soils, the cow was also taking more phosphorus, more potassium, and similar nutrient items. Carbohydrates are increased where young plants are grown on soil given soil treatments.

The plant factory more effectively uses the sunshine in manufacturing these complex substances when there are no deficiencies in the soil fertility. Young forage plants contain more energy, or heat, as shown by test, when lime for example is added to a lime-deficient soil. Not only protein and carbohydrate production by the plants, but even the plant's formation of the more elusive and less understood vitamins have been shown to be related to the soil fertility.

Soils deficient in potash are less effective in producing feeds rich in carotin, the forerunner of vitamin A. A complete fertilizer on wheat has increased the vitamin B content in the grain. All this indicates that the crop may be a defective feed on soils of low fertility but is improved in its feeding value when the soil is treated to correct these fertility deficiencies.

Fertilizer Placement Influences Profit

(*From page* 22)



growers of a varied number of crops. The growers' interest has naturally aroused the concern of quite a few farm implement manufacturers. As a result of this interest there are today a number of machines on the market which permit definite control of the placement of the fertilizer in reference to the seed. Transplanting machines are also being equipped so that the fertilizer can be placed to the side of the plant and not directly under the plant, as has been the custom. In quite a few cases these machines are constructed to provide for planting the seed and distributing the fertilizer at one operation. In this type of operation a more definite control of the placement can be obtained.

Ben Barber Shaves Cow Costs

(*From page* 20)

During the drought he set up truck routes to get wet malt from local breweries out to his patrons. He found bakers throwing out a couple of tons of rye bread (flatbrod) daily, and this he seized and had taken to some of his membership at a very low hauling charge. Lately he experimented in the keeping of wet brewers' grains in silos and found it successful. He writes plenty of pieces for the Duluth paper about Ole Olson's oats and Olaf Anderson's alfalfa, and how it grew that way.

Meanwhile the demand for his services exceeds his individual capacity, hard worker though he is. One way he hopes to double his capacity is to finish the new house trailer which he has designed, in which he will carry a light steam boiler and a steam-driven Babcock outfit.

A Day's Work

Take one of his typical testing days. He arrives at John Johnson's farm about noon. He leaves John sample bottles for all his cows, a duplicate for checking, and one more for the separator. Driving on down the road he leaves similar sets of bottles at half a dozen farms and doubles back another way and takes in as many more. Back at the Johnson farm he helps milk the herd, or does it all perhaps in a labor emergency. He dehorns a calf or two, castrates a pig maybe, uses the clippers on some hairy heifers that want "barbering." In the morning he gathers up the samples (which the dairymen take themselves after the first two or three lessons) and notes the milk weights. He runs the tests and records them on duplicate barn sheets, mailing one to the customer, keeping one to record in his herd book—which is sent out later. Suggestions go out with the barn sheets and herd books. In some cases in this pioneer area he is obliged to furnish a milk scale, so he keeps a stock on hand for lending a day at a time when needed. These trips are made bi-monthly or six times a year over his territory. The herd books are all sealed because the service is private.

Barber often finds errors open to correction in tests made at local dairy plants by comparison of his own figures with the regular remittances coming to members. With perhaps one lone exception, the plants have gladly made restitution. In this case of refusal by the creamery owner, Barber called a mass meeting at the school house and invited several former patrons of the plant and a few competing plant managers to attend. He had already arranged to get a truck route going toward a neighboring creamery noted for its fair treatment of patrons. The upshot naturally is that the offending creamery withdrew its opposition and came across in handsome style with fairer test weights. This stunt may not have been a pretty one to pull, but it was decidedly practical and earned him respect as a fighter for farmers' rights.

One other idea of his is excellent. He has rented a farm with a big barn on it, planning to establish there what he calls a "calf orphanage." It is intended to set up an exchange service for men with scrub herds in need of new young replacements of pure-bred stock. Heifer calves from the larger dairy farms supplying Duluth with fluid milk will be a source of excellent foundation stock, and they will go to this orphanage and later be taken out to the places that ask for them.

Barber does not bother with bull rings as this is well handled by the county agents. There are more than 50 bulls in rings in Itasca county alone. He sticks to individual herd matters and personal sales at small cash commissions. During the months of September and October 1937, Barber sold about $4,000 worth of cattle for his members to other members.

Without nosey interference with college or State extension activity, and cooperating fully with the official agricultural agencies, Ben Barber has made a secure place for himself and looks ahead to a model farm of his own where he will install a laboratory and become a permanent fixture in the development of mixed farming in one of the most promising regions of the Lake States.

Commercial Fertilizers in Grape Growing

(*From page* 14)

potassium plats, while the fruit from the check was a poor third. In several years of the experiment it was noted that earlier leaf ripening occurred on the vines of the phosphorus-potassium fertilized. No element has seemingly affected the sugar content, nor has any of the three affected cold resistance pro or con. In some seasons as the period of fruit maturity approaches, the grape berries fall from the stem. This in the parlance of the grower is known as "shelling." There has existed for many years back the idea that certain plant-food elements could check this trouble. Neither in this experiment, nor in an earlier one which was devoted entirely to the control of "shelling," did any of the fertilizers have any influence.

An examination of the data from this experiment shows that less cane or wood has been pruned away from the vines in the check plat than from any of the others, while at the same time fewer canes were put up each year for fruiting purposes. There can be but one explanation, less cane and leaf growth was made on the check vines. The vines fertilized with phosphorus and potassium have grown more cane and hence had more pruned away than the check vines. Throughout the life of this experiment all nitrogen fertilized plats yielded the greatest amount of cane.

A statistical analysis of the 24-year averages by pairs shows all treatments significantly higher than the check. Nitrogen in all cases gave significant results, as did potassium, but with the latter the significance was somewhat less than for the treatments containing nitrogen. It is also shown that lime depressed cane yields. Thus the data clearly indicate that nitrogen has been the most important material in producing greater amounts of cane and leaf in this vineyard, and that potassium has contributed materially, while phosphorus has been of doubtful value.

When the yields are considered in connection with the costs of obtaining the increases for the 25-year period — that is, cost of fertilizer deducted from the actual sales of the increased fruit production each year — it is noted that the plats receiving nitrogen have returned a larger profit than the phosphorus-potassium plats and a considerably greater money return over that of the unfertilized check. The net gain in money received from the vines subjected to the phosphorus-potassium treatment as compared with the amount received for the fruit from the check was quite substantial. Nitrogen in combination with potassium has been worth considerably more than nitrogen used with phosphorus. In fact the greatest financial gains were realized from the nitrogen-potassium combination.

Probably the financial gains as a result of the use of fertilizers would not be so high, except for the fact that immediately following the adoption of the Eighteenth Amendment the selling prices for grapes were unusually high, and that these high prices continued for 3 or 4 years. At the same time yields were likewise high, and the increases in tonnages from the use of fertilizers were very marked.

Financial Gain

It should be kept in mind, however, that the costs of fertilizers were likewise high and continued so for some time after the selling prices for grapes declined. For the last 10 years of this experiment, the greatest financial gain has come from the use of nitrogen, phosphorus, and potassium in combination, but the increase was only $18.49 greater than that realized from the nitrogen-potassium treatment or a gain of $1.85 for each of the 10 years. This small gain is not sufficient to pay the cost of the 300 lbs. of superphosphate which were used in the combination.

Since nitrogen in the quickly available form of nitrate of soda consistently gave substantial gains of fruit and cane and larger money returns than other fertilizer elements, any vineyard fertilizer program on this soil type should include nitrate of soda, or possibly some other nitrogen carrier of equal availability. The data suggest that at least 250 lbs. of nitrate can be applied profitably. This amount carries approximately 39 lbs. of actual nitrogen.

Potassium seems to have been the next most important element, and possibly the effectiveness of the nitrate of soda has been in part due to the combination of potassium with it. Perhaps larger quantities of both nitrate of soda and muriate of potash would have given a greater money return.

Phosphorus applied annually in the form of superphosphate at the rate of 300 lbs. per acre seems of doubtful value, but since it has been noted that this element materially benefits the green manure crops, it would seem good practice to make an application in this amount at intervals of 2 or 3 years.

Commercial fertilizers cannot be used profitably with grapes if the soil is poorly drained. Diseases or insects that injure or destroy the foliage must be controlled in order to secure the greatest effectiveness from the use of fertilizers.

Peanuts Win Their Sit-down Strike

(*From page* 18)

which would leave a deficit of 56 lbs. in order to make the income balance with the outgo. The use of 500 to 600 lbs. of 0-10-10 per acre on peanuts is necessary to balance the removal of nutrients by the crops grown in the rotation, with the income.

On many soils additional fertilizer must be used to take care of that lost through leaching, and as a general rule it will pay best if used on the legume cover crop. The above program of fertilization may appear to be extravagant, but the crops must have nutrients in order to produce large yields, and when the soil does not contain a sufficient quantity of nutrients, they must be added if economical yields are expected.

The soil is the farmer's bank account; and, as a general rule, when we check out more than we deposit, a "No Funds" slip will be used by the bank. The soil uses the method of returning low yields to indicate the account is low, but many who are receiving this notice do not recognize it as a call for another deposit. Then, too, it must be realized that all of the phosphorus and potash that is added to the soil is not available to plants because some of it is placed in the "lock box" and is not given up fast enough to supply the needs of the plant.

peanuts is considered to be around $30 per acre, the use of 40 lbs. of K_2O reduced the cost of producing the peanuts from 3.2 cents to about 2 cents per pound.

Taking a look into the future, if it costs 3.2 cents per pound to produce peanuts, there will be very little margin of profit between 3.2 cents per pound and the future selling price. This conclusion is arrived at from the present situation of thousands of acres of land in the Southern States that are well adapted to producing peanuts, which will be used for that purpose when the price of peanuts gets too far out of line with the price of cotton. In other words, the peanut grower must use all methods possible to reduce the cost of producing peanuts below 3 cents per pound, if he expects to have very much profit on the production of peanuts. The results of the above experiment point the way to a lower cost of production, and the grower who follows the direction to which the above experiment is pointing will be far better off in the future than the one who ignores it.

TABLE IV. Balance Sheet for Plant Nutrients.

Crop	Removed by Crops N	P_2O_5	K_2O	Returned by Crop Residue N	P_2O_5	K_2O
Cotton	39.5	15.6	15	0	0	0
Clover	67.8	13.8	66.9	40.7	8.2	40.1
Corn	83.0	36.7	64.2	41.5	18.3	32.1
Soybeans	42.5	10.0	17.6	21.2	5.0	8.8
Peanuts	80.7	16.2	48.5	15.5	3.0	15.2
Total Removed	313.5	92.3	212.2			
Total Recovered				118.9	34.5	96.2
Excess of outgo over income				194.6	57.8	116.0

The best proof as to the soundness of the practice of using fertilizer on peanuts is to ask the crop through field tests and experiments, and if the peanut will pay for the fertilizer used and leave a net profit to the grower, its use will be practical and economical.

The results of an experiment at the Virginia Agricultural Experiment Station, located at Holland, Va., show that the use of 40 lbs. of K_2O per acre on peanuts gave an increase of 630 lbs. of peanuts per acre. At 3½ cents per pound for peanuts, the gross increase would be $21.05 or a net increase of about $18.50 per acre for the use of 40 lbs. of K_2O. In the above experiment the yield was increased from 920 to 1,450 lbs. per acre. When the cost of producing

The results of a demonstration in 1936 in Isle of Wight County on a Norfolk sandy loam soil that tested very poor in available potash by the Hester method was very convincing as to the potash needs of the peanut and the value of rapid soil testing in indicating deficiencies of potash. The results are given in Table V.

As a general rule it is desirable to have results over a period of at least 5 years before drawing any conclusions, but, as stated in the beginning of this article, the peanut was considered as a scavenger for many years, and long-time results on heavy fertilization of peanuts are not available. The above results for 1 year may be used to get at least some idea as to the response that may be expected from the use of potash on peanuts when grown on soils very poor in potash.

The field, in which the demonstration was conducted, had been cropped for several years without the addition of sufficient fertilizers to the crops grown in the rotation, which is a typical example of the practice followed on the majority of the peanut farms. The information in Table IV shows that where no fertilizers are used in the rotation, the outgo exceeds the income by 116 lbs. of K_2O, when all possible means of conserving the nutrients are used.

Response to Potash

The peanut responded when the practical test was applied to the theoretical needs and gave response up to 160 lbs. of K_2O. This difference could be easily accounted for by the failure to return all of the residue to this field or by the losses through leaching that were not taken into consideration in that table. The main point to be considered from an economical farm-management standpoint is not how large a yield was produced, but did the addition of potash yield a net profit to the grower. The use of 200 lbs. of muriate of potash broadcast on the soil about 2 weeks before planting and 500 lbs. of 0-12-12 applied on top of the row when the peanuts were cracking the ground increased the yield from 1,338 lbs., where 500 lbs. of 0-12-6 were used, to 2,813 lbs. per acre, or an increase of 1,475 lbs. of peanuts per acre due to potash. The peanuts were sold for 3½ cents per pound, which meant a net increase of $47.68 per acre.

TABLE V. Fertilizer Demonstration in Isle of Wight County—1936

Fertilizer Treatment	Yield per Acre	Increase	Net Value of Increase Due to Potash
500 lbs. 0-12-6	1,338		
500 lbs. 0-12-6 200 lbs. muriate of potash	2,005	667	$20.15
500 lbs. 0-12-12	2,110	772	26.27
500 lbs. 0-12-12 200 lbs. muriate of potash	2,813	1,475	47.68

The information in Table VI gives the results of a demonstration conducted on a farm where practically the same crops are grown as given in Table IV, where lespedeza is substituted for the majority of the cotton. The fertilizers used consist of 300 to 350 lbs. of 2-12-4 per acre on corn, 600 lbs. of 4-8-6 per acre on cotton, and 300 lbs. of 0-12-5 per acre on clover, and in 1937, 500 lbs. of 0-10-10 were applied to the peanut crop. The potash test of the soil was fair.

The results of this demonstration are used for two reasons. First, to show that even where the proper fertilizers are used on the other crops in the rotation and the soil is far above the average in fertility and productivity, as indicated by the high yield of 2,288 lbs. of peanuts per acre on the check which is over twice the average yield, the peanuts responded to an application of 60 lbs. of K_2O and gave a net value of $4.53 per acre for the K_2O applied. Second, the soil test indicated in the beginning that very little response could be expected; and when the limit was approached, the yield was actually decreased. In other words, there is a limit to the use of fertilizers and lime; and unless good judgment is used, they may be of more harm than value.

There were over 500 soil tests made in Isle of Wight during 1935 and 1936, and approximately 85 per cent of these tests showed the potash content to be below fair, leaving only 15 per cent that tested fair or better. Fertilizer recommendations were made on the basis of the tests, and the best indication of the results obtained from the use of an 0-10-10, which was the recommendation on soils testing poor in potash, is the fact that the tonnage of 0-10-10 sold in the county has steadily increased, and the better farmers in that area have adopted that analysis as a regular practice. The indications of potash deficiency in the cotton and corn crops throughout the peanut belt will be found on the majority of the farms that have not been following a well-rounded fertilizer program, which would be further evidence of the general potash deficiency of soils in the peanut belt.

TABLE VI. Fertilizer Demonstration in Isle of Wight County—1936

Fertilizer Treatment	Yield per Acre	Increase	Net Value of Increase Due to Potash
500 lbs. 0-12-6	2,288		
500 lbs. 0-12-6 200 lbs. muriate of potash	2,332	44	—$1.44
500 lbs. 0-12-12	2,420	132	4.53
500 lbs. 0-12-12 200 lbs. muriate of potash	2,112	—176	—10.99

Maintain Balance

It is not meant to convey the idea that potash is the only element needed in peanut production, as lime that carries calcium and magnesium, phosphorus, and organic matter are essential, and unless there is a balance between all of these elements in the soil, maximum response cannot be expected. The decrease in yield of peanuts shown in Table VI could be due to the excess of potash as compared to phosphorus or some other element. The use of potash in the peanut belt has not received the attention that it is due because, as shown in Table IV, the excess of the outgo of potash over the income is 116 lbs. per acre, as compared to 56.8 lbs. for phosphorus. Then too, there is very little phosphorus lost through leaching, while the potash loss is very high. Due to the above reasons, it would appear that in order to make the nutrient sheet balance, the ratio of phosphorus to potash should be about equal for peanuts. The results of tests on the farm justify this conclusion, as well as the balance sheet in Table IV.

When we consider that on the average peanut farm small quantities of fertilizer are used when compared to the loss through crop removal, the low plant-nutrient content of the soils, the loose and open nature of the soils, a farming system that includes a relatively low number of animal units per acre for proper use of the crop residue, and, in general, the use of a soil-depleting system of agriculture, the following program must be adopted and strictly followed if the yields per acre of peanuts and other crops are expected to be maintained at a profitable level. This program applies not only to producers of crops. In my opinion the future of the whole South depends upon the general recognition of the need and the adoption of a sound and economical soil-building program.

1. The use of sufficient lime to correct the undesirable conditions associated with soil acidity and to provide the necessary calcium and magnesium. The exact amount needed

will be determined by the State Agricultural Colleges.

2. A systematic crop rotation that includes at least one legume as a green manure crop in order to balance the removal of nutrients, add nitrogen to the soil, and maintain the organic matter.

3. A program of "No bare acres by Christmas" to reduce the loss of nutrients by leaching and to provide winter grazing for livestock.

4. If peanuts are grown on light sandy soils, on which legumes have not been grown, the use of about 2 per cent N in the fertilizer or 500 to 600 lbs. of 2-8-10 fertilizer per acre. On soils where a proper rotation that includes at least one legume as a green manure crop has been used, the application of 500 to 600 lbs. of 0-10-10 per acre will be sufficient. The fertilizer should be used on top of the row when the peanuts begin to crack the ground, in order to prevent germination injury.

5. The wise use of fertilizers in sufficient quantities to more nearly balance the income of plant nutrients with the removal by all crops grown in the rotation and lost through leaching.

6. A general recognition that legumes remove large quantities of potash and phosphorus, and that in order to make a legume program effective, liberal applications of potash and phosphorus must be made.

7. A larger number of animal units per acre to make economical use of crop residue and provide an additional source of income.

8. A recognition by the business and professional men that a soil fertility program is just as essential to their future happiness as it is to the farmer.

In conclusion, if the evidence presented in this case is not sufficient to convince you of the fertilizer needs of the peanut or the soundness of the fertility program, you may take the evidence and the program to the crop and soil which is the highest court of judgment on a subject of this kind, and I feel sure they will stand the test and the original decision will be upheld.

Raising Pure-bred Seed for the South

(*From page* 11)

nition and propagation of animal variations bear to the production of livestock. There are thousands of experts all over the world engaged in the business of testing animals and propagating from those of proved quality, whereas there are only a few men engaged in the work of testing plants and propagating those of proved superiority, although plant products are of far greater value than animal products.

The plant breeder takes advantage of the well-known fact that all nature is variable, discovers which of these variations in plants are most valuable, and propagates these for distribution. When a pure-bred strain of superior quality and yield is discovered, increased, and distributed by the plant breeder, nature (and usually the farmer himself at thresher or gin) begins at once to destroy its uniformity and value. Within a few years natural variation, crossing, mixing, or all three, result in the destruction or lowering of the uniformity and money-producing value of the new strain. So it is necessary for the plant breeder to continue his operations indefinitely, not only to discover new and better variations, but to maintain the uniformity and character of all varieties which he has heretofore bred and distributed.

From the above it is clear that if

the practical farmer wishes to profit continuously by the work of the scientific breeder, it is necessary for him constantly to renew his seed stocks.

Now the real plant breeder is not a seedsman in the ordinary sense; he is not primarily a distributor of seeds but a creator of new types and varieties which may be of incalculable value to agriculture. But the really scientific plant breeder, operating on a large scale, must sell his comparatively small outturn at high prices as compared with ordinary seed.

A Plan Pays Profit

However, the value of these superior creations of the breeder can be reflected into profits to the farmer at extremely small cost, as suggested by one agricultural worker, after the following plan:

The farmer who grows 100 acres of cotton can secure the services of the best plant-breeding talent at a cost averaging not more than 10c or 15c per acre.

He will need, say, 100 bushels of seed per year with some reserve for replanting. Pedigreed seed from the very best scientific sources are usually sold at $3 to $3.50 per bushel. Suppose the farmer places an order each year with his plant breeder for 6 bushels of cotton seed costing, say, $15. Planted on 6 acres of well-fertilized land with a drop seed planter, he should produce not less than 120 bushels of seed. Charging the extra cost of the scientifically bred seed over ordinary seed to this 120 bushels, will add 10c per bushel to their cost and this will add but 10c per acre to the cost of his next crop. If the new strain or variety is in any respect superior to the strain or variety formerly planted (and the difference in its money value will generally be from $5 to $20 an acre) the resulting gain will be almost without cost.

Since cotton is the South's main money crop, and since the best opportunity of the cotton grower to make a good profit is in producing a lint of superior length and quality, Coker's Pedigreed Seed Company began in its early days to develop "staple" cotton varieties. And with the successful development of these superior lints arose the problem of a market where the farmer could secure the premium prices justified by the length and quality of his lint.

So it was that in 1918 David Coker and his colleagues organized the Coker Cotton Company with ample capital and facilities to handle for farmers the long staples. It has now the largest staple organization in the Carolinas. How the Coker Cotton Company and its representatives in England and America, with the aid of some enlightened spinners, overcame the difficulties in establishing a long-staple market cannot be told here, but let it be sufficient to say that the Coker Cotton Company and Coker's Pedigreed Company have jointly rendered a great service to the cotton manufacturing industry, as well as to the cotton farmer. Mills can now easily secure uniformly and accurately classed long-staple lints, and the grower can sell these lints at equitable premiums.

Just a brief enumeration of some "pedigreed" results. It is of course not possible to discuss in detail these results and their economic values.

1. Cottons that make greater yields and longer staple. A half dozen years ago most Southern cotton mills were using mostly 15/16-inch to 1 1/32-inch cotton. Recently many mills are using 1 1/16- to 1⅛-inch cotton, and the demand for these lengths is increasing, with higher premiums over prices of shorter cottons.

2. A bright tobacco, the Gold Dollar variety, that has already brought immensely greater profits to the growers, over $400 per acre to many farmers.

3. Smut-immune and highly cold-resistant oats that make high yields and have very high feeding value.

Serving Coker watermelons to a group of visitors at the farm.

4. A wheat which will make heavy yields from Piedmont to Tidewater, so that the Southeastern farmer may grow his own bread to advantage.

5. Wilt-resistant varieties of cotton that are helping to avoid losses of millions of dollars on wilt-infected lands.

6. Improved varieties of soybeans, some bred especially for seed and others especially for hay, to meet Southern needs and conditions.

Hartsville, South Carolina, is a Mecca for practical farmers of the Southeast who want to learn the value of purebred seeds and intelligent practices; for scientists far and wide who want to study the plant-breeding technique of Coker; for cotton buyers representing American and foreign mills who want to find the staples they need.

Scientific agriculturists from practically every foreign country in which cotton is grown have visited Hartsville, and officials and specialists from the United States Department of Agriculture are not infrequent visitors. But the real missionary work that Coker is doing is among the small farmers and croppers who must be convinced by actual demonstration of the practical value of scientific plant breeding and cultural practices. That is why county agricultural agents and other agricultural leaders of South Carolina and other States have been prompt to recognize the Pedigreed Seed Company as a free educational institution of great value to the average farmer, bringing annually thousands of these farmers to Hartsville on "see and learn tours."

In 1937, Plant Breeder Wilds estimates between 6,000 and 7,000 visitors were welcomed at the Pedigreed Seed Company's plant-breeding and demonstration farms. The "welcome" is genuine Southern style hospitality, and always includes in season a feast of Coker-bred watermelons, many acres of which are grown annually for this purpose.

Value of Demonstration

"There is no way of teaching agriculture as well as by demonstration," says Mr. Coker. That is why he endorses and supports so actively the work of the agricultural extension services, why he and his organization welcome to Hartsville all who will come, and why he operates large farms on which he practices what he preaches about better soils, better seed, better fertilization, better cultivation.

The extent of the plant-breeding work itself may be judged by the fact that for cotton breeding there are 70 acres in plant-to-row and variety tests, 150 acres in first-year increase, and 279 acres in second-year increase; for small grain 14 acres in head-to-row and variety tests, 30 acres in made possible through the genius and courage of the individual? Moreover, it also means liberty to work and freedom to plan unhampered by dogma; and an atmosphere of encouragement, not always evident but imminent.

AND to prove that talent was not engrossed only in mundane affairs of the factory, note how medical science has leaped ahead with plans to ease pain and prolong life. This past century has seen the successful ether surgery of William Thomas Green Morton and Doctor Long of Georgia, followed by laughing gas, chloroform, and procaine, and the twilight sleep of child bearing. It has also welcomed vitamins, insulin for diabetes, synthetic hypnotics, glandular preparations, and inoculation against tetanus and typhoid.

In celebration of the American patent system two years ago, a pageant was presented which attempted to reveal just a few of the newest scientific achievements. In seeing it the observers stood on the threshold of another realm in which the mind and persistence of man had again outrun his ability to equip consumers with needful buying power (through some social agreement not yet envisioned).

At any rate, what did they see? First, a method of substituting direct current for alternating current in long-distance transmission, using Thyratron tubes, to render short circuits harmless and to increase power effect at lower costs. Second, solar heat devices by Dr. Abbott, fresh from long research in the Southwest. Third, polaroid lenses to polarize light and eliminate headlight glare. Fourth, high frequency oscillations induced by Dr. Woods ultrasonic waves of "inaudible sound" for heat generation. Fifth, the electric image tube of the RCA, to catch visible reflections of beams not seen by the eye's ordinary range, as an aid to the microscope. Sixth, lignin from wood fibers to use in heating, road building, and adhesives. Seventh, a new chemical substance, "chloroprene," to make rubber resistant to heat and the action of gasoline. Lastly, tempered glass for safety uses, and spun glass in yarn and braid, for textiles, insulation and tape, fireproof and lasting.

But in these rushing times of manifold machine design and multiple power at the finger's ends, have we solved our ultimate riddle? Must the exceptional individual pause in his pace and wait for the world to catch up? Must we hide away the hosts of thrifty and economic devices that men have kept up their sleeves because of fear that their introduction will disrupt some established business?

There are no more physical frontiers in land and no more world empires to settle. Our job is to fix life so that we, who can communicate together so quickly and enjoy such common luxuries, have a better understanding and more mutual good will.

THE crown of destiny awaits some man or small fearless group of leaders who will get us out of the rut of precedent in our social and economic thinking. The key to the unlocked door must be found by a union of experience and imagination, of skill and sentiment.

We may not live to see any sweeping change, so that all those who want these marvels may get them in return for honest labor; but our confidence in the steadfast progress of man's mind tells us that our schools and our associations, our cults and our policies will gradually shift toward greater emphasis on distribution of universal benefits rather than on scarcity and profits. And don't let's wait for Congress to do it!

A Few Whinnies

DOCTOR, QUICK!

An old negro, riding on a train, fell asleep with his mouth wide open. A mischievous drummer came along and, having a convenient capsule of quinine in his pocket, uncorked it and sifted the bitter dose into the old negro's mouth at the root of his tongue. Soon the darkey awoke and became much perturbed. He called for the conductor, and asked:

"Boss, is dere a doctor on dis here train?"

"I don't know," said the conductor; "are you sick?"

"Yas, suh; I sho' is sick."

"What is the matter with you?"

"I dunno, suh, but it tastes like I busted my gall."

WITH FINESSE

The young man was teasing the pretty girl for a kiss.

"Tell me," she demanded, looking straight into his eyes, "have you ever kissed a girl before?"

The young man hesitated for a moment, and admitted:

"I cannot tell you a lie; I have."

"All right," said the sweet young thing, presenting her lips. "I didn't want you to practice on me."

"Remember, my boy," said the elderly relative, "that wealth does not bring happiness."

"I don't expect it to," answered the young man. "I merely want it so that I may be able to choose the kind of misery that is most agreeable to me."

Teacher: "Spell straight."

Johnny (second grade) "S-t-r-a-i-g-h-t."

Teacher: "Correct. What does it mean?"

Johnny: "Without ginger ale."

The lady remarked: "Hobo, did you notice the pile of wood in the yard?"

"Yes'm, I seen it."

"You should mind your grammar. You mean you saw it."

"No'm. You saw me see it, but you ain't seen me saw it."

DAUGHTER DEAR

Mother: "Mary, where have you been until 3 a. m?"

Mary: "Walking, Mother."

Mother: "For goodness' sake!"

Mary: "Yes, Mother."

"Tom and Miss Cory were on the teeter-totter board when Miss Cory slipped off and her end flew up, resulting in an injury to his vertebrae."

Gal: "How do you like my new hat?"

Guy (absently): "Fine, but you have a run in one."

JUST DESERTS

"Well Mandy, I heard your no-account husband died and you had him cremated. Is that right?"

"Yasuh, tha's right, only he ain't no-account no moah, ah's got 'im workin' for me now."

"Why, how is that possible, Mandy; he's dead, isn't he?"

"Yasuh, he's dead all right, but ah's got his ashes in an hour-glass."

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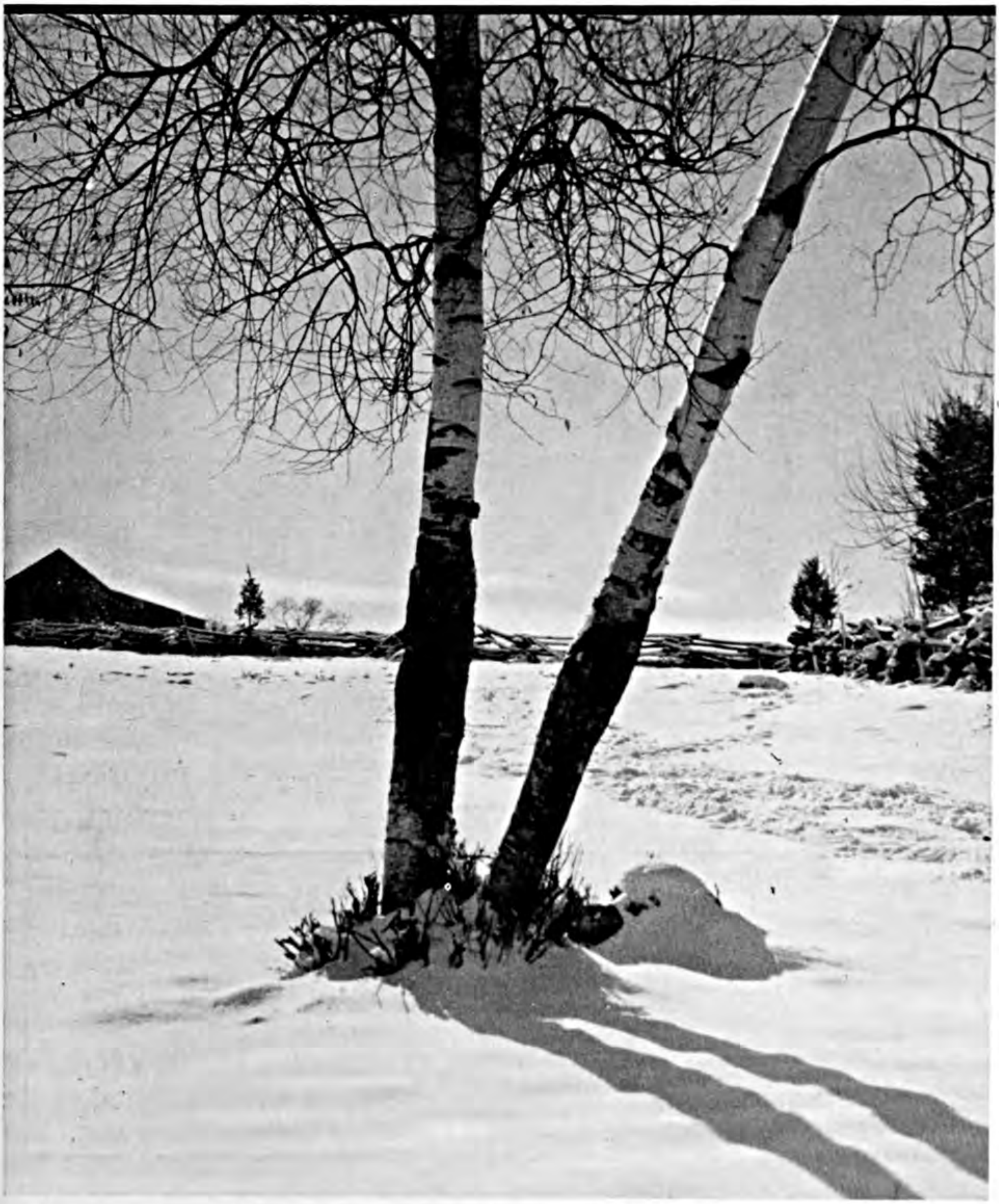

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Better Crops with PLANT FOOD

The Whole Truth—Not Selected Truth

R. H. STINCHFIELD, *Editor*

Editorial Office: Investment Bldg., Washington, D. C.

VOLUME XXII NUMBER TWO

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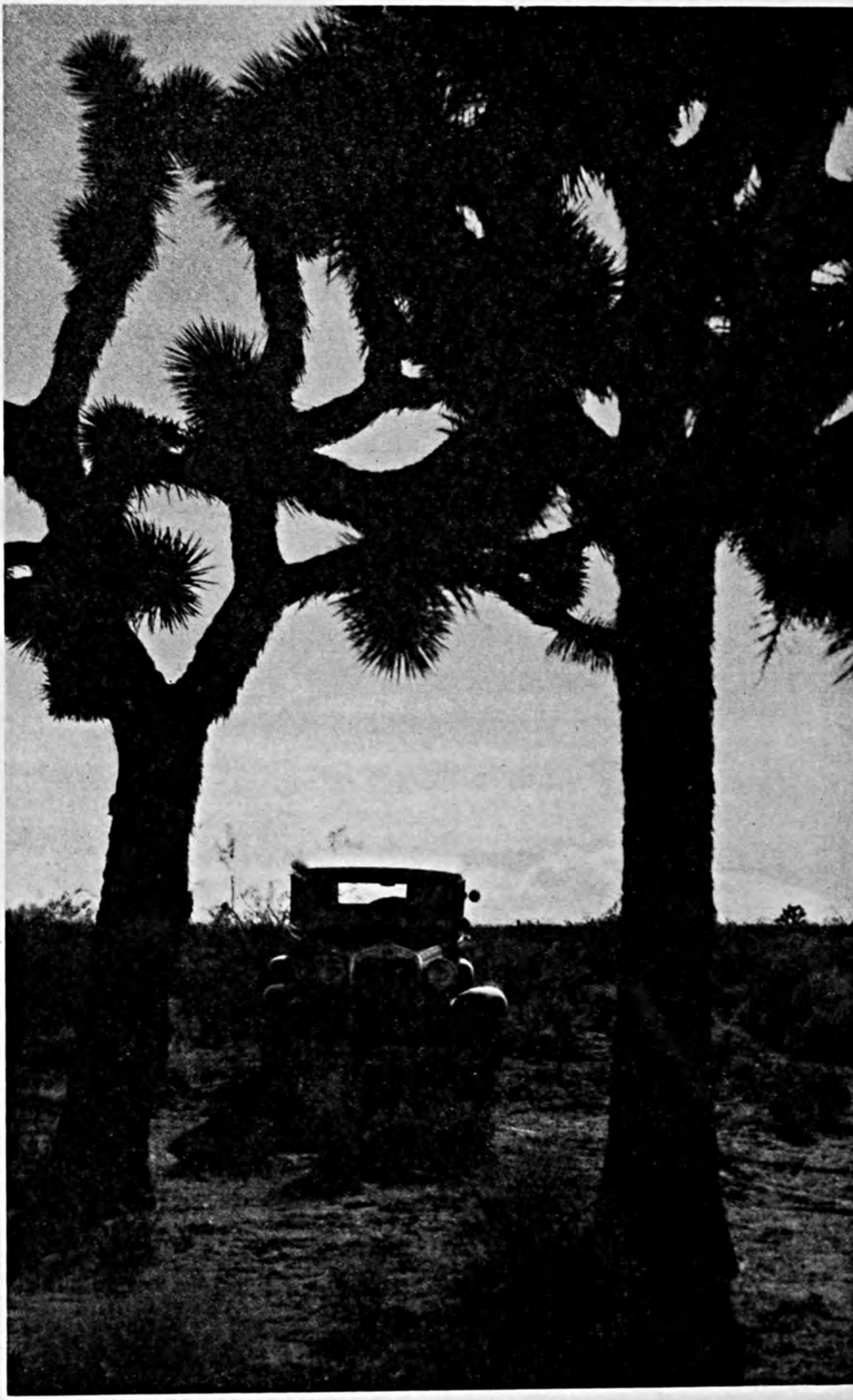

WHERE WINTER'S TRAIL ENDS.

Better Crops with PLANT FOOD

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VOL. XXII WASHINGTON, D. C., FEBRUARY 1938 No. 2

Jeff makes the query

Is Individualism Out?

Jeff McDermid

PONDERING sundry farm experiences both before and after the AAA, your favorite scribe has stumbled on the notion that two rather primal forces direct the destiny of agriculture—weather and individualism. That is, you can pretty safely wager that nobody can manage a farm (outside the pages of a bulletin) without finding weather and individualism the biggest factors to be thankful for or to wrestle with.

Despite the fact that we have a bigwig bureau all set to handle the weather at Washington, with scores of its branches blown about the country, no carping critic of Federal domination can make a pretense that we have the slightest bureaucratic control of the weather. Since the days when Adam grafted apples, farmers have admitted that not much can be done about it.

Whereas with the second factor, individualism, we imagine we can set up a school or a jail, or something, to adjust its effect on our lives and fortunes. But in this case some current opinions of great lung power insist that modern society, with bureaucrats and government meddling, have spoiled the once heroic chances of individualism to leave its mark on farm progress. They try to comfort us on this reputed loss of our native rural individualism. They pat us on the bowed shoulders and remind us that in compensation for the loss of our esteemed personality at the plow, we have largely been saved from such miserable remnants of the rugged era as the kerosene lamp, the frozen pump, the highway poll tax, and the remote fresh-air privy in zero weather. (They do this perhaps to hide the fact that we have exchanged a cold seat for a hot one.) "Tenneyrate," they proclaim that individualism has gone west with the last settlers and jumped in the ocean. Moreover, they say that individualism stands for selfishness and is therefore harmful, and that collectivism is the true answer!

Taking it up here just between us furrow folks, they're plumb loco! We can't escape the effects either of weather or individualism, and as we admit that little can be done to reform the former, maybe we can profitably think a little about the latter. And we can do a whale of a lot to strengthen our native individualism along the right lines and still not get in bad with the chaps who circulate membership papers for the co-ops.

ABOUT two decades ago a Wisconsin historian, Dr. Frederick Turner earned a reputation as the foremost student of the American frontier. Along with his studies he outlined a theory that the onward march of empire-making farmers with their self-reliance, sacrifice, and hardihood, set a standard and left an indelible impression on the country as a whole, and more especially on the traditions of agriculture.

Now everybody knows that these old-timers were not all high-minded fellows, and that their sweep across the continent left a few scars and sad spots as well as tributes, wreaths, and monuments. Yet his main contention was that the sturdy, positive character of these newcomers put something lasting and valuable into the character and ideals of their descendants. His impression was, that although the physical frontier had gone with the bison and the Indian, American agriculture had inherited a certain stamina and integrity which would surely be of help in meeting the social and economic frontiers still facing us.

We all know that Turner did not live to see the full effect of machine-age power and large organizations, or the magic of quick transportation and instant communication, on the daily outlook of the farmer—who in Turner's day was of course the last of the rugged individualists.

SO WE may take up his question ourselves and ask if in this day of new alignments his theory still has any roots left in our country soil? We can ask ourselves if the farmers of the country can rely on the fibers of sound individualism woven into the rope of cooperation to solve the complexities which are as hard to conquer as the wilderness. Secretary Wallace himself has faith in its latent power today, but he says that our future explorations must lie in the realms of the heart and the mind—and if this be true, then where is there a force stronger than trained individualism to depend upon?

But if we meet such a challenge, our first job is to sort over our assortment of individualism and pack along with us only the kind we can use. We throw overboard the weak and subservient kind, the shallow and selfish kind, the ignorant and prejudiced individualism—happily now in the minority. Many cases of this nature still bob up around us, but the sins of the minority of selfish individualistic farmers and leaders should not be laid at the door of agriculture in general.

Two other things we do not propose to do. We do not intend to set up our individualism against society, or claim that the ancient dogma of John Stuart Mill anent government encroachment is a threat. Farmers as individuals owe a constant debt to society and their community for good roads, better schools and churches, and adjacent markets to create stable land values.

Again we reject the philosophy of

Mill and others, who held that all things secured for individual liberty are taken away from government, and that every gain for government power is a consequent loss to individualism. Thus far, at least, in my bucolic wanderings and discussions, I have found few farmers proclaiming their chief goal to be utter freedom from State or Federal influence, or that the utmost end of liberty is to be "let alone."

But if we are looking for a place where individualism is really being invaded and broken down, it lies in the invasion of the individual's natural right and duty to *think for himself*. Large and well-organized pressure groups and mass formations try to take over the thinking business for the individual. They are willing to do it for him by proxy and at a price! As much pressure is brought to bear in trying to get the individual farmer to abdicate his mind as was lately focused on the Duke of Windsor for the same purpose.

Much blatherskite is showered around to make us think that individualism is old-fashioned, conservative, and anti-social, and to uphold these loud mass vociferations as the true guardians of democracy, progress, and rural hope! Yet a peek behind the scenes of farm history shows many things to the contrary.

By the kind of agricultural individualism needed today I mean the constructive kind, that takes thought before decisive action, and which weighs all mass propaganda before it allows itself to be swept like a chip on the wave of mob hysteria. Every trained, thoughtful, hopeful, serious-minded, and socially helpful farmer is just such an individual. Over against him are arrayed many loose-thinking blocs and pressure parties, sometimes claiming all sorts of bona fide farm membership or sectional allegiance, and advocating hand-made programs to be bossed by hand-picked men. Even the best of farm organization leaders have sometimes fallen for these artificial stunts, and they are the bane of existence for the government official.

OUR better individuals in farming are students, men with patience acquired in practice, usually tolerant, who know that Rome wasn't built in a day and that dollars don't grow on bushes. On the contrary the characteristics of mass formations and pressure movements consist of advertising sudden salvation via the short route, to grab the main chance and push for the quick conquest. Intolerance and prejudice also become the spears they use to drive the individual along in their processions.

Instances of individuals yielding to flamboyant and half-baked schemes of this kind are so numerous that it seems almost worthless to mention any. They rank all the way from actually harmful things down to mere examples of lazy mentality.

Just one of these mass-mind floods comes to mind, as experienced in dairyland. Rather than face the issue

(*Turn to page* 46)

Rapid Chemical Tests Show Soil Needs

By S. F. Thornton

Soil Chemist, Purdue University Agricultural Experiment Station, Lafayette, Indiana

IT has long been recognized that the majority of Indiana soils are phosphorus deficient and in need of additional lime. Recognition of the general prevalence of potash deficiency has come only in recent years. However, recent yield data from the permanent fertility experimental plats and numerous fertilizer demonstrations, as well as observations as to the general prevalence of potash-deficiency symptoms on growing crops and the results of soil tests, are indicating that potash deficiency is rapidly becoming as serious a problem as is phosphate deficiency.

This is particularly true for the corn crop and is due in large measure to the fact that in the past phosphorus has been predominant in the fertilizers used. This practice has resulted in the rapid depletion of the "available" potash supplies in the soil through crop removals without providing for adequate replacements. Due to the recognition of this condition, the present trend in fertilizer analysis appears to be toward equal parts of phosphorus and potash as is illustrated by the fact that the average potash content of all fertilizers sold in Indiana has increased from 1.5 per cent in 1920 to 7.8 per cent in 1936 while the average phosphorus content has remained almost constant over this 16-year period.


A Purdue Kit containing all reagents and equipment necessary for both soil and plant tests.

The use of rapid chemical tests as aids in determining fertilizer needs was started in Indiana by the work of Hoffer (1). Hoffer established the inverse relation between the accumulation of iron in the nodal tissues of the corn plant and the supply of potash available to the plant and developed chemical field tests for use in diagnosing nitrogen and potash deficiencies. When used in conjunction with external symptoms, these tests proved to be quite helpful and reliable, indicated the great possibilities of such methods of attack, and emphasized the need for additional tests.

In 1932 the author (2) proposed a simple and rapid test on plant material for use in diagnosing phosphorus deficiencies and in 1933, a similar test for potash (3). These tests on plant material were adapted to use on soils in 1934 (4), making it possible to use practically identical reagents, equipment, and technique with both soils and plants. The tests on soils indicate the dilute acid-soluble phosphorus and the water-soluble and replaceable potash supplies. The tests on plant material indicate the relative nitrate nitrogen, phosphate phosphorus, and total potash contents. With soils they indicate the "available" supplies present in the soil and with plants, the relative nutrient levels in relation to other possible limiting factors.

Used Extensively

Preparation of the Purdue Soil and Plant Test Kit, containing all reagents and equipment necessary for both soil and plant tests, was begun in 1934 by the Agronomy Department of the Agricultural Experiment Station. Since that time more than 700 kits have been supplied, at approximate cost, to extension workers, vocational agriculture instructors, canner's fieldmen, C. C. C. agronomists, soil conservation workers, fertilizer salesmen, greenhouse operators, and, in a few cases, individual farmers. Additional supplies of reagents and equipment are furnished to kit owners as needed.

The wide distribution that the Purdue kit has received has naturally led to the very extensive use of the tests in Indiana. It is estimated that in the neighborhood of 100,000 soils samples are tested each year, at the present time. Several thousand samples are tested each year in the Soils Laboratory of the Agronomy Department

When corn is suffering from potash deficiency the leaves fire along the edges.

but the greater part of the testing work is carried on by county agents and vocational agriculture instructors. Practically all county agents and the majority of vocational agriculture instructors have kits and operate a testing service. It is required that such workers receive training in the use of the tests before they are permitted to purchase a kit. Through extension workers an attempt is made also to help the various workers in the State in the proper interpretation of the test results.

The procedure used in the Purdue tests has been kept simple with a view to making their use possible by workers not specially trained in soils or chemistry. Proper interpretation of the test results in terms of fertilizer needs is the more difficult part of the problem and requires considerable experience. The county agent, because of his familiarity with local soils, crops, and fertilizer practices, should be especially well qualified to make such interpretations. It should not be expected that test results can serve as the sole basis for fertilizer recommendation. Neither should it be expected that such results can answer the questions as to exactly how much or precisely what kind of fertilizer will give the most profitable returns for any one year. Test results do give additional information which is of very great help in making better fertilizer recommendations. These results indicate trends in fertilizer needs and changes that may profitably be made in present fertilizer practices.

As a general guide in making fertilizer recommendations for soils that have been tested, a printed sheet containing suggestions for the more important crops grown in Indiana has been supplied to all workers using the tests. The suggestions contained in this sheet are shown in Table 1.

It will be noted that by combining "low" and "very low" and "high" and "very high" readings the tests for phosphorus and potash have been divided into three groups for each or nine possible combinations for the two nutrients. The analyses and quantities of fertilizers recommended for these nine groups are based on general experience as to the responses that may be expected for the various crops and the "available" phosphorus and potassium supplies indicated by the test readings. The ratio of the plant nutrients, especially phosphorus and potash, to each other is the important thing in the fertilizer analysis. In preparing this list of suggested fertilizer recommendations an attempt has been made to use only such analyses as are on the "approved" list prepared by the fertilizer manufacturers in consultation

(*Turn to page* 42)

TABLE 1.—SUGGESTED FERTILIZER RECOMMENDATIONS FOR INDIANA [1]

Soil Tests [2]		Corn, Soybeans, Oats [3]			Wheat, Rye, Barley	
			Lbs. per acre			
Phosphorus	Potassium	Analysis	In hill for corn	Drilled in row for corn	Analysis	Lbs. per acre
VL or L	VL or L	0–12–12	100	200	2–12–6	300
VL or L	M	0–14–7 or 0–14–6	100	200	2–12–6	300
VL or L	H or VH	0–20–0	100	200	2–14–4 or 0–20–0	250
M	VL or L	0–10–20	75	150	2–12–6	250
M	M	0–12–12	100	150	2–12–6	250
M	H or VH	0–20–0	100	150	2–14–4 or 0–20–0	200
H or VH	VL or L	0–8–24	75	125	3–12–12	150
H or VH	M	0–10–20	75	125	2–12–6	150
H or VH	H or VH					

Soil Tests		Truck Crops			Alfalfa (At seeding time)	
			Lbs. per acre			
Phosphorus	Potassium	Analysis	Muck [4] soils	Other soils	Analysis	Lbs. per acre
VL or L	VL or L	3–12–12	750	500	0–12–12	300
VL or L	M	2–12–6 or 4–10–6	750	500	0–14–7 or 0–14–6	300
VL or L	H or VH	2–14–4	750	500	0–20–0	250
M	VL or L	3–9–18 or 2–8–16	600	400	0–10–20	250
M	M	3–12–12	600	400	0–12–12	250
M	H or VH	2–12–6 or 4–10–6	600	400	0–14–7 or 0–14–6	200
H or VH	VL or L	3–9–18 or 2–8–16	450	300	0–8–24	200
H or VH	M	3–12–12	450	300	0–10–20	200
H or VH	H or VH	2–12–6 or 4–10–6	450	300		

[1] These suggestions are for average conditions. Both analysis and amount should be varied to suit particular conditions. If the recommended analysis cannot be obtained readily, any similar analysis may be used. When using double strength fertilizer, reduce the amount per acre. On manured land, the analysis containing the next lower potash ratio is recommended. On mucks and black sands, the analysis containing the next higher potash ratio is recommended for the general farm crops.

[2] VL=Very Low; L=Low; M=Medium; H=High; VH=Very High.

[3] Oats and soybeans are seldom fertilized but same amounts as in hill for corn may be used.

[4] For late potatoes and other late planted crops, fertilizers without nitrogen but containing the next higher potash ratio are usually recommended.

Rotations & Fertilizers For Bright Tobacco

By C. B. Williams

Agronomist, North Carolina State College of Agriculture, Raleigh, North Carolina

ALTHOUGH in this article attention will be devoted to a discussion of proper crop rotation and fertilization for tobacco in the bright belt of the Coastal Plain area of the South, it must be realized by growers that there are other factors which must be carefully looked after in the growth of tobacco if best results are to be obtained. If proper cultural methods and the best kinds of seed are not used, and the soil type is not carefully selected with reference to its special suitability for the production of fairly high yields of high quality tobacco, it matters not how well suited the rotations are or how wise the fertilization is, best results cannot possibly be obtained. Repeating, all of these factors must be carefully provided on every farm if the highest yields of the best quality tobacco are to be secured and the greatest average net returns afforded the producers. If any one of them is neglected, it may become the limiting factor and the yield or quality of the crop, or both, will suffer materially and the returns of the producer will be diminished.

Tobacco like this was the result of well-balanced fertilization.

Tobacco is a most exacting crop in all of its requirements. Its growth directly after legumes usually does not result in the production of the highest quality of leaf, particularly if the legumes are of a heavy growth and the crop at or just before maturity is plowed into the soil. This does not mean that legumes cannot be grown in rotation with tobacco, but it does mean that when they are included and are turned under after growth, this should usually be done before another crop in the rotation at least 1 year prior to putting the land into tobacco. Of course if the growth of the legumes is light, their being turned under just before the tobacco is grown on the average soil would probably not injure the quality of the tobacco and might help on the poorer soils. Notwithstanding this fact, it is not generally considered a good practice to follow the tobacco immediately after legumes because of the danger of injuring the quality of the leaf.

Suitable Rotations

In giving four rotations below that are suitable for use in this area, we are advertent to the fact that there are others which can and are no doubt being used at the present time with excellent results. If such be the case, by all means continue to use them. The rotations given are submitted as types of good ones in the hope they will be of some value to tobacco growers. They are simple and if put into effect should not only give good results in increased yields and in the improvement of the quality of the tobacco crop, but will help in maintaining the yields of other crops in the rotations to a fairly high level. In some cases they will no doubt help to reduce the loss from disease and insect attacks. The rotations suggested for wider use by tobacco growers in this area are:

For Sandy Loam Soils:

(1) 1st year—Tobacco, abruzzi rye, vetch or crimson clover in fall (for turning under).
2nd year—Corn (for grain) with velvet beans (for grazing and turning under).
3rd year—Cotton, abruzzi rye in fall (turned under the following spring).

(2) 1st year—Tobacco, crimson clover in fall for turning under.
2nd year—Corn, abruzzi rye in fall turned under the following spring).

(3) 1st year—Tobacco with cowpeas sown at last cultivation (for turning under).
2nd year—Cotton, abruzzi rye in fall (for turning under).

For Very Sandy Soils:

(1) 1st year—Tobacco, abruzzi rye and vetch or crimson clover in the fall (for turning under).
2nd year—Sweet potatoes, abruzzi rye in fall (for turning under).
3rd year—Wild grass and weeds.

As most growers well know it is of the highest importance to use for bright tobacco the kind of fertilizer in proper amounts to best fit the needs of tobacco grown on each particular soil type. Unfortunately in some cases, this is not done, particularly by many who may have used in the past and are planning to use this year, the ordinary 3-8-3 mixtures. The best yields of high quality tobacco are seldom, if ever, obtained from the use of such mixtures. These are not usually properly balanced for tobacco. They have too little potash and frequently contain too much chlorine and not enough magnesia, especially for use on very sandy soils and others on which tobacco is grown and is quite frequently subject to magnesia deficiency (sand-drown).

For several years, interested official agricultural workers of the whole bright tobacco belt of the South, including tobacco workers of the U. S. Department of Agriculture, have been

(*Turn to page* 38)

Jennets and foals on good pasture are easy to keep.

Green Pastures

*By E. W. Sheets**

Chief, Animal Husbandry, State College, Mississippi

THERE is a time-honored belief that the good things in life come hardest; that the race is to the swift, the persistent, and brave. In the production of livestock, especially, it is regarded that profits and extra pains go hand-in-hand. If a man's farm bristles with good crops and green pastures, and if his cattle are slick and thrifty, his neighbor riding by is apt to shake his head and say that it took "a deal of hard work."

There is one crop and one system of farming that forms a notable exception to this rule. That crop is pasture: the system, the ultilization of it by livestock. The providing of abundant pasture and other forage crops throughout the year is one of the stockman's most important problems. Whether it be permanent, annual, or range pasture the answer is the same, depending somewhat upon the particular kind of livestock for which it is being provided.

We know that there is no feed which enables an animal to pick up flesh so rapidly as good pasture. We also know that formerly on most farms in many sections of the country the land usually allotted to pasture was that which was not much good for any other crop use; that little or no attempt was made to put fertilizer back on the land to make up for the

* EDITOR'S NOTE: Dr. Sheets was for more than a dozen years Chief of Animal Husbandry in the U. S. Department of Agriculture. Among his contributions during this time was important pasture research and progress.

fertilizing substances taken off each year in the form of milk or meat or bones or hide or horsepower.

We know, in short, that we spend very little money on our pastures, almost no labor on them, that we wish we had them with us the year round, that they're undoubtedly the cheapest feed, for, although grass is not marketable directly for money, studies and general observation in many sections seem to indicate that those livestock farmers who have a great deal of their land in pasture make more money than those with but a little pasture.

Early spring finds these Hereford calves on annual pasture.

Investigate Further

What we need to know more about, with respect to pastures, is, chiefly: What proportion of a general farm where livestock is kept should be in good pasture, and how much of each pound of milk, beef, pork, mutton, wool, and each unit of horsepower should be grown from grass and other forage crops, to make the farmer the most money? The answer will vary with the farm, the locality, and the relative cost of other things. One of the certain advantages of our present agricultural situation is that grass is being given its best opportunity to show what it can do. Another is that many new converts have, through necessity, been made for pastures that formerly would not give them passing consideration.

When we speak of the use of livestock in utilizing non-crop land we realize there are some who believe all that is necessary is to turn animals on it and let them graze at will. It is not so simple as that. To utilize such areas with livestock so that taxes and interest above living and operating expenses may also be obtained is a complicated problem.

We have often said that if told why a tract of land had been abandoned, we could tell whether livestock had an opportunity to bring it into practical use in a farm program. There are two words, each beginning with the sixth letter of the alphabet, which are the keys to this question. They are *feed* and *forage*. We just as well jump over to the next letter of the alphabet, and we have *grass* as the master key to the whole situation which is the subject of our discussion. Because, if a stretch of country won't grow grass (and legumes that logically belong with it), it won't grow much in the way of livestock nourishment. Without grass we have a slim chance of success in the production of livestock on a profitable basis.

A Cheap Feed

Many readers are familiar with our farm philosophy which holds that the best security for stockmen is an abundance of good pasture and roughage at all times. Just as haystacks and bulging granaries offer the greatest security for a permanently sound livestock enterprise, so does an abundance of good pasture at all seasons insure the most efficient and economical system of livestock maintenance and production. In other words, grass is the stockman's cheapest feed. It costs less to produce than cultivated crops. It also costs less to harvest, as the animals do most of the work themselves. Whether pasture is scanty or abundant, however, it has been learned by wise stockmen that careful management is an important item, even when grass, the most economical feed of all, is concerned. The farmer with good pastures has a decided advantage over another who must rely upon higher priced feeds for a larger share of his grains, but grass alone seldom makes top livestock. And the best pastures may make greater profits if the stockman wisely provides the proper balance with other forage and grain crops.

Generally the first thing to determine is whether the additional pasture is to be permanent or annual. Annual pastures afford greater insurance against parasites, fit into rotations readily, and distribute the benefits of grazing animals more uniformly on the whole farm. On the other hand, such pastures require much more labor and seed than permanent pastures, are not so effective in controlling erosion, and are somewhat less dependable than permanent pasture, since in many areas one has annually the risk of not getting a good stand. Generally it is advisable to have both permanent and annual pastures, with the permanent pasture furnishing the bulk of the grazing and the annual pasture being of such size, kind, and time of seeding that it furnishes an abundance of grazing while the permanent pasture is dormant.

In the North, cereals and Italian rye grass supplement permanent pastures in the fall and spring, while sudan, alfalfa, and soybeans do the same in midsummer. In the South, vetch, crimson clover, and other legumes as well as Italian rye and cereals lengthen the grazing season in the spring and fall. Such pastures are not commonly dormant in midwinter. For permanent pasture, the land most subject to erosion should be selected. Such land is most likely to have an available water supply for the livestock. While such land may not always be located conveniently to the farmstead, it is better as a rule to build a lane for the stock to go back and forth to the pasture than it is to crop the rougher land while more level land nearer the farmstead is in pasture. If such lanes are made 4 to 6 rods wide, among other advantages they are much less likely to be barren, weedy, gullied, and unsightly than if barely wide enough for passage. A lane 4 rods wide and a quarter of a mile long requires only 2 acres and may furnish considerable grazing.

There are many advantages of taking certain fields out of cultivation and seeding them to pasture. It will not only stop most of the erosion and gullying which may have been taking place but at the same time be an important step in soil improvement. If rolling land which has a porous subsoil is level-terraced, practically all of the water which falls can be held until it soaks in.

On farms which have several fields

(*Turn to page* 39)

Fertilizer Developments In Mississippi

By E. B. Ferris

Superintendent, Holly Springs Branch Experiment Station, Holly Springs, Mississippi

THE writer has had many years experience in dealing with fertilizers in Mississippi. Starting in 1893 as a student assistant to the State Chemist, he has since witnessed the many changes in the fertilizer business of the State, always as one vitally interested in all changes as they occurred, because all the while engaged in some phase of agricultural work closely connected with the ups and downs of the fertilizer industry.

During these many years we have seen the fertilizer business grow from the exercise of no control by the State over the composition of materials and mixtures sold, and where an unscrupulous dealer might sell any material he chose to call a fertilizer at any price the farmer would pay, to the present close inspection by State authorities of every fertilizer mixture or material put upon the market. Starting as a graduate chemist about the time the first fertilizer law was put into effect, we have seen the tonnage used in the State gradually rise from about 17,000 tons in 1895 to more than 400,000 tons in 1930, fall off severely during the years of the depression, and again rise to reach some 330,000 tons in 1937. This recent increase in fertilizer usage and better selection of land and varieties, together with almost ideal weather conditions, are responsible for the highest yield of cotton per acre in 1937 that Mississippi has ever grown.

These comparative tonnages do not show the real picture of actual plant-food increases in the State, for in 1895 many of the best sellers contained only from 8¼ to 9½ pounds of plant food per hundred pounds. In recent years the law forbids the sale of any mixture containing less than 16 units, and some of the present sellers contain 24 units, with a few as high as 60 units. It is possibly safe to say that the average complete fertilizer sold today contains at least twice as much actual plant food per ton as did the average of 40 years ago, or that Mississippi used in 1937 almost 40 times as much commercial plant food as she did in 1895.

Extent of Need

In the early days, it was our duty as a chemist not only to analyze the samples as they came to the laboratory, but also to go out over the State during the selling season and collect samples of the various shipments as they were received by the dealers from the factories. Thus we came to know rather intimately those parts of the State where fertilizers were used in any quantity. In those days an inspector spent the most of his time in south Mississippi, a much smaller part of it in the sandier parts of east Mississippi, scarcely no time at all in the loamy lands of north and west Mississippi, and never a day in the Mississippi Delta.

As the years have passed, the use of fertilizers has extended to every part of the State. Even the Mississippi Delta, famed the world over for the richness of its soils, has come to use about as much nitrogen per acre as the poorest lands in the hills, and the loamy lands of north and west Mississippi depend on fertilizers about as did south Mississippi 40 years before. Another change almost as revolutionary as that of increased tonnage, higher analysis, or the extension of fertilizer territory, has been the ratio at which nitrogen, phosphoric acid, and potash are being used in fertilizer mixtures. In 1895 the prevailing ratio was a 1-5-1, or wider, whereas now this ratio has been narrowed to a 1-2-1, or narrower, and the tendency seems toward a still narrower ratio of 1-1-1. Witness the 2-10-2 as the prevailing analysis of 1900, the 4-8-4 some 30 years later, and what the following figures may imply as to the relative importance of nitrogen, phosphoric acid, and potash.

The Mississippi experiment stations

Demonstrations show that potash will control cotton rust (potash starvation). Left: Insufficient potash, badly damaged plant. Right: Sufficient potash, healthy, normal plant.

have had much to do with the change in composition of fertilizers sold in the State. Located as they have been on several of the main soil types, these stations have conducted thousands upon thousands of tests to determine not only the plant foods needed but as well their ratio to each other and the amount per acre most profitable to apply. The writer spent 26 years in doing such work in south Mississippi and during the past 6 months has succeeded a former co-worker who had likewise done the same kind of work in northwest Mississippi, but on a radically different soil type.

Thorough Tests

While south Mississippi used fertilizers from the beginning, northwest Mississippi used practically none before this station was established at Holly Springs and demonstrated their beneficial effects. It is most interesting to study the work of this Holly Springs Station with fertilizers, particularly the tests that were started many years ago and have been continued on exactly the same plots for 13 years in succession, giving them a sort of historic value. These tests afford a better idea of the long-time requirements of such soils, much better than if the same work had been done for even a longer time but on different plots.

We give here the increases in yields of seed cotton per acre that have been obtained as an average of 12 years' results, beginning in 1925 and including 1937, excepting only 1932 when yields were not included. These annual yields were obtained from an average of three plots each year, treated in the same way and compared with nearby plots that received no fertilizer. Six hundred pounds per acre of the several mixtures were used, the soil being in a well-drained bottom, later classified as Lintonia Silt Loam. These results are reported in Information Sheet No. 135 just issued

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Using Soil Tests To Get the Picture

By T. H. Blow
County Agent, Caledonia County, Vermont

THE use of soil tests as a guide to making fertilizer recommendations for the various fields, crops, and rotations of the Caledonia County, Vt., farms would seem to provide a fairly accurate measure for this work. These tests combining not only results on nitrogen, phosphorus, and potash, but also lime and calcium give a much-needed basis for a more effective field work by extension agents and a much more effective program under soil conservation work.

In 1937 some 900 samples, representing farms in every one of the 17 towns in the county, indicate a close correlation to fertility needs, and recommendations made as a result of these tests indicate a definite degree of accuracy as shown by the crop results. The tests, even though quick, answer the desire of many farmers to find out how best to make their fertilizer expenditures from year to year and crop to crop. The range used by the State in making the county analysis on the tests was from extra high to very low, and samples were distributed over the entire year.

In the case of nitrogen, the tests showed a sharp increase in the number in the medium, low, and very low group on the tests made in the fall months or from September through December. The cause of this was due to the nitrogen supply being depleted by the growing crops using up their normal supply in their growing period, as well as some loss from leaching. In the spring tests, applications of manure also tended to increase the number of tests in the higher group. With phosphorus and potash this sharp reaction in the lower groups did not occur in the fall tests, and where spring applications of either had been made, there was a decided tendency for very few samples to fall into the very low classification.

Low in Potash

While there has been a very definite knowledge that Vermont soils are low in phosphorus, the samples tested indicate that potash is also a much-needed plant food in Caledonia County. Out of the 913 tests made, 492 fall into the low-potash grouping, while with phosphorus 377 fall into the low classification. The graph accompanying this article shows the very sharp reactions for potash in the samples tested. The care of the farm manure supply not receiving the attention it should and the very limited applications of potash in past years account for this condition.

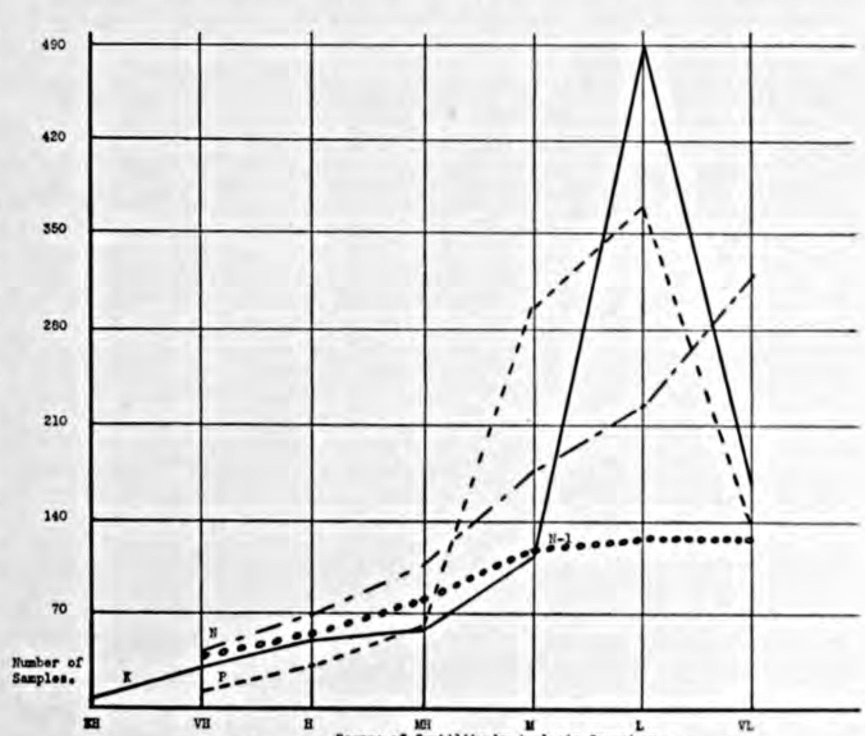
In barnyard manure fully 80 per cent of the potash is in the urine, and with inadequate absorption a great loss occurs. Caledonia County is a dairy county, hence a great supply is available right on the farm with proper care, but undoubtedly will need supplementing through the use of commercial fertilizers. In looking over the tests, it was also interesting to note that those farmers reporting a good stand of clover, or that clover stayed well, had a higher test for

Hay crop on the Lee Farm, East St. Johnsbury, Vermont. This crop shows the effect of an even balance in fertility.

phosphorus and potash and particularly the latter. The county program calls for a concerted effort in using superphosphate, either in the gutter at the rate of at least 1 pound per mature cow per day during the stable season, or by adding it to the loads of manure as they are hauled to the fields at the rate of 30 to 40 pounds per ton.

This balances up the manure supply in so far as phosphoric acid is concerned and, if properly handled and sufficient bedding used to absorb the moisture, makes for a more efficient conservation of both potash and nitrogen. However, on many farms there is still a great loss of the potash which will have to be supplemented by individual applications or in high-potash complete fertilizers, if the greatest results are going to be obtained from our hay, pasture, and other forage crops.

The guide being used in Caledonia County for making fertilizer recommendations is the same as that used by the State and is, of course, adjusted to the soil history given by the farmer, such as slope, subsoil, drainage, pre-



Degree of fertility by Analysis Groupings.
K-Potash;P-Phosphorus;N-Nitrogen;N-1-Nitrogen(spring tests only).

vious treatment, and previous crops and cropping system. The tables used as a guide for recommendations are as follows:

POTASH FERTILIZATION TABLE

(Pounds of K_2O per acre to be supplied as fertilizer and used when seeding down or for top-dressing.)

Rating	Alfalfa Clay, silt loam	Alfalfa Sands, sandy loam	Clover & timothy Clay, silt loam	Clover & timothy Sands, sandy loam	Permanent past. (top) Clay, silt loam	Permanent past. (top) Sands, sandy loam	Perm. past. Clay, silt loam	Seed down Sands, sandy loam
Extra high	0	0	0	0	0	0	0	0
Very high	0	0	0	0	0	0	0	0
High	30	40	20	30	30	40	30	40
Medium high	40	50	30	40	40	50	40	50
Medium	50	75	40	50	50	75	50	75
Low	60	100	50	75	75	100	75	100
Very low	75	125	60	100	100	125	100	125

PHOSPHORUS FERTILIZATION TABLE

(Pounds of P_2O_5 per acre to be supplied as fertilizer and used when seeding down or for top-dressing.)

Rating	Alfalfa Clay, silt loam	Alfalfa Sands, sandy loam	Clover & timothy Clay, silt loam	Clover & timothy Sands, sandy loam	Permanent past. (top) Clay, silt loam	Permanent past. (top) Sands, sandy loam	Perm. past. Clay, silt loam	Seed down Sands, sandy loam
Extra high	0	0	0	0	0	0	0	0
Very high	0	0	0	0	0	0	0	0
High	40	48	0	0	64	64	0	0
Medium high	48	64	40	48	80	80	40	48
Medium	64	80	48	64	96	96	48	64
Low	80	96	64	80	112	112	64	80
Very low	96	112	80	96	128	128	80	96

NITROGEN FERTILIZATION TABLE

(Pounds of nitrogen per acre to be supplied as fertilizer.)

Rating	Alfalfa Clay, silt loam	Alfalfa Sands, sandy loam	Clover and timothy Clay, silt loam	Clover and timothy Sands, sandy loam	Grass meadows (top) Clay, silt loam	Grass meadows (top) Sands, sandy loam	Grass past. (top) Clay, silt loam	Grass past. (top) Sands, sandy loam	Perm. pasture (early grazing) Clay, silt loam	Perm. pasture (early grazing) Sands, sandy loam
Very high	0	0	0	0	0	0	0	0	0	0
High	0	0	0	0	0	0	0	0	0	0
Med. high	0	0	0	0	0	0	0	0	0	0
Medium	16	16	16	16	16	16	32	32	32	32
Low	32	32	32	32	32	32	48	48	48	48
Very low	48	48	48	48	48	48	56	56	56	56

There is very slight variation in tests between the towns in the county, a greater difference showing up between farms. Those farmers following a better system of manure conservation, cropping, and fertilization showed much higher tests than those not following such a practice. This would also seem to be borne out by checking with farmers over various parts of the county who report this to be true in practice.

In summarizing these results it can be said that such tests can be put to a most practical use by the county

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J. W. Haddon Grows Popcorn for Profit

By F. J. Hurst

Editor, Agricultural Extension Service, State College, Mississippi

A NEW cash crop that is good enough to displace cotton on the farm of a successful cotton grower must be plenty good. But that is exactly what popcorn has done on the farm of J. W. Haddon, one of Newton county's best cotton farmers, who was once employed by the Government of Brazil as a cotton specialist.

Starting on a small scale five years ago, Mr. Haddon gradually increased his acreage in popcorn to 75 acres last year. However, over half of his crop last year was planted on poor land, and yields ranged from 6 bushels per acre on thin soil to 60 bushels per acre on the best land, with an average yield of 19 bushels per acre. Even at that popcorn paid him better than cotton, and he averaged close to a bale of cotton per acre.

This year he planted 250 acres, all of it good land, to popcorn. He grows Super Gold, a variety developed by Dr. A. M. Brunson of Kansas State College, who spent seven years developing three special characteristics of this variety. These important characters are (1) a high popping expansion, (2) elimination of the hard center in the kernel, common to all popcorn, and the development of more crispness, and (3) retention instead of dissipation of the popcorn flavor during the process of popping.

Mr. Haddon has done a remarkable work in further improving the popping qualities of Super Gold popcorn. When he started growing this variety four years ago, it had a popping expansion of 21.3 as compared with 15 for the United States average. Through the selection and testing of 1,500 to 2,000 individual ears each year, Mr. Haddon has increased the popping expansion to 29.9. This year he has a seed patch planted from ears that tested 42, the highest expansion on record. In fact, this was so high that he sent some ears to Dr. Brunson to verify his own tests. Dr. Brunson reported a slightly higher expansion than Mr. Haddon had obtained.

He prepares a good seedbed by thorough breaking and harrowing the soil. He plants popcorn in rows three feet wide and thins the plants to two stalks to the hill.

Proper Fertilization

He fertilizes heavily with a complete fertilizer high in potash. He adds 100 pounds of potash to a 6-12-6 fertilizer and applies 500 pounds of this mixture per acre before planting. Then 150 pounds of cal nitro per acre is applied as a side-dressing when the corn is about knee high. Cultivation is about the same as for regular field corn.

Mr. Haddon says that if popcorn is grown on poor land there is quite a bit of reversion to field corn, but there is no tendency toward reversion where it is grown on good land. To prevent mixing with field corn, it should be planted at a safe distance from any other corn or planted at a time when it will tassel about two weeks earlier or later than other corn. Popcorn is usually about two weeks earlier than most field corn.

One of the reasons Mr. Haddon

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What's Wrong With Your Alfalfa Crop?

By Ralph W. Donaldson
Agronomist, Agricultural Extension Service, Amherst, Massachusetts

ALFALFA tends to be short lived in Massachusetts. A number of seemingly good seedings thin out prematurely to grass hays. Lured by its reputation for longevity, farmers have devoted expense to seed this legume, often to discover later that its fruitful period may last but little beyond that of ordinary clover. Unless its productive period can be prolonged, part of the incentive for growing alfalfa in this region is gone.

Admittedly, alfalfa is a plant fussy of its requirements. For preparation, it takes considerable lime applied gradually to plow depth for our acid soils. It needs extra superphosphate, manure, and a firm seed bed to start it, and the new seeding will soon fall a victim of either poor inoculation, close cutting of a nurse crop, or later injury from winter heaving on soils insufficiently drained. Such pitfalls lie in the path of preparation for this crop, and they wreck many first attempts even to get the crop started. However, the causes in such instances are generally obvious, remedial measures are known, and success in starting the crop seems largely a matter of education.

The future of alfalfa might seem pessimistic were it not for a proportion of growers who succeed reasonably well. In fact, it is mainly due to individual instances in which alfalfa has been maintained as vigorous stands for long periods that prompts the challenge—Why?

Serious Hazards

Climate cannot be blamed entirely for alfalfa loss, since good stands have survived its rigors. Perhaps a more frequent lack of snow cover and exposure to thawing and freezing in this area constitute the main hazard in this respect.

Nor is the varietal strain the apparent cause. Repeated tests of

Compare this alfalfa, which received potash, with that in the picture on the right.

Grimm and other variegated types of hardy strains indicate little preference over northern-grown, common alfalfas in the matter of longevity. In the matter of disease, bacterial wilt plays some part, the extent of which has not been well investigated; hopper injury also does some damage. The main causal difference, however, appears to lie elsewhere, either in the matter of soil differences, nutrients supplied, or effects upon the plant induced by time of cutting.

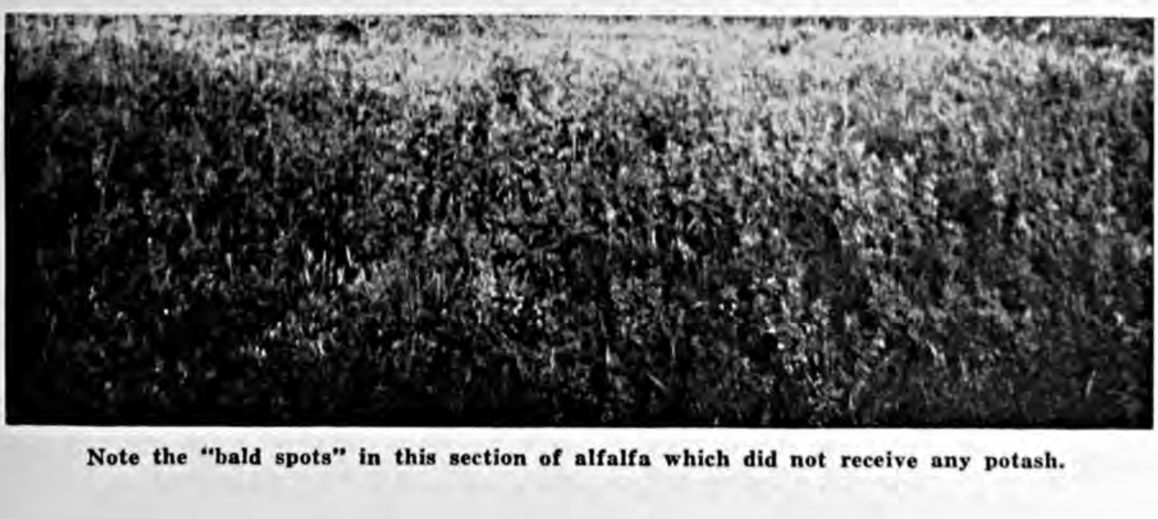
Wet soils or level pockets where heaving or ice sheets may occur are excluded from this discussion for alfalfa. But what of the well-drained sandy slopes of which a predominance exist in this State? Is the strongly acid nature of most of these soils the cause of short-lived stands, even though the topsoil is limed? Failure to lime them adequately no doubt is a common cause. Yet, strange as it may seem, more outstanding evidences of longevity are found today established on these acid soils than normally are found on the limestone soils of Berkshire County. In fact, it has been the relatively short life of alfalfa on these supposedly ideal limestone soils that arouses the suspicion that some nutrient supply for the plant has been neglected, or the function of the plant has been disturbed by times of cutting.

It might be plain starvation. A 3½-ton yield of alfalfa removes from the soil the equivalent of about 200 pounds of superphosphate and 300 pounds of muriate of potash per year. Farmers have been instructed to apply manure and about 1,000 pounds of superphosphate at time of seeding, perhaps 5 years' reserve phosphorus, in addition to which annual supplements of about 250 pounds are commonly supplied as top dressing. Lack of phosphorus undoubtedly is of major concern on clay-type soils of high absorptive capacity for it. Yet for these sandy soils when limed, the abovementioned rates would not seem likely to occasion the first cause of starvation.

Potash Deficiencies

But what of potash? Farmers rely on manure or the soil to supply this. Theoretically, a 15-ton rate of manure supplies just one season's requirements of this crop for potash—30 tons enough for two seasons. And more often than not, the productive period of the average stand shows a relationship to the amount of manure applied. If, further, we assume these light-textured soils to be relatively deficient in potash, usually corroborated by tests, then the missing suspect might be *potash*.

Several earlier field trials showed response of alfalfa to large amounts of potash, but often negligible results from ordinary amounts applied. Again in 1936, field trials of two sorts have been started on 15 farms growing alfalfa.



Note the "bald spots" in this section of alfalfa which did not receive any potash.

The first sort is a comparison between applying potash in the soil prior to seeding versus surface applications annually. In this test, 500- and 1,000-pound rates of muriate of potash have been worked into the seed beds (additional to the farmer's normal fertilization) for comparison with adjacent strips which receive 300-pound rates top-dressed annually.

A second type comprises top-dressing trials of superphosphate and potash. These two materials are being applied each spring at rates of 160, 320, and 640 pounds per acre each, alone and in combination.

With the new seedings just getting under way, it is yet too soon to anticipate any response from the potash applied in the soil.

Response to Top-dressing

In the top-dressing tests, only one field showed response the first season, and it was distinct on the 320- and 640-pound rates of potash. It was sufficient to induce the grower immediately to broadcast potash on the balance of his field that season. At the end of this, its second season of treatments, results are even more pronounced, with the alfalfa largely gone on the check and with alfalfa on the 320- and 640-pound potash plots decidedly good, but with no evident response to the superphosphate except as additions on the high-potash plots where it appears to be of slight benefit. The 160-pound rate of potash, although repeated this spring, may be helping slightly but appears to be insufficient. Soil tests taken when the trial was started—the first season after seeding—showed pH around 7.0, medium high phosphorus, but very low potash.

With this one exception, the rest of the field tests showed no visible response to any of the treatments the first year. This was rather anticipated, since in most cases alfalfa may thrive several years at least, because of the reserve nutrients supplied either by the grower or by the soil. These tests are expected rather to be trials of endurance.

Again in 1937, the same lack of response occurred the early part of the season. However, by autumn several other fields appeared to be showing response on the 320- and 640-pound rates of potash.

It is too soon yet to form any opinion, but at least their development is being followed with interest.

Cutting the Crop

Associated with a concept of possible starvation must be considered injury induced by frequency and time of cutting alfalfa. An experiment at the Massachusetts State College offers some evidence on this point.

Beginning 2 years ago, alfalfa has been cut at definitely spaced intervals, starting early June and extending to late September. Eight plots are cut three times, and four plots are cut twice per season. Of special interest in this experiment is the commotion that resulted from a 300-pound rate of muriate of potash (60 per cent) applied to half of all plots in June 1936. So-called "winter-killing" the following winter of 1936-37 was so severe on the no-potash ends of the three-times-late-September-cut plots, that only scattered plants remain. Excellent evidence otherwise of murdering alfalfa by wrong cutting twice before bloom and again too late in the season has been spoiled because of potash supplied on the other end where almost a perfect stand remains.

All the plots cut three times on the no-potash ends suffered more or less from "winter-killing," dependent upon periods at which cutting took place, as compared with the potash ends. Only on the plots cut twice was the alfalfa uninjured on the no-potash end and seemingly as vigorous as where the potash had been applied.

Longevity is the ultimate goal. Failure to lime adequately in preparation

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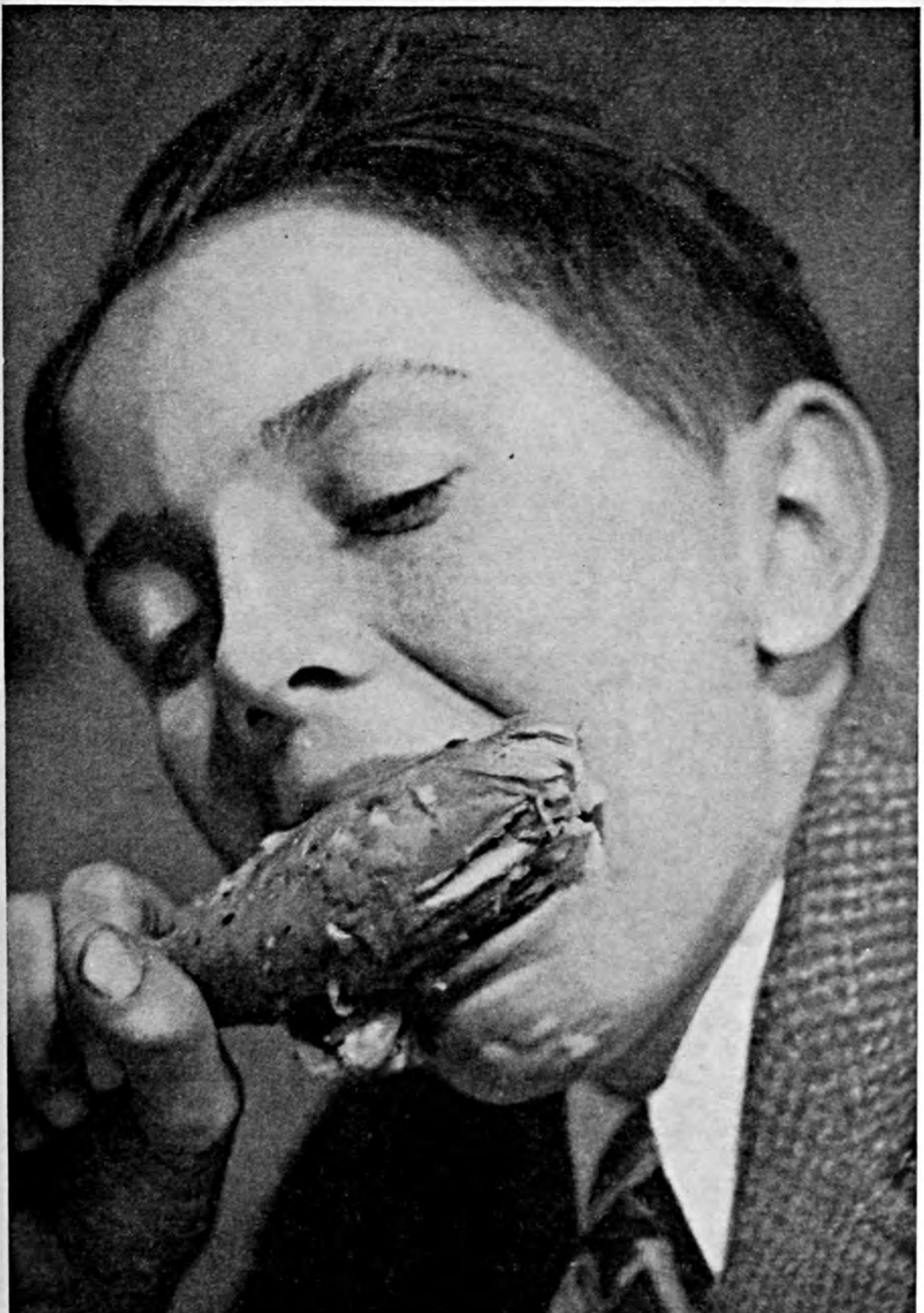
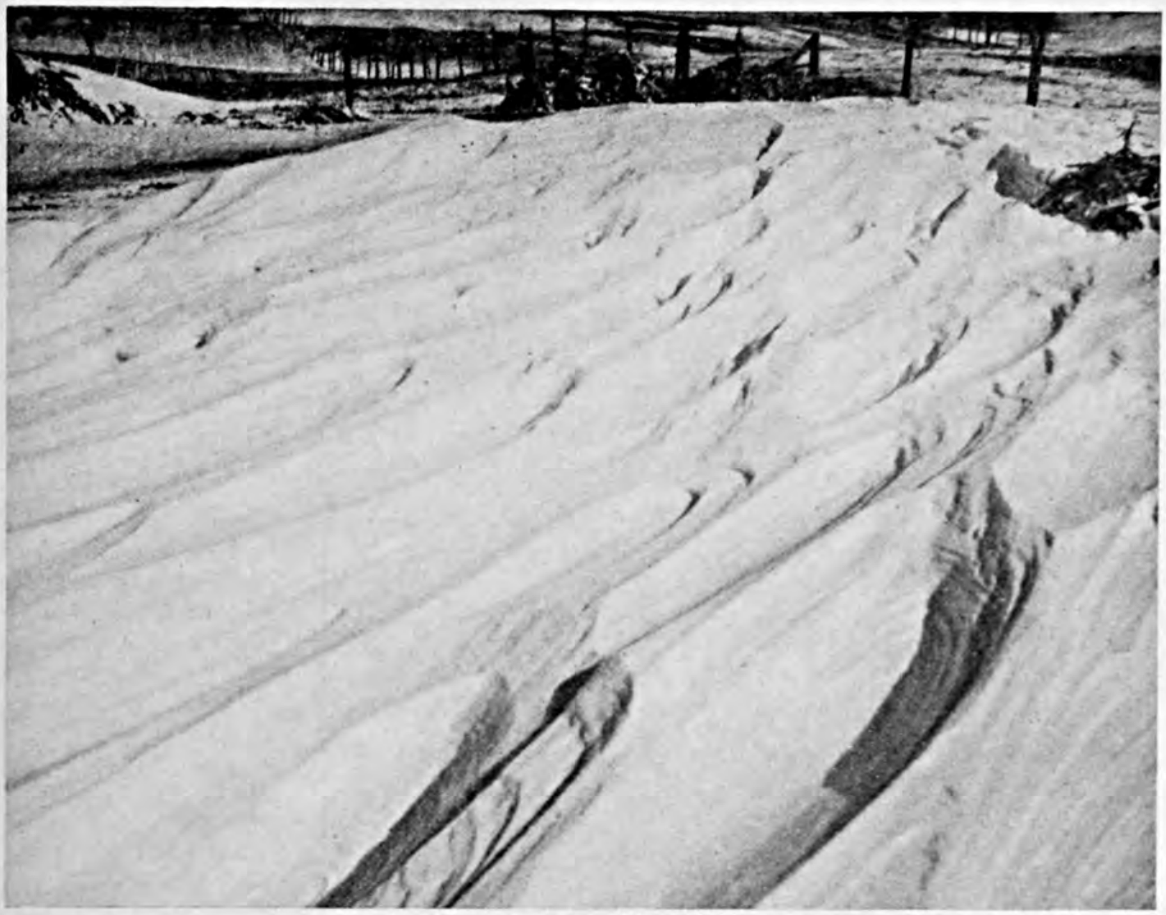
PICTORIAL



THE DEMAND FOR POULTRY IS PICKING UP!

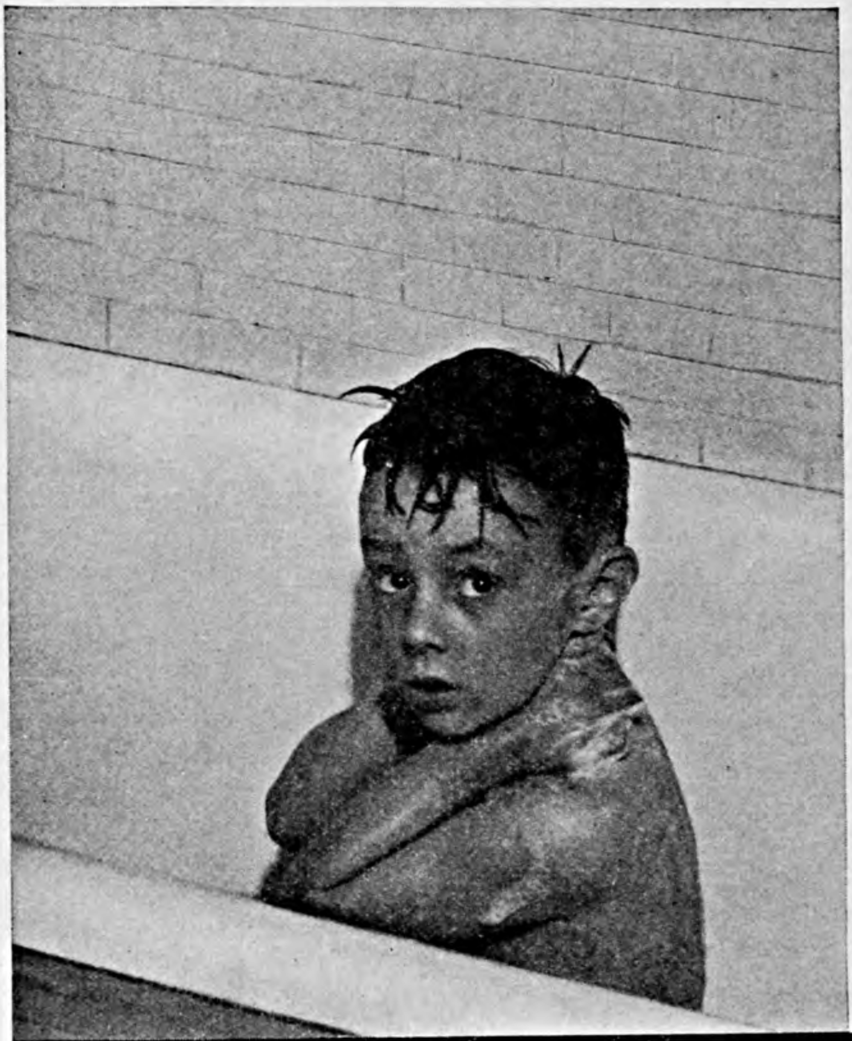
Above: Reflections of a Snow Fence.

Below: Wild geese feeding in a corn field—enough to make a hunter's trigger finger itch.

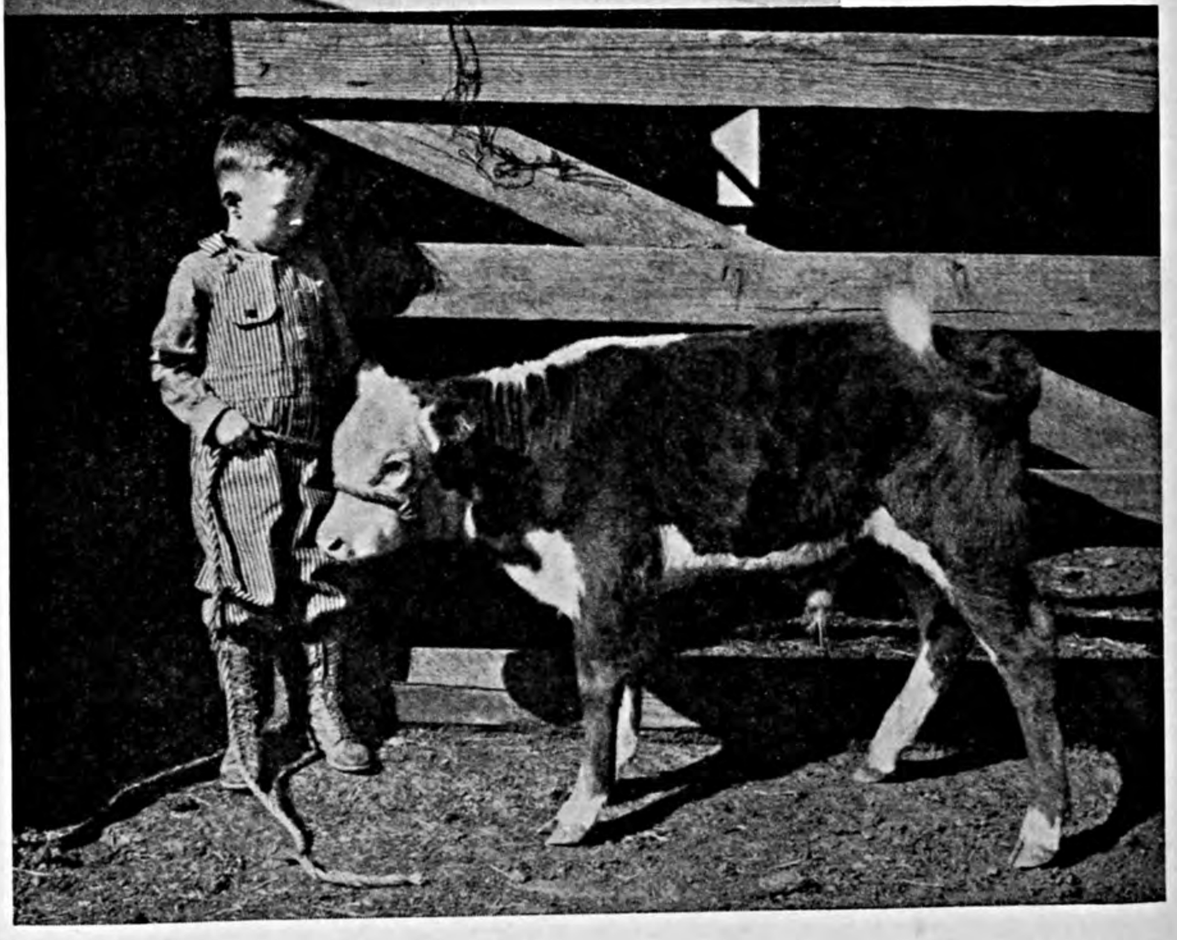


Above: Snow tides will soon recede.

Below: Friends gnawing the same bone—but wait till they get to the middle!



At this age in a man's life, pride in person is not as great as pride in good livestock.



The Editors Talk

Climatic Zones and Crop Production

Whatever the Government or any other agency does about farming, the farmer has to try to run his farm more efficiently, cut out waste in work, lower production costs, and obtain maximum returns from the expenditures he makes for seeds, fertilizers, feeds, and other materials in which he invests money, time, and labor.

In years gone by we tried out varieties of crops, found one was better than another, tried to get some good seed of that variety, and let it go at that. Later, tests were made with fertilizers. Some combinations seemed to give better results than others. So, with the best variety of oats, wheat, corn, or other crop fertilized with the best combination of plant foods, what more was necessary? Was not this—a good variety and a good fertilizer—all that a man could do or hope for? For a long time it was.

But no problem stands still for very long. In this case the climate has stepped in to complicate the picture of efficient crop production and fertilizer usage. It has been found that certain varieties, with or without fertilizers, do much better in certain "soil-climatic" zones than in others. So in addition to the best variety and fertilizer analysis, the farmer is on his way to knowing the most profitable variety and fertilizer for the soil and climate in which he farms, which may be quite different from those used by another farmer some distance away.

This newer phase of efficiency in crop production was discussed in a most interesting manner at the meetings of the Ontario Agricultural and Experimental Union held at the Ontario Agricultural College, Guelph, Ontario, in January.

For agricultural purposes, southern Ontario has been divided into 15 climatic regions. Cooperative tests with field crops, using four distinct types of cooperative tests, were carried on with farmers in the several soil-climatic zones. The results of this work were reported by Dr. G. P. McRostie before the general meeting of the Experimental Union.

It was amply demonstrated that certain varieties of several crops did much better in some zones than in others, and the response to fertilizers varied with the variety and climatic zone. For instance, in one climatic zone the Alaska variety of oats was very significantly higher yielding than other varieties when fertilized—48.1 bushels per acre—but without fertilizers the variety, O. A. C. No. 72, gave the highest yield.

In another soil-climatic region, however, the results obtained with testing the same four varieties of oats were quite different. In this test the Banner Oat gave the highest yield, both fertilized and unfertilized, 42.5 bushels per acre fertilized compared with 26.27 for the Alaska. Other results could be cited, but these indicate the type of result that is being obtained by relating variety tests and fertilizer treatment to soil-climatic zones.

These preliminary investigations, in which the agricultural section of the Ontario Research Foundation cooperated, point the way to a vast field of experimentation to help the farmer along his endless road of more efficient crop production. It is possible that we shall soon have "zoning" in the corn-growing areas where in recent years much attention has been given to the development of corn hybrids which would be better adapted to various soil and climatic conditions, and where recent tests have conclusively shown that hybrids which yield well without fertilization will usually do even better with proper fertilization.

King (?) Cotton In North Carolina

While cotton may popularly be called King in North Carolina, in the unromantic light of cold statistics, it has to give way to tobacco, according to W. H. Rhodes in the December 1 issue of the *Agricultural Review,* issued by the North Carolina State Department of Agriculture. Not only must cotton take second place in the value of crops produced in this State, but it is well below tobacco in the agricultural hierarchy of the State. The lowly corn crop can hold its head almost as high as cotton, and not far below come the combined vegetable crops.

The cash value of tobacco in 1936 is given as over 100 millions of dollars, with cotton, including lint and seed, valued at a little under 50 millions. Corn has a value of about 40 millions, not counting the feed value of the stover. Adding the grain and stover values probably would put corn about even with cotton. Vegetable crops, including Irish and sweet potatoes, had a total value of about 30 millions. Hay crops are fifth, being valued at over 11 millions. Peanuts are not far behind, while somewhat lower are the values of wheat, apples, peaches, oats, soybeans, strawberries, cabbage, lespedeza seed, and sorghums for syrup and feed. All of these crops have values of between 1 and 10 million dollars.

We would be the last to disparage the importance of cotton in the agriculture of North Carolina. It would be difficult indeed to replace its value to the many farmers of the State growing the crop. However, let us give due credit and attention to the other crops which in aggregate value far overshadow cotton. It is these crops which keep the agriculture of the State in a comparatively good condition year in and year out, and put it fifth among all the States of the country in value of agricultural crops produced.

These figures tell a far more important story than the mere relative values of the important crops grown in North Carolina. They show that many of the farmers have found that it does not pay to put all the eggs in one basket. Thus, instead of putting all their effort into growing only one cash crop, such as cotton, they are growing many cash crops, as well as a number of crops for consumption on the farm. In the long run, this is undoubtedly the safest way to farm and is the program the agricultural experts long have been advocating. A diversified farming system not only is most likely to produce a moderately good income each year, but is by far the best from the viewpoint of soil conservation.

REVIEWS

This section contains a short review of some of the msot practical and important bulletins, and lists all recent publications of the United States Department of Agriculture and the State Experiment Stations relating to Fertilizers, Soils, Crops, and Economics. A file of this department of BETTER CROPS WITH PLANT FOOD would provide a complete index covering all publications from these sources on the particular subjects named.

Fertilizers

¶ Summarizing the extensive fertilizer experiments on truck soils in the southeastern truck and cotton belt, and particularly those on North Carolina soils, Bulletin 316 of the North Carolina Agricultural Experiment Station, entitled "Adapting Standard and High Analysis Fertilizers to Truck Crop Soils," suggests methods of improving fertilizer practice in this area with substantial savings in fertilizer costs. The authors, J. J. Skinner and R. A. Lineberry, of the Bureau of Plant Industry, cooperating in these studies, and H. B. Mann and E. R. Collins, conclude that generally the double strength grades may be as efficient as single strength fertilizers for truck and cotton soils, resulting in lower cost to growers. It is estimated that increasing the plant-food concentration in commercial fertilizers from 15 to 20 or 25 per cent effects a saving of 17 to 23 per cent of the fertilizer cost.

Differences in efficiency of the various complete fertilizers may be due to differences in their composition. Among these listed by the authors are sources of nitrogen, differences in the acid-forming properties of the fertilizers, content of secondary plant-food elements as calcium and magnesium, and the content of minor nutrients such as copper, manganese, boron, and zinc.

The data secured in truck and cotton experiments indicate that the use of concentrated fertilizers containing soluble but relatively leaching-resistant sources of nitrogen should give good results and materially reduce the cost of crop production. High analysis fertilizers, as well as the standard fertilizers, have given best results when applied to the side of the seed at planting. On soils from which fertilizers are readily leached, application of part of the nitrogen as a side-dressing is said to be preferred.

Fertilizers for truck crops and cotton should be neutral or non-acid-forming for the acid soils of the State, unless they are used with lime. The acidity of the fertilizer and its content of calcium and magnesium are especially important factors influencing the efficiency of Irish potato and cotton and sweet potato fertilizers. Data from the strawberry experiments near Chadbourn confirm the results obtained in experiments with other truck crops. They indicate that there is little or no difference between sources of nitrogen when they are used in non-acid standard fertilizers. However the high analysis fertilizers were superior to the single strength fertilizers even though the latter were non-acid-forming.

The results of the experiments with sources of nitrogen and high analysis fertilizers with truck crops in general substantiate those secured with cotton.

"Fertilizer Experiments with Greenhouse Tomatoes," Agr. Exp. Sta., Urbana, Ill., Bul. 438, Nov. 1937, J. W. Lloyd and B. L. Weaver.

"Nitrogenous Fertilizers for Growing Tobacco," Agr. Exp. Sta., Amherst, Mass., Bul.

346, *Oct. 1937, A. B. Beaumont and M. E. Snell.*
"*Tobacco Fertilizer Recommendations for 1938," Agr. Exp. Sta., Raleigh, N. C., Agron. Inf. Cir.* 108, *Aug.* 1937, *R. Y. Winters, Director.*
"*Fertilization of Pastures for Milk Production," Agr. Exp. Sta., Blacksburg, Va., Bul.* 309, *Sept.* 1937, *A. D. Pratt and C. W. Holdaway.*
"*Report of the Chief of the Bureau of Chemistry and Soils, 1937," U. S. D. A., Washington, D. C., Henry G. Knight, Chief.*
"*Production and Agricultural Use of Sodium Nitrate," U. S. D. A., Washington, D. C., Cir.* 436, *June* 1937, *Albert R. Merz and C. C. Fletcher.*

Soils

¶ Designed with the view of providing instructional material for teachers of vocational agriculture, Volume 13, Numbers 9-12 of the Agricultural Education series (Clemson Agricultural College, South Carolina, cooperating with the State Department of Education) furnishes detailed information pertaining to soil studies that should be helpful to farmers and farm boys of the State. In this publication, entitled "The Significance of Soil Types in Farming," the editors, W. G. Crandall, et al., clarify a host of problems that are often closely related to soil types. About thirty years ago it was commonly believed that the natural fertility of the soil was inexhaustible and that the soils could not wear out. Today we know that soil fertility is exhaustible, even under the best cropping systems, and many farmers are tilling worn-out soils. In areas affected by erosion, the destruction processes are greatly aggravated and accelerated.

The physical characteristics of the subsoil are most important factors in determining the movements of soil moisture, proper drainage, and root penetration. Knowing only certain facts of the surface soils, farmers are seriously handicapped in effectively managing their soils. As this publication is edited primarily for trained agricultural instructors, thorough dissemination of the contents should greatly enable them to point out certain facts to farmers and farm boys so that they can understand more about the soils they are cultivating.

¶ The soil and fertilizer requirements for the production of sweet corn are among the important topics stressed in U. S. D. A. Farmers Bulletin 1634 (Revised), entitled "Growing Sweet Corn for the Cannery," by J. H. Beattie. This crop, which ranks among the three most important canned vegetable commodities, is produced in commercial quantities in several States in the northern half of the United States. The Bulletin states that sweet corn may be successfully produced in growing seasons too short for the maturing of most types of field crops. It fits well into the farm crop rotation and occupies the land a shorter time than certain other crops, giving an increased use of green manure and cover crops. The canner and farmer in this industry are interdependent and will succeed or fail together. Operations should be attempted only in regions where yields can be obtained on land of medium value.

A well-drained, moderately heavy loam, abundantly supplied with organic matter, will probably give the best results. Where heavy clays are used, their physical character should be improved by turning under large quantities of manure and cover crops. The kind and amount of fertilizer required for sweet corn depend upon the soil conditions. In general, a fertilizer containing 4 to 5 per cent nitrogen, 8 to 10 per cent phosphoric acid, and 5 to 6 per cent potash will be found satisfactory. The rate of application varies from 200 to 600 pounds per acre, the lower amount being used in conjunction with barnyard manure. Where more than 200 pounds of fertilizer per acre are used, the excess should be broadcast and worked in during the final working of the soil before planting. Up to this quantity may be applied near the row at planting time, but not placed in contact with the seed, the author recommends. Other subjects discussed include preparation of the land, varieties, planting, and cultivation and care.

"Slick Spots in Western Colorado Soils," Agr. Exp. Sta., Fort Collins, Colo., Tech. Bul. 20, Oct. 1937, Robert Gardner, Robert S. Whitney, Alvin Kezer.

"Soil Erosion Control in Farm Operation," Agr. Ext. Serv., University Farm, St. Paul, Minn., Sp. Bul. 170, Rev. Sept. 1937, H. B. Roe and J. H. Neal.

"Land Classification in West Virginia Based on Use and Agricultural Value," Agr. Exp. Sta., Morgantown, W. Va., Bul. 284, Nov. 1937, G. G. Pohlman.

"Land-class Maps of West Virginia, I-Land Classification, II-Slope of Land, III-Types of Soil," Agr. Exp. Sta., Morgantown, W. Va., Bul. 285, Nov. 1937, G. G. Pohlman.

"What Program of Erosion Control Is Needed in America?" Agr. Ext. Serv., Madison, Wis., Sten. Cir. 191, Sept. 1937, Kenneth S. Davis and Martin P. Andersen.

"Report of the Chief of the Soil Conservation Service, 1937," U. S. D. A., Washington, D. C., H. H. Bennett, Chief.

"Soil Survey Manual," U. S. D. A., Washington, D. C., Misc. Pub. 274, Sept. 1937, Charles E. Kellogg.

"Sources of Moisture for Precipitation in the United States," U. S. D. A., Washington, D. C., Tech. Bul. 589, Oct. 1937, Benjamin Holzman.

"Soil and Water Conservation in the Pacific Northwest," U. S. D. A., Washington, D. C., Farmers' Bul. 1773, July 1937, E. M. Rowalt.

"Conserving Corn Belt Soil," U. S. D. A., Washington, D. C., Farmers' Bul. 1795, Nov. 1937, Glenn K. Rule.

Crops

¶ Of particular interest to celery growers of Michigan is the recently published Circular Bulletin 165 of the Michigan Agricultural Experiment Station, entitled "Celery Production in Michigan," by C. H. Mahoney, P. M. Harmer, Ray Nelson, and Ray Hutson. The bulletin devotes considerable attention to the types of muck soil and recommended soil amendments and fertilizer for the commercial production of this crop. Very practical information regarding varieties and cultural practices and methods for the control of insects and diseases are also discussed in detail. Since celery is a crop which has a high water requirement, muck soil, with its high water-holding capacity, is ideally suited. Although rotation with other crops is advisable, it is possible to produce this crop almost continuously year after year on the same soil if a proper system of management and careful disease and insect control measures are practiced.

A very comprehensive chart giving recommendations for the use of fertilizer, sulphur, salt and borax is included in the bulletin. Concise information regarding the different materials and quantity to use under varying soil conditions is shown by the chart. The proper ratio of phosphate to potash in the fertilizer mixture depends chiefly on the time of producing the crop and on the reaction of the soil. For early celery a good supply of phosphate in the mixture tends to bring along the crop faster. On the middle and late crops of celery, more potash is advisable in order to produce a larger stalk and improve the eating and keeping quality. While a 3-12-15 mixture is suitable for the early crop, an 0-8-24 generally will produce the best results on the late celery crop. The very acid muck requiring lime to produce satisfactory growth will give best results from a ratio that is intermediate between the above mixtures. Unless the soil is strongly acid, lime should not be applied, the authors state. Cracked stem on alkaline muck can be prevented by use of sulphur or manganese sulphate. Studies on Michigan mucks show that either borax or boric acid is effective in decreasing cracked stem on both acid and alkaline mucks.

Methods of plant production and setting plants, proper field management, and other important points worthy of consideration but too numerous to include here, are clearly defined by the authors.

¶ "What's New in Farm Science," Part I of Wisconsin Agricultural Experiment Station's 54th Annual Report, tells just what the title implies. Full of interesting reading, the report contains practical information resulting from research on animal nutrition, diseases and breeding; dairy products; feeding and clothing the family; farm income and welfare; farm engineering; game management; and bacteria, molds, and yeasts. Part II of this report will cover such subjects as livestock feeding; soils; plant diseases; field crops, etc., the Station announces. On the inside cover page is listed a number of queries under the heading "Did you know——." Opposite each is given the exact page to look in finding the answers. The subjects treated in this report will be found very practical and instructive.

"A Study of the Effect of Pollen upon the Length of Cotton Fibers," Agr. Exp. Sta., Tucson, Ariz., Tech. Bul. 70, Sept. 15, 1937, E. H. Pressley.

"Irish Potato Production, Harvest, and Storage," Agr. Ext. Serv., Little Rock, Ark., Ext. Cir. 344, June 1937, William G. Amstein and J. H. Heckman.

"Cheaper Feed Through Pastures," Agr. Ext. Serv., Little Rock, Ark.

"The Chemical Control of St. Johnswort," Agr. Exp. Sta., Berkeley, Calif., Bul. 615, Nov. 1937, R. N. Raynor.

"Golden Anniversary Annual Report Colorado Experiment Station 1936-37," Agr. Exp. Sta., Fort Collins, Colo., July 1, 1937, E. P. Sandsten.

"Nutritional Characteristics of Some Mountain Meadow Hay Plants of Colorado," Agr. Exp. Sta., Fort Collins, Colo., Tech. Bul. 21, Oct. 1937, J. W. Tobiska, Earl Douglass, C. E. Vail, Melvin Morris.

"A Preliminary Report on Frenching of Tung Trees," Agr. Exp. Sta., Gainesville, Fla., Bul. 318, Dec. 1937, Walter Reuther and R. D. Dickey.

"Dahlia Variety Test, 1937," Agr. Exp. Sta., Experiment, Ga., Cir. 114, Dec. 1937, H. L. Cochran, David D. Long, and B. E. Phillips.

"Regeneration in Various Types of Apple Wood," Agr. Exp. Sta., Ames, Iowa, Res. Bul. 220, Sept. 1937, V. T. Stoutemyer.

"Hybrid Corn in Iowa," Agr. Exp. Sta., Ames, Iowa, Bul. 366, Aug. 1937, A. A. Bryan and R. W. Jugenheimer.

"Barley in Iowa," Agr. Exp. Sta., Ames, Iowa, Bul. 367, Oct. 1937, L. C. Burnett and Chas. S. Reddy.

"Woody Plants for New England Gardens, Parks and Roadsides," Agr. Exp. Sta., Amherst, Mass., Bul. 345, Aug. 1937, George Graves.

"Fruit Notes—December 1937," Agr. Ext. Serv., Amherst, Mass., Mimeo., W. H. Thies.

"The Massachusetts Commercial Vegetable Grower," Agr. Ext. Serv., Amherst, Mass., Vol. 1, No. 8, Dec. 1937.

"Tung Oil Production in Mississippi," Agr. Ext. Serv., State College, Miss., Ext. Bul. 87, Oct. 1937, Chesley Hines.

"Cotton Varieties, Natchez, 1937, Results for 1933-37," Agr. Exp. Sta., State College, Miss., Inf. Sheet 125, Dec. 1937, J. R. Ricks, Director.

"Forest Restoration in Missouri," Agr. Exp. Sta., Columbia, Mo., Bul. 392, Nov. 1937, F. B. Mumford, Director.

"Photoperiodism and Enzyme Activity in the Soybean Plant," Agr. Exp. Sta., Columbia, Mo., Res. Bul. 271, Dec. 1937, Audrey D. Hibbard.

"Grape Production in New York," Cornell Univ. Agr. Ext. Serv., Ithaca, N. Y., Bul. 375, Aug. 1937, M. B. Hoffman.

"Experiments with Cover Crops on Long Island," Cornell Univ. Agr. Exp. Sta., Ithaca, N. Y., Bul. 677, June 1937, P. H. Wessels and John D. Hartman.

"Fall Gardening," Agr. Ext. Serv., Stillwater, Okla., Gen. Ser. 48, Cir. 102, 1937, D. C. Mooring.

"4-H Club Horticultural Manual," Agr. Ext. Serv., Stillwater, Okla., Club Ser. 91, Cir. 316, Revised 1937, D. C. Mooring.

"Cotton in Oklahoma, 4-H Crop Club Manual Series," Agr. Ext. Serv., Stillwater, Okla., Club Ser. 99, Cir. 349, 1937, Roy W. Ellithorp.

"Effect of Agricultural and Home Economics Research on Oregon's Agricultural Progress, A Report of Activities and Accomplishments for Biennium Ending June 30, 1936," Agr. Exp. Sta., Corvallis, Oreg., Sta. Bul. 350, June 1937, Ralph S. Besse.

"Extension Work in South Carolina 1936, A Review of Agricultural Progress," Agr. Ext. Serv., Clemson, S. C., D. W. Watkins, Director.

"Catalogue of the Flora of Texas," Agr. Exp. Sta., College Station, Brazos County, Tex., Bul. 550, July 1937, V. L. Cory and H. B. Parks.

"Valuable Plants Native to Texas," Agri. Exp. Sta., College Station, Brazos County, Tex., Bul. 551, Aug. 1937, H. B. Parks.

"Losses of Vitamin A and Carotene from Feeds During Storage," Agr. Exp. Sta., College Station, Brazos County, Tex., Bul. 557, Oct. 1937, G. S. Fraps and A. R. Kemmerer.

"Department of Agriculture-Immigration of Virginia," Richmond, Va., Bul. 355, Dec. 1937.

"Spring Bulbs for the Home Grounds," Agr. Ext. Serv., Madison, Wis., Sten. Cir. 192, Sept. 1937, James G. Moore.

"Growing Dutch Bulbs Indoors," Agr. Ext.

Serv., Madison, Wis., Sten. Cir. 193, Sept. 1937, James G. Moore.

"Report of the Chief of the Bureau of Plant Industry, 1937," U. S. D. A., Washington, D. C., Frederick D. Richey, Chief.

"Flaxseed Production in the Far Western States," U. S. D. A., Washington, D. C., Farmers' Bul. 1793, Sept. 1937, A. C. Dillman and L. Gordon Goar.

"American Grape Varieties," U. S. D. A., Washington, D. C., Cir. 437, Sept. 1937, I. W. Dix and J. R. Magness.

"Rhubarb Production," U. S. D. A., Washington, D. C., Leaf. 126, J. H. Beattie.

"Irrigated Crop Rotations at the Huntley (Mont.) Field Station, 1912-35," U. S. D. A., Washington, D. C., Tech. Bul. 571, June 1937, Stephen H. Hastings and Dan Hansen.

Economics

¶ Since there is so much current interest in grain storage and stabilizing crop prices through storage and loans, the recent publication of the Iowa State College of Agriculture "Stabilizing Corn Supplies by Storage," by Geoffrey Shepherd and Walter W. Wilcox, is very pertinent. The bulletin is written in an easy-to-read style and discusses briefly the possibilities of stabilizing corn supplies, prices, and livestock production, and prices through storage of corn.

A farmer who plants corn in the Spring may harvest a normal crop, a bumper crop, or possibly no crop at all. And likewise, a dependent hog producer may sell his hogs for a fair price, a very good price, or a price far below the cost of production. The instability in agriculture is due to two factors: (1) changes in supply of farm products, and (2) changes in the demand. While it has been very evident that changes in demand are a very important factor, changes in supply constitute a definite problem in agriculture at the present time. The bulletin confines itself to a study of the effects of changes in supply of corn-belt products.

Unfortunately, from the storage standpoint, large corn yields and small yields do not follow each other in regular fashion, but it is more a matter of chance, such as flipping a coin. Two large crops may follow each other, or two small crops may follow in consecutive order. The extreme in variation, however, above the normal line is less than the variation extremes below the line, but during the past 68 years there has been a considerably greater number of crops with yields above normal than below normal. From this it is apparent that large crops are more likely to follow each other than small crops. It is further noted that fluctuations in production and yield of corn are much greater in the western edge of the corn belt than in the eastern and central sections of the belt. From this it is noted that storage operations in the western edge of the belt would have more effect on supply and price than storage operations in the eastern and central parts. Approximately 70 per cent of all feed other than pasture produced in Iowa is represented by the corn crop, and approximately 85 per cent of the corn crop in Iowa is consumed as livestock feed, the other 15 per cent being sold as cash grain. If the supplies of corn could be stabilized through some sort of storage program, a great part of the fluctuation in the supply of feed for livestock would be eliminated.

In the past, farmers have stored approximately 3.8 per cent of their corn crops. This percentage has fluctuated from as little as 1 per cent to as much as 11 per cent. Of course the larger the crop the greater the carry-over.

It is further pointed out that the cheapest and perhaps the most effective place to store corn is on the farm. While corn stored in a terminal elevator may be more readily accessible from the standpoint of one market, it is difficult to take advantage of favorable prices in other markets, whereas corn stored on the farm can to a certain extent take advantage of them. The cost of storing corn on the farm, including the interest on the cost of the crib, losses due to rodents, insurance, etc., amounts to about 3c per bushel per year, and it might be expected that a crop would often remain in a crib as long as 3 years.

The effect of storing corn on hog production and prices would be expected to be of a stabilizing nature. Under our present system of things, hog production is drastically reduced in years of short corn crops and is increased somewhat in years of large crops, but due to physical limitations, it is impossible for hog producers to snap back from low levels of production as rapidly as the supplies of corn change. Therefore, a small corn crop usually causes a greater reduction in pork production than a large crop produces in the way of an increase. An analysis of the cash value of a small pork crop and a large one discloses that in the past a large production of pork is worth less than a small crop, and that the average value of a large or a small hog crop is less than a normal one. From the standpoint of the hog producer, it would be an advantage to stabilize his production and thus tend to stabilize his income.

The effect of stabilization of supplies on cash corn prices would be to level off the ups and downs of price changes. The ordinary way is for low prices and storage to result from large production. Under a storage and loan program the mechanism would tend to work in the opposite direction. Instead of the amount of corn consumed determining the price level, the loan value would set the price and determine the amount consumed, and thus determine the quantity stored.

According to the conclusions set forth in the bulletin, a corn storage and loan program apparently would be applicable to livestock and corn producers in the Midwest. How far a program of this type could be carried to other crops is not indicated. It would seem that a program of this kind would work better on corn than practically any other crop, in view of the fact that so much of the crop is consumed as feed for livestock and such a very small quantity is ever exported. While a storage and loan program might work in the case of such commodities as wheat and cotton which enter into international trade, the problems which would confront the administrators would be a great deal more difficult than in the case of corn.

¶ Although Illinois is still in the early stages of the development and use of commercial fertilizer, they publish a very comprehensive report on fertilizer tonnages sold within the State. The data are compiled by the Department of Agronomy at the University of Illinois. According to their 1936 tonnage report as compared to 1935, the total tons of mixed fertilizer increased 47 per cent from 15,381 tons to 22,576 tons. While the tonnage of materials increased only 3 per cent from 8,446 to 8,732 tons, the tonnage of superphosphate increased 15 per cent from 3,600 to 4,133 tons. The total tonnages of materials and fertilizers increased 31.4 per cent from 23,827 tons to 31,308 tons. The 10-6-4 advanced from 40th to 11th place in tonnage, and 2-14-4 dropped from 15th to 41st place. The 2-12-6 is the leading single analysis, with an increase of from 13.1 per cent of the total of mixed goods in 1935 to 19 per cent in 1936. Twenty-two new analyses were added and three were dropped, making a total for 1936 of 81 different analyses.

Only one of the new analyses contained less than 20 per cent plant food, and the average plant-food content of those added was 31 per cent. In 1934, 60 per cent of all the mixed goods contained 20 per cent or more plant food, and in 1936, 70 per cent contained more than 20 per cent plant food. In 1929 the average of the 10 leading analyses was 1.9-12.5-6.0. In 1934 the average of the 10 leading analyses was 2.2-11.1-7.7, and in 1936 the average was 1.9-11.6-9.2. About 14,168 tons of mixed goods in 1936 were reported as Spring sales, and 8,408 tons were sold in the Fall.

"Florida Citrus Prices, II," Agr. Exp. Sta., Gainesville, Fla., Bul. 317, Nov. 1937, A. H. Spurlock and Marvin A. Brooker.

"Farm Tenure in Iowa, IV. Farm Tenure Conditions in Palo Alto County," Agr. Ext. Serv., Ames, Iowa, Bul. 364, Aug. 1937, Rainer Schickele.

"This Business of Farming in Michigan—1936," Agr. Ext. Serv., East Lansing, Mich., Ext. Bul. 189, Dec. 1937, C. O. May and H. A. Berg.

"1937 Fertilizer Bulletin" (Fall Season 1936, Spring 1937), Dept. of Agr., Lansing, Mich., John B. Strange, Commissioner.

"Minnesota Farm Business Notes, The Farm Program for 1938," Agr. Ext. Serv., St. Paul, Minn., Mimeo. 181, Jan. 20, 1938, Andrew Boss.

"Current Economic Facts for Mississippi Farmers, No. 1—Yearly Average Cotton Consumption and Industrial Production in the U. S., 1920 to 1936; No. 2—Yearly U. S. Cotton Exports, 1929 to 1936; No. 3—Principal Sources of Mississippi Cash Farm Income Average 1934-1935; No. 4—Cotton—Average Parity Price and Average Price per Pound Received by Farmers 1923-24 to 1936-37; No. 5—Cotton—World Supplies of All Kinds American and Foreign Growths 1920 to Date," Agr. Ext. Serv., State College, Miss., July 15, Aug. 15, Sept. 15, Oct. 15, and Nov. 15, 1937, E. H. White, Director.

"1938 Agricultural Outlook for Mississippi," Agr. Ext. Serv., State College, Miss., Ext. Bul. 89, Jan. 1938, E. H. White, Director.

"Proposed Adjustments in the Farm Tenancy System in Missouri," Agr. Exp. Sta., Columbia, Mo., Res. Bul. 270, Dec. 1937, John H. Dickerson.

"New Farming Systems Applied to Southwest Missouri Upland Farms," Agr. Ext. Serv., Columbia, Mo., Res. Bul. 370, Oct. 1937, Donald B. Ibach.

"Economic Studies of Vegetable Farming in New York, III. Truck-crop Production and Price," Cornell Univ. Agr. Exp. Sta., Ithaca, N. Y., Bul. 679, Sept. 1937, E. G. Misner.

"Farm Economics," Cornell Univ. Agr. Ext. Serv., Ithaca, N. Y., No. 104, Dec. 1937.

"Current Farm Economics," Agr. Exp. Sta., Stillwater, Okla., Ser. 40, Vol. 10, No. 6, Dec. 1937, Lippert S. Ellis.

"Labor Input on West Virginia Farms," Agr. Exp. Sta., Morgantown, W. Va., Bul. 286, Dec. 1937, L. F. Herrmann, R. O. Stelzer, and W. W. Armentrout.

"Grade, Staple Length, and Tenderability of Cotton in the United States 1928-29 to 1935-36," U. S. D. A., Washington, D. C., Stat. Bul. 60, July 1937.

"Carlot Shipments of Fruits and Vegetables from Stations in the United States for the Calendar Years 1934 and 1935," U. S. D. A., Washington, D. C., Stat. Bul. 61, Sept. 1937.

"Consumption and Production of Tobacco in Europe," U. S. D. A., Washington, D. C., Tech. Bul. 587, Nov. 1937, J. B. Hutson.

"Sales of Cotton for Future Delivery, 1925-26 to 1935-36," U. S. D. A., Washington, D. C., Misc. Pub. 282, Sept. 1937, Ronald E. Betts.

"What Is the Cotton Situation?" U. S. D. A., AAA, Washington, D. C., G-82, Dec. 1937.

"Determination of Farming Practices to Be Carried Out in Connection with the Production of Sugar Beets and Sugarcane During the Crop Year 1937, Pursuant to Subsection (e) of Section 301 of the Sugar Act of 1937," U. S. D. A., AAA, Washington, D. C., S. D. No. 14, Dec. 20, 1937.

"Sugar Consumption Requirements and Quotas for the Calendar Year 1938," U. S. D. A., Washington, D. C., AAA, G. S. Q. R., Series 5, No. 1, Dec. 20, 1937, H. A. Wallace.

"Facts Relating to the Agricultural Situation in 1938," U. S. D. A., Washington, D. C., Ex Parte 123, Jan. 1938, L. H. Bean.

"Estimated Monthly Cotton Marketings by Farmers in Percentage of Year's Sales, Crop Years 1924-1936," U. S. D. A., Washington, D. C., Mimeo., Jan. 1938.

"Disposition of Cottonseed, Crop Years 1909-1936, by States," U. S. D. A., Washington, D. C., Mimeo., Oct. 29, 1937.

"Outstanding Farm-Mortgage Loans of Leading Lending Agencies," U. S. D. A., Washington, D. C., Mimeo., Dec. 1937, Norman J. Wall.

"The Preparation of Statistical Tables, A Handbook," U. S. D. A., Washington, D. C., Mimeo., Dec. 1937, A. G. Black.

A Los Angeles patrolman had brought in a Negro woman somewhat the worse for wear, and the desk sergeant, with his very best scowl, roared: "Liza, you've been brought in for intoxication!"

"Dat's fine!" beamed Liza. "Boy, you can start right now!"

Patricia: "Harry surprised me by telling me that we're going to take our honeymoon in France."

Nellie: "How nice! And how did he spring it on you?"

Patricia: "He said as soon as we were married he would show me where he was wounded in the war."

J. W. Haddon Grows Popcorn for Profit

(*From page* 19)

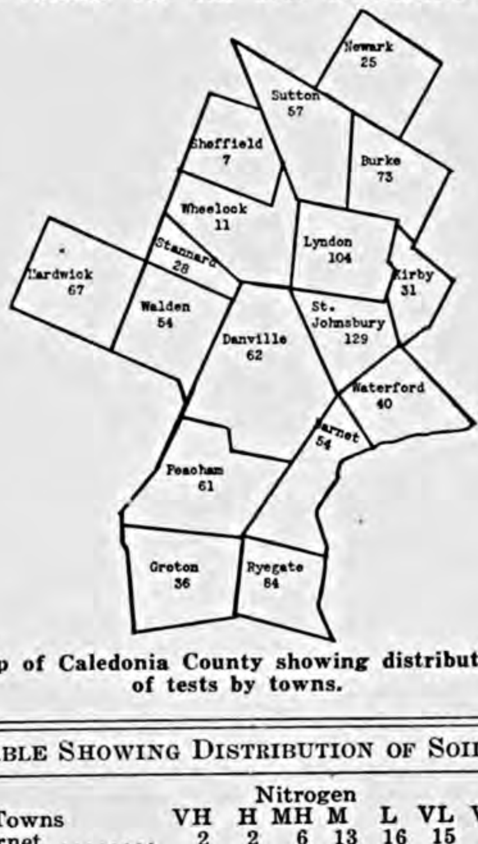
turned to popcorn was that there is a ready market for his entire output. He can sell all that he can grow at a satisfactory price. Last year he sold 100,000 pounds to one buyer. All popcorn is sold in the ear.

Mr. Haddon believes that only a few producers can grow popcorn successfully as its production requires attention to important details such as careful selection of seed and precaution against the mixing with other corn.

Using Soil Tests to Get the Picture

(*From page* 18)

agent in making recommendations to the farmer for the best treatment in the way of necessary plant food. The farmer himself getting tests made regularly of his entire tillable or pasture acres can have for himself a complete picture of his farm, because he receives a copy of his tests and can make reference to them from time to time. The tests also show that all the expenditure for fertilizer should not be made on any one or even two of the necessary plant foods, but that an even balance should be kept with nitrogen, phosphorus, and potash, keeping in mind what the tests show, what crop is being grown, and the history of the field. While phosphorus has received a great boost in the past few years, the need of potash should also be studied and maintained in any soil fertility program in Caledonia County.



Map of Caledonia County showing distribution of tests by towns.

TABLE SHOWING DISTRIBUTION OF SOIL TESTS BY THE VARIOUS ANALYSIS GROUPINGS

	Nitrogen						Phosphorus						Potash						
Towns	VH	H	MH	M	L	VL	VH	H	MH	M	L	VL	EH	VH	H	MH	M	L	VL
Barnet	2	2	6	13	16	15	..	1	6	20	21	10	2	3	3	5	7	22	14
Burke	2	4	14	20	14	19	..	1	4	29	36	5	..	2	9	2	14	41	11
Danville	2	2	7	14	12	25	..	1	6	28	23	6	1	4	..	3	9	40	11
Groton	2	4	3	11	8	8	3	3	5	7	16	1	2	2	2	4	8	18	2
Hardwick	4	4	3	4	17	25	..	2	3	26	35	2	..	..	..	3	2	46	3
Kirby	1	3	3	6	5	13	..	..	1	4	10	15	..	1	..	2	5	13	11
Lyndon	3	10	13	14	30	34	1	2	5	31	43	22	..	2	5	6	11	58	17
Newark	..	..	2	6	7	10	..	..	..	6	15	5	..	..	..	..	..	18	8
Peacham	1	4	8	17	11	20	1	..	4	25	22	1	..	..	3	5	8	37	6
Ryegate	1	5	12	17	14	35	1	..	5	29	40	7	..	3	6	4	9	43	19
St. Johnsbury	6	11	12	22	37	41	3	13	14	40	36	21	..	2	12	12	12	58	19
Sheffield	1	..	1	..	3	2	..	..	..	1	4	2	..	..	..	..	2	4	2
Stannard	..	3	4	4	5	12	..	3	2	6	16	4	..	..	..	7	5	15	4
Sutton	2	..	5	8	13	29	..	5	5	14	22	11	..	2	2	5	7	28	15
Walden	9	3	5	9	11	17	..	1	2	13	18	20	..	3	2	1	9	29	12
Waterford	2	6	4	5	9	14	..	..	1	11	13	5	..	2	1	..	10	16	7
Wheelock	..	1	3	4	2	1	..	..	..	5	7	..	..	..	1	..	6	6	..
Totals	38	62	105	174	214	320	9	32	63	295	377	137	5	26	46	59	124	492	161

NOTE: EH—Extra high. VH—Very high. H—High. MH—Medium high. M—Medium. L—Low. VL—Very low.

Fertilizer Developments in Mississippi

(*From page* 15)

by the Mississippi Experiment Station and are as follows:

600	pounds	of	a	4-8-8	gave	an	average	increase	of	749	pounds	of	seed	cotton
600	"	"	"	4-8-6	"	"	"	"	"	690	"	"	"	"
600	"	"	"	4-8-4	"	"	"	"	"	590	"	"	"	"
600	"	"	"	4-8-2	"	"	"	"	"	390	"	"	"	"
600	"	"	"	4-8-0	"	"	"	"	"	140	"	"	"	"
600	"	"	"	8-8-4	"	"	"	"	"	545	"	"	"	"
600	"	"	"	6-8-4	"	"	"	"	"	578	"	"	"	"
600	"	"	"	4-6-4	"	"	"	"	"	550	"	"	"	"
600	"	"	"	4-4-4	"	"	"	"	"	475	"	"	"	"
The average yield of unfertilized plots was 889 pounds of seed cotton														

During a part of the time rate tests were conducted on the same land and ran from 600 to as much as 2,400 pounds of a 4-8-4 mixture per acre, the results going to show that 600 pounds of a 4-8-8 gave as an average about as great an increase as any higher amount of a 4-8-4. During the same years similar tests were conducted on hill soils, but had to be changed several times, the results as a whole going to indicate that such hill lands respond best to higher percentages of nitrogen and lower percentages of potash than the bottom soils.

In connection with the above, it may be said that for some years after the establishment of experiment stations in the State it was believed and taught that because Mississippi soils generally contained a relatively high percentage of potash compared with phosphorus and nitrogen, as determined by chemical analyses, such soils did not need potash. As a matter of fact, many of the earlier field tests indicated that potash was not so necessary as nitrogen and phosphorus. But almost invariably when such tests were continued for a number of years on the same land, as at Holly Springs and Poplarville (with which the writer is most familiar), the need for all three of these plant foods has been apparent. Except on the alluvial soils of the Mississippi Delta, practically all the soil types of the State require all three plant foods in a fertilizer, and even these Delta soils along their eastern border, where affected by washings from the nearby hills, are showing the need for potash to control cotton rust, which is becoming so destructive to cotton yields on what is locally known as the foothills.

Nitrogen is the most seriously deficient plant food in Mississippi soils, taken as a whole, and our farmers are coming more and more to appreciate the importance of supplying at least a part of it with legumes. But these legumes, both summer and winter, seem to accomplish less good in the hills than in the Delta, apparently because they do not get sufficient minerals in the hills to meet their demands. Thus the Delta plants 2/3 of the winter legume acreage in the State, while occupying only about 1/6 of the land area. Too, such summer legumes as cowpeas and soybeans apparently increase soil fertility, as measured by succeeding crops of corn or cotton, much faster in the Delta than they do in the hills. The obvious conclusion is that these legumes should be given more liberal amounts of the mineral plant foods rather than continue to regard legumes of all kinds as soil-builders, never recognizing the fact that they only have the ability to supply their own nitrogen and are just as dependent on the soil for supplying the minerals as are the non-legumes.

The above has been conclusively demonstrated at Holly Springs, where for several years vetch and cotton have been grown on land liberally fertilized in the beginning with a complete mixture. This vetch came to grow so luxuriantly that in 1937 no nitrogen was added to the phosphorus and potash applied to the cotton, yet in some instances yields up to two bales per acre were obtained.

Rotations & Fertilizers for Bright Tobacco

(*From page* 10)

meeting annually to study their field results in fertilizer experiments with tobacco grown on different kinds of soil and to formulate fertilizer recommendations for this crop.

The recommendations which they have formulated and issued are based upon the best judgment of all these workers. The mixtures which they recommend it is believed are the ones which when used properly will give higher return per acre, especially when this treatment is linked up with proper selection of the soil and seed, proper cultivation, spacing of the plants in the row, and harvesting, curing, and grading the crop. It is fully realized that these better mixtures will usually cost more than an ordinary or special 3-8-3 mixture, because they will contain more plant food and 2 per cent each of chlorine and magnesia, and will be made of the best grade of materials. Where the acidity of the soil is low to fairly low, 3 per cent of chlorine may be used. About one-third of the nitrogen will be derived from high-grade organic materials and two-thirds from standard inorganic water-soluble materials, one-half of which is in the nitrate form. Wherever the recommended mixtures have been used by farmers, the returns have been found to be almost universally satisfactory.

It is remarkable that there are still some growers in the belt who will buy, year after year, low-grade fertilizers to use on their tobacco, an expensive crop to produce. Such growers, generally, are those who are content to receive low acreage returns. If they are to get the best returns for the money and effort which they put into the crop, they will have to use fertilizer mixtures which are better proportioned and compounded to fit the needs of the crop grown on their particular kind of soil.

It is a well-known fact that sandy and loamy soils of the Marlboro, Norfolk, and Craven series of the Coastal Plain section are the soils, other things being equal, that produce the best yields and quality of tobacco. These soils, and these alone, as far as practicable, should be devoted to the growth of this crop on each farm where they occur.

Fertilizer Recommendations

For tobacco grown on adapted soils, it is recommended for those which are of a heavy nature and are of the more productive character that 800 to 1,000 pounds per acre of a mixture containing 3 per cent nitrogen, 10 per cent available phosphoric acid, and 6 per cent potash be used in the drill before transplanting.

For the light and less productive soils, use 1,000 to 1,200 pounds of the same mixture per acre.

On sandy loams and fine sandy loams, underlain by sandy clay subsoils, it will not usually be necessary to use more than about 800 to 1,000 pounds per acre; but on sands and loamy sands, underlain by open sandy subsoils, it will generally be best to use about 1,000 to 1,200 pounds per acre applied in two applications, about 600 to 700 pounds in the drill before transplanting and the remainder of the application as a side-dressing after the plants have begun to grow well and just before a cultivation.

In many cases, it will pay in improved quality of the leaf to add as a side-application 60 to 120 pounds of potash as a supplement within three weeks after transplanting and just before a cultivation.

There are few, if any other, crops grown in the South that require the care in the selection of the fertilizer mixtures and analyses that tobacco does, and on which, when properly selected and used, fertilizers will give as great returns.

Green Pastures

(*From page* 13)

of rather uniform size in a rotation, putting one field in a permanent pasture necessitates changing the rotation or increasing the number of fields on the land kept in cultivation. If the rotation containing the annual pasture can be located on land near the permanent pasture, the fencing problem, a big one in the South, will be simplified. On a great many farms which have had some livestock other than milk cows and workstock and which have been managed with as little pasture as possible, increased acreage in pasture should be used first of all to increase the amount of available feed without any change in the number of kind of livestock kept. They will be better kept and thriftier.

On many farms, particularly those of the single one-crop areas, such as the Cotton Belt, the establishment of pastures will make it possible to keep a cow or two for milk and to cut down considerably on the feed purchased for the workstock. Providing pasture for the workstock on idle days and at night will greatly reduce the requirement for grain as well as hay. It is well not to increase the livestock kept until the pastures have been established. It is a good plan to start gradually and allow considerable margin in order to provide plenty of grazing and winter feed. As a rule, from 3 to 8 acres will be required to graze and produce winter feed for a cow and calf or equivalent in other farm animals, depending of course upon the location. In the case of farms with several tenants operating on a small scale, one or more large pastures on which their cows or herd furnishing all with milk and meat may graze is likely to be much more satisfactory and economical than having a separate pasture for each cow. Providing similarly for the mules or workstock should cut the annual cash outlay for feed fully one-third where all feed previously had been purchased.

On livestock farms where most of the land has been in harvested crops which have been used for fattening stock bought for fattening, the increased acreage of pasture should result in the keeping of more breeding stock or the purchase of stockers or feeders at an earlier age, which will necessitate feeding them longer and permit the use of more pasture and roughages in the process.

If a breeding herd is established it is important that the animals be well-bred, so that the calves may be sold as feeders or be successfully fattened at an early age and sold either as heavy veal or fat calves when weaned or a few months later. Creep feeding may be practiced on good pastures where a single location for shade, water, or both makes it certain that the calves will make use of the creep freely. Otherwise, if extra feeding is desired it is usually better to separate the calves and allow them to nurse twice daily.

In order to get the most from permanent pastures with hogs and sheep at least two pastures should be available so that they can be changed from one to another as desired. Annual pastures meet the need for clean pastures for hogs and sheep and should be provided to supplement permanent pastures.

Pasture Efficiency

There are a number of reasons for the remarkable efficiency of pasture in livestock production. One is that its cost of production is relatively low. Its natural enemies seem to be fewer than those of most cultivated crops. Another reason for its efficiency is that it is harvested by the animals themselves. A third is its high nutritive value. The dry matter of grasses before they are mature has properties very similar to high-protein concentrates. Analyses of a large number of grasses we have made at intervals of 2 to 6 weeks from May until September showed a crude protein content for the dry matter of about 17½ per cent on the average. This is nearly double that of ear corn and slightly higher than that of wheat bran or middlings. The crude fiber content (25.6 per cent) is higher than in most concentrates, but digestion experiments which have been made show that the fiber of immature grass is as digestible as its other nutrients and as the nutrients of concentrates in general. It is only after the toughening of grass begins (a process known as lignification), which happens about the flowering stage, that the crude fiber of pasturage becomes difficult to digest and hinders the digestion of the other nutrients.

Not only is grass high in feeding efficiency, but it yields a high-quality product. Repeated experiments at the Mississippi, Purdue, and other experiment stations showed that lambs produced on good pasture alone are equal in quality to those grown on grass with a liberal supplement of grain feed, and that the cost of production was considerably less. Another remarkable property of fresh pasture is its high mineral content, which renders it especially valuable for growing animals and for females giving milk. The dry matter of immature grass contains practically four times as much mineral as the average cereal grain and as much as the average legume hay.

Harvested feeds cannot, of course, be eliminated from the livestock ration, but there are many indications that our livestock operations in the future will depend more and more upon pasture and other forage crops. We repeat again as we have for many years that animals should be and are in a few instances being bred for their capacity to produce efficiently with a minimum of concentrated feeds: pasture rotation systems and means of supplementing permanent or annual pasture with temporary pastures and hay crops will come into more common use. The efficiency of winter grazing crops in the South for maintaining beef cattle has been demonstrated experimentally by a number of the state experiment stations. From the evidence thus far obtained we feel safe in saying that as time goes on annual pastures for fall and winter use will become more general for young and growing animals, those producing milk and for those doing work, as well as for fattening animals.

Increased use of pasture not only results in a more economic system of production but pastures increase health and thrift. Rotation on clean pastures means fewer parasites and lower mortality. This applies not only to swine but to all classes of livestock in all sections of the country. Land in crops erodes much more rapidly than land seeded to pasture. Land in corn erodes in 1 year as much as the same land in a well-sodded pasture would erode in 500 years. For all practical purposes, a good sod is permanent if the fertility is maintained by replacing those elements carried away in the carcasses of the livestock and if it is not improperly grazed, due in part, no doubt, to a rather general notion that pasture land will pretty well take care of itself. There is a surprising number of different ways to manage livestock on pasture, both permanent and annual pasture, as well as cut-over land ranges. Such pastures can stand greater abuses and yet yield fair returns.

Ewes and lambs grazing in a field of permanent pasture.

The following points, if generally observed, will repay the stockman:

1. Give the grass a chance to get a good start in the early spring before the stock are turned on. Without top growth, the grass cannot grow strong roots.

2. Do not overgraze. Overgrazing leaves unpalatable plants to crowd out the palatable ones. Overgrazing aids erosion.

3. Do not undergraze. Pasturage allowed to mature becomes less palatable, is about half as rich in protein, or less, and the digestibility is greatly reduced.

4. Fertilize pastures at least enough to replace the elements lost each year by grazing. Animals on good pasture graze only about one-third of the time, and therefore but about one-third of the manure produced is put back where it came from. Accordingly it is generally estimated that if about one-third of the plants in a pasture are legumes the nitrogen content of the soil will be maintained automatically. If the pasture is producing 100 pounds of beef per acre annually it will be necessary to apply once every 5 to 10 years 275 pounds of super-phosphate and 250 pounds of muriate of potash. At current prices this fertilizing would necessitate a cash outlay of something like $1.50 an acre, in addition to the labor cost of hauling and applying. When also necessary to purchase nitrogen the cost would be increased by about $2.40.

5. Supply elements which may be naturally deficient in the soil, for the purpose of maintaining balanced animal nutrition. In certain regions the soil is deficient in such essential min-

erals as calcium, phosphorus, and possibly iron and copper.

6. Provide fresh clean water, shade, and salt in all pastures. Satisfactory performance by livestock cannot be secured without these accessories, which are generally inexpensive but too often neglected.

7. Avoid bloating by turning cattle or sheep in when they are full of feed and when the grass is dry, and by keeping them there day and night thereafter. They should have access to good hay or straw, a continuous supply of water, and a good mineral mixture.

8. Eradicate poisonous weeds in some areas. They are most apt to be dangerous when other feed is scarce.

9. Kill weeds by close clipping at the beginning of the blooming period.

10. Kill brush by grubbing late in the summer while the sap is still up and before food is stored in the roots to provide for growth the following spring.

11. Supplement or rest pastures during periods of drought and other times of little or no growth. Where it is not practicable to turn livestock on other permanent pastures reserved or temporary pastures grown for such occasions, use such supplements as hay, silage, or soiling crops.

12. Consult your county agricultural agent or your state agricultural experiment station in order to ascertain methods best adapted to your locality and what portions of your farm you could most profitably devote to either annual or perennial pasture crops.

What's Wrong With Your Alfalfa Crop?

(*From page* 22)

is a common mistake. Superphosphate, possibly up to a ton with manure, seems a good investment. But the unpardonable sin committed against this valuable crop, restricting its greater usefulness, is to starve it—possibly for potash if not well-supplied by the soil—and further to emaciate it through greed of over-cutting and at the wrong periods.

An example of how alfalfa may be grown in Massachusetts was observed at the farm of the Welch Brothers, Worcester County, in June. Three excellent fields had been well-limed, with heavy manure and generous superphosphate added prior to seeding. They have been top-dressed liberally each year with potash, superphosphate, and lime, cut twice, and lightly grazed. The solid alfalfa, slightly lodged, measured by rule 4 feet 10 inches high, *and the stand was* 8 *years old.*

Rapid Chemical Tests Show Soil Needs

(*From page* 8)

with the experiment station agronomists of the district, to eliminate small differences in analyses and to keep the number of different analyses to the minimum necessary to satisfy the requirements of the various crops grown under the many different soil and climatic conditions found in Indiana.

Suggestions for limestone applications similar to those already discussed for fertilizers are given in Table 2. Since the recommendations for any one crop are based entirely on pH values, they apply only to average soil conditions. Soils of different types may have different lime requirements and

The corn on the left was fertilized with nitrogen and phosphorus but received no potash, that on the right received nitrogen and potash but no phosphorus.

respond differently to applications of limestone. Soils high in organic matter need lime less than do light colored soils of the same pH and clay soils, less than sandy soils. However, the amount of limestone required to correct the acidity of light colored, sandy soils is less than that required for darker colored or clay soils of the same pH.

As a supplement to the suggested lime recommendations a printed sheet indicating the relative acidity tolerance of a number of crops has been prepared. This information is shown in Table 3. The pH values which characterize each group are looked upon as the minimum values that can be depended on as satisfactory for all soil and climatic conditions. Under

TABLE 2. SUGGESTED LIME APPLICATIONS PER ACRE FOR SOILS OF DIFFERENT pH TESTS

Rotation of crops with legumes is essential to good yields, and the rate of liming depends largely on the legume crops to be used. Soils that test acid on the surface, but have sweet subsoil within 2 feet, require less lime than those with deeper acid subsoils. Drilling 300 to 500 pounds of ground limestone with the legume seed is often successful on soils where 1 to 2-ton broadcast applications are indicated. Soils that are dark colored, or that have been heavily manured, or which test high in phosphorus and potash, need less lime than soils of similar pH testing low in plant foods. Phosphate is more efficient in the soil at pH 6.2 to pH 6.8 than at lower or higher pH.

	Systems with Different Crops in Rotation								
Soil pH Tests	Alfalfa or Sweet Clover Tons	Red Clover Tons	Timothy Tons	Soy-beans Tons	Lespedeza or Red Top Tons	Corn and Oats Tons	Potatoes and onions on muck Tons	Garden Crops Tons	Lawns Tons
3.8—4.2	8	6	5	4	3	4	8	6	4
4.2—4.6	6	5	4	3	2	3	4	5	3
4.6—5.0	5	4	3	2	1	2	0	4	2
5.0—5.4	4	3	2	1	0	1	0	3	1
5.4—5.8	3	2	1	0	0	0	0	2	0
5.8—6.2	2	1	0	0	0	0	0	1	0
6.2—6.4	1	0	0	0	0	0	0 500℔ Sulfur	0	0
6.4—7.0	0	0	0	0	0	0	0 1,000℔ Sulfur	0	0
7.0—7.4	0	0	0	0	0	0	0 2,000℔ Sulfur	0 1,000℔ Sulfur	0 1,000℔ Sulfur

Sulphur makes soil more acid and neutralizes excess lime which is undesirable in some cases. Eight hundred pounds of sulphur will neutralize one ton of limestone.

particularly favorable conditions satisfactory crop production often can be obtained on soils having pH values considerably below those indicated in this table. Abundant supplies of organic matter and available plant nutrients are particularly effective in producing such conditions.

Considerable information regarding the reaction (pH) and "available" phosphorus and potash supplies in Indiana soils and also regarding the influence of fertilizer applications on these factors has been obtained through the use of rapid chemical tests in the Soils Laboratory. This applies both to general farming and to the permanent fertility experimental plats operated by the Agronomy Department at various locations throughout the State.

Data given in Table 4 indicate that for the permanent fertility plats there are no significant differences in "available" phosphorus and potash supplies between the untreated and fertilized plats, in most cases. The "available" phosphorus and potash contents of the soils have remained approximately the same regardless of treatment, the amounts of these elements added from year to year on the fertilized plats appearing to have been either removed in the harvested crops or fixed in the soil in a form no longer available to plants. A similar finding as a result of soil tests using the Neubauer method has been reported previously by the author (5).

While such results seemed surprising at first, a more careful analysis of the situation showed that these results were to be expected in view of the small amounts of fertilizers used on these permanent fertility plats. Calculations of the probable removals of plant nutrients by the crops show that in many cases the increased yields due to fertilizer additions account for the removal of larger quantities of phosphorus and potash than have been added in the fertilizers used. Under

TABLE 3. RELATIVE TOLERANCE OF LEGUMES AND OTHER CROPS TO SOIL ACIDITY

No exact pH can be given for any crop. Some crops will grow on acid soils and yet respond to lime. Acid-tolerant crops like lespedeza may do better on limed land, but not compete with rank-growing, lime-loving crops on sweet soil. The supply of plant food and organic matter in the soil has a marked influence on the need for lime.

Greatest Tolerance	Legumes	Field Crops	Truck Crops	Weeds
pH 4.0 to 4.8 and above Very strongly acid	Japanese Lespedeza Korean Lespedeza Sericea Hop clover	Red Top Buckwheat Rye	Huckleberries Dewberries Blackberries Strawberries	Dewberries Broom sedge Red sorrel Wild garlic Cinquefoil
pH 4.3 to 5.4 and above Strongly acid	Vetches Soybeans Yellow trefoil Cow peas	Millett Oats Sudan grass Sorghum Tobacco Broom corn	Black raspberries Potatoes (Irish) Potatoes (Sweet) Onions on muck Watermelons Tomatoes	Bracted plantain Ox-eye Daisy Chicory White Top Curled dock Wild carrot
pH 5.4 to 6.0 and above Medium acid	Crimson clover White clover Alsike clover Beans	Corn Wheat Timothy Canada blue grass Kentucky blue grass	Red raspberries Sweet corn Beans Radishes Turnips	Buckhorn Winter cress Crab grass Canada thistle Quack grass Wild mustard
pH 6.0 to 6.6 and above Slightly acid	Red clover Mammoth clover Canada field peas	Barley Rape Mint Sugar beets	Onions on loam Carrots Cantaloupes Beets, peas Lettuce	Common plantain Smart weed Artichoke Jimson weed Dandelion
pH 6.6 to 8.2 Neutral to alkaline	Alfalfa Sweet clover		Spinach Cabbage Cauliflower Celery	

TABLE 4. SUMMARY OF TEST VALUES FOR PLANTS OF PERMANENT FERTILITY EXPERIMENTS IN INDIANA

Location	Soil	Phosphorus: O * Plats	Phosphorus: M * Plats	Phosphorus: P * Plats	Phosphorus: M+ P * Plats	Potassium: O * Plats	Potassium: M * Plats	Potassium: K * Plats	Potassium: (M) +P * Plats
Bedford [1]	Bedford	L—	L—	L—	L—	M+	H—	H—	H—
Bedford [2]	Bedford	VL	VL	L—	L—	M—	M	M+	..
Culver [1]	Plainfield	M+	M+	H—	H	L—	L—	L	L+
Farmland [1]	Brookston-Crosby	VL	VL	L	L	M—	M	M	..
Huntington [1]	Brookston-Crosby	L—	L—	L+	L	M—	M	M—	..
Jennings County [1]	Clermont	L—	L—	L—	L—	L	L+	L	L+
Wanatah [1]	Newton	L	L	L+	L+	L	L+	L+	M—
Lafayette [3]	Brookston-Crosby	L	L+	L+	L+	L	M+	L	M+
Lafayette [1]	Brookston-Crosby	VL	VL	L—	L	L—	L	L—	L+
Lafayette [2]	Brookston-Crosby	VL	VL	L	L	L—	L	VL	..

* O=no fertilizer or manure; P=phosphate fertilizer; M=manure; K=potash fertilizer.
[1] Fertility series. [2] Phosphate series. [3] Grain vs. Livestock series.

such conditions it should not be expected that higher test values will be obtained for the fertilized plats.

Data summarizing the results for nearly 5,000 soil samples tested in the Soils Laboratory for farmers during the past several years are given in Table 5. These samples represent all sections of the State. Because of the large number of samples involved it is believed that the results portray, quite accurately, the conditions existing in the State as a whole.

The data given in Table 5 indicate that slightly more than 69 per cent of all soils tested are definitely deficient in "available" phosphorus and that slightly more than 68 per cent are definitely deficient in "available" potash. For reaction (pH), the data show that the greater proportion of Indiana soils are either strongly to moderately acid (pH 5.9 or below) or slightly acid (pH 6.0 to 6.9), with only a relatively small number of soils found in the neutral to slightly alkaline group (pH 7.0 or above). Since experience has shown that soils in the strongly to moderately acid group are too acid for the most profitable crop production in most systems of farming, it will be seen that the data indicate a definite need for liming for almost one-half of the soils tested. An appreciable proportion of the soils in the slightly acid group require additional lime for the most satisfactory production of alfalfa and sweet clover. Thus it may be estimated that in the neighborhood of three-fourths of all

TABLE 5. SUMMARY OF RESULTS OF RAPID CHEMICAL SOIL TESTS MADE DURING 1934, 1935, 1936 AND 1937

Soil Test	Phosphorus: Number	Phosphorus: % of total	Potassium: Number	Potassium: % of total	Reaction (pH): Number	Reaction (pH): % of total	Interpretation
Low	3,264	69.2	3,215	68.3	2,120[1]	45.0[1]	Deficient for all crops
Medium	620	13.2	579	12.2	2,015[2]	42.7[2]	Doubtful
High	828	17.6	918	19.5	577[3]	12.3[3]	Not deficient for most crops
Total	4,712	100	4,712	100	4,712	100	

Mucks, peats and lawn and garden soils not included.
[1] pH 5.9 or below—strongly to moderately acid.
[2] pH 6.0 to 6.9—slightly acid.
[3] pH 7.0 or above—slightly alkaline (calcareous).

Indiana soils are more or less in need of liming.

The extensive use of rapid chemical soil tests in Indiana is exerting a significant and important influence on lime and fertilizer recommendations and use. Chief among such influences are the tendencies toward the recommendation and use of larger applications of limestone, the recommendation of some fertilizer for a larger proportion of all soils and crops, and the use of a higher proportion of potash to phosphorus, particularly for corn and legumes. Thus the analysis most commonly recommended for corn and alfalfa at the present time is 0-12-12 or 0-20-20 instead of 0-14-7, and in many instances 3-12-12 is replacing the 2-12-6 formerly recommended for tomatoes. Reference to Table 1, will show that these are the analyses suggested for corn, alfalfa, and tomatoes on soils testing low or very low in both phosphorus and potassium, the condition most often found when Indiana soils are tested. In actual practice it is being found that the use of the analyses suggested in this table is simplifying the problem of fertilizer recommendations, tending to reduce the number of analyses used in the State and contributing to better fertilizer practices.

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Is Individualism Out?

(From page 5)

of better raw material delivered to the intakes by a universal plan of premium payments for uniform quality, certain "missionaries" went rampant and mobbed the legislature. The results were new laws which have not brought anticipated results. Meanwhile, without recourse to laws or ballyhoo, California citrus growers got busy and put orange juice into almost every milk bottle in that same old commonwealth of dairy hysteria!

At another time, in trying to wiggle out of a way to stir up individual action for improvement in production and home marketing, a movement in dairyland called for a special commission to investigate on cooperative methods in New Zealand, hoping to have these astute men bring back a cure-all for domestic discord. Finally their commission returned and presented their bills and a few bulletins. The home dairymen merely found out that the New Zealand farmers had their backs to the economic wall and were all of one racial stock, so they *had* to cooperate and regulate; whereas in the good old home State we had 13 or more breeds of farmers and so many violently competitive milk depots that strict regulation for quality was defeated. There is no magic in imported ideas!

And when it comes to the national farm forum in congress, it is often hard to tell which lobby is for farmers and which is for framers. The funny side of it is that we plead for a national objective and a countrywide viewpoint in agriculture, and then elect Congressmen on purely local prejudice planks. No wonder the busy-body lobbies enjoy a field day at the expense of the individuals supposed to be represented there!

However, let's be positive—let's turn to the brighter side, let's sound the plea for strong and purposeful individuality once more in farming! Just as thinking starts with the individual brain, so does all progress reflect the meeting of individual needs. There is little we have in farm life which hasn't happened to us because somebody did some good, hard, old-fashioned thinking about the needs of his own neighborhood.

MY OWN conception of true liberalism is liberalism of the mind to grasp essential needs and to inspire the folks with talent and power to supply them, if we lack that particular ability ourselves. Nursing ancient grudges and fomenting bitter prejudices is far from liberalism, and it surely is not liberty, but license.

In these days it is so easy to copy what some other branch of industrial society does rather than to exercise agricultural ingenuity to devise a better way to make farming fit a changed order. My hunch is that agriculture was here first and ought to have independence enough to give full play to individualism which invents rather than imitates. We may have to drift along awhile the easy way, but let's not bog down!

Now if we hastily scan a survey of agricultural achievement we find the full effects of strong individualism in four classes of effort; and we also find that cooperative and group action has been based on trails broken by individualism.

I mean by this that individual initiative and personal achievement have been triumphant in all cases, whether through movements financed privately, by those financed with public funds, or those financed and supported by agricultural cooperatives.

RUN through this small roster of renown with me and see if individualism privately financed has not turned some deep furrows for agriculture.

In the cradle of farm progress abroad several names appear, such as Sir John Lawes, noted soil experimenter; Jethro Tull, who studied "horse-hoeing husbandry"; and those early beef cattle breeders, Cobban, Bates, and Cruickshank. We must not forget Louis Pasteur, noted French scientist. Over on this side we find Benjamin Franklin, fertilizer tester; Eli Whitney, inventor of the cotton gin; Jethro Wood of the first iron plow; and later the western immigrant, John Deere of Illinois, and his first steel plow. Down in Virginia in a shack among the meadows, Cyrus H. McCormick fought out alone the great problem of the reaper. A German settler named Wendelein Grimm developed the hardiest variety of alfalfa for the northwest prairies. David Fife of Ontario patiently worked with increase plots of wheat until he developed the strain which bears his name.

Similarly, in the Midwest we had James Reid and J. S. Leaming, each independently trying to breed a higher yielding and more uniform corn. Up in southern Wisconsin a hard-working farm boy dreamed of releasing men from stooping to tie grain into bundles, and the result after years of study was the modern knotter bill and hook, invented by John Appleby. Peter Henderson of New York was another dreamer who left the horticultural world in his debt.

F. Lothrop Ames of Massachusetts forgot his wealth in a lifelong search for finer-bred Guernsey cattle. David Lubin wasn't afraid of individualism, and he brought forth the international institute of agriculture which became established at Rome. Luther Burbank bowed to no man in the plant "realm," and his discoveries netted the fruit and flower world many fortunes. Boyce Thompson's wonder laboratory of vegetative study opens new vistas.

Look next into individualism which sharpened its wits under the wings of public institutions. Here the list is so formidable and exhaustive that several books the size of ours would hardly make a beginning. I refer you for instance to the two superb volumes on superior plant and animal germ plasm, compiled by the U. S. Department of Agriculture. The roll of distinguished and disinterested contributors to agricultural progress found in our State experiment stations is the Legion of Honor of America.

LIKEWISE with the 4-H and Future Farmer juvenile movements and the extension service, we find in a moment that somebody working somewhere in an individual way laid those firm foundations. And the carrying out and the expansion of these splendid forward movements again reflect the same unbeatable combination of inspiration and individualism.

What good would it do to appropriate public money to advance the welfare of agriculture and deposit it in a corner-stone at dedication time? In other words, we do not invest public money unless we first rely upon private brains! Private brains, of course with a social leaning!

Then once more we mention government service in drafting laws and regulations deemed best suited to the times and needs of individual farmers as a whole. Here again the bulk of the tough spade work is left to the leaders, and such men as Henry Wallace, M. L. Wilson, and Marvin Jones —and numerous silent workers—devote the best that is in them for the cause.

FINALLY, turning to the great cooperative ranks, of which our agrarian States are honestly proud, it is personal valor and long working hours, plus ingenious thinking, which supply the mainspring of their success. They simply won't run themselves. G. Harold Powell, Charles Teague, Samuel Sanders, and Judges Bingham of Kentucky and Miller of New York are outstanding examples of that sterling devotion to individualism which makes cooperatives lasting. And this is a kind of individualism that works well in harness, and which knows that team work and grand-stand play are two different things!

I think that agriculture will not relinquish its slow but sure advance to newer social goals or be sidetracked by glittering generalities. Its assets are just the same as ever supported and exhalted by superb individualism. It represents the last of the complete crafts, where each man must know and be prepared to do all there is to do. It communes with natural forces and rises with new courage after a season's brief defeat. It possesses an army of well-trained and ambitious youth, mostly headed wholesomely in the right direction. It depends on friendly human relationships in pleasure and in trade, and the warp and woof of its cooperative power lies, as always, in the will and the welfare of the individual farmer.

When we have lost our rural individualism, and not until then, may we say there is no hope in green pastures!

GENEROUS!

"Look what the Lawd's done fo' you all, bredren!" shouted the parson. "Give Him a tenth. A tenth belongs to de Lawd!"

"Amen!" yelled a perspiring member of the congregation, overcome by emotion. "Glory to de Lawd, give Him mo'—give Him a twentieth!"

Dad: "I'll teach you to make love to my daughter, young man."

Suitor: "I wish you would. I don't seem to be doing so well."

He: "I suppose you dance."

She: "Oh yes, I love to."

He: "Great. That's better'n dancing."

FOR EXAMPLE

Two colored men were discussing things in general. One was telling how he'd just got a job as a Pullman porter and that his conductor had told him he must treat the passengers with tact.

"What am dis here tact stuff?" he asked.

"Let me enlighten yore intelleck, brothah," said the other and wiser darkie. "Once ah was workin' up at de Waldawf hotel. One day ah was cleanin' up and happens to open a bathroom door and dere was a lady sittin' in de tub.

"Ah shuts de door quick and ah says 'Beg yo' pahdon, suh!

"Well, dat 'beg yo' pahdon' was jes plain politeness, but de 'suh'—dat was *tact.*"

Edison, with all his inventions, was a piker compared to the ambitious young photographer who advertised: "Your baby, if you have one, can be enlarged, tinted, and framed for \$8.79."

About the busiest thing in the world is a hen scratching for one chick. We must give the hen credit for not letting up on her energy because the chick crop was not what she expected.

NO MISTAKE

Jimmy: "What's that book?"

Elsie: "It's entitled 'What Twenty Million Women Want'."

Jimmy: "Yeah? Let's see if they spelled my name right."

An intelligent girl is one who knows how to refuse a kiss without being deprived of it.

When the conductor came around, the mother said, "One fare for me and a half fare for the boy."

The conductor looked critically at the lad and replied, "But, lady, he has on long pants."

"If that's the way you figure," she answered, "full fare for the boy and half fare for me."

MASQUERADE

The guests at a recent ball were supposed to represent insects. A meek little man who arrived in his everyday clothes and without any disguise explained falteringly that it was his wife's idea.

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Editorial Office: Investment Bldg., Washington, D. C.

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American Potash Institute, Inc.

Investment Building, Washington, D. C.

J. W. TURRENTINE, *President and Treasurer*

G. J. CALLISTER, *Vice-President and Secretary*

"Son, when I was a boy, the fish in that stream . . ."

Better Crops with PLANT FOOD

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For men only, an essay—

On Being Domestic

Jeff McDermid

WHILE my wife prepares me a thumping big dinner let me suggest that every man ought to take a course in being useful around the home. Requirements in a liberal arts college should include a semester with the stewardess and a seminar in sewing. There is nothing which will give a man more fortitude than a work-out with the wringer or a wrestle with the range; and moreover, it should give him the practical background he sorely needs when the feminine members of the family brow beat and belittle him.

There are two kinds of husbands. One tribe boasts it can do a "brigand breakfast" over a woods fire and produce fish or fowl fit for a gourmet, even when the matches are wet and the water is dry. The other bunch of boobies don't know a dish-rag from a mop and use the same suds water for lingerie and overalls, and when they sew on a button it is done with dental floss and a darning needle.

Usually those proud outdoor home-ec exponents cease their labors when the fishing trip is over, and simply use their alleged prowess to entertain company, while the women scare up the sustenance. I am not so sure you can do much with these artful dodgers in anybody's finishing school of domesticity. They are posers and quitters. Some say they are just naturally he-men and need the tang of the primeval forest or some ants in the gravy to get them in fettle for culinary endeavor. Personally I do not know which class to pity the least—the hubbies who could if they would or the others like myself, who would if they could. I presume that we should save all our commiseration, however, for their household victims in either case.

In early days pioneer husbands expected their wives to take over the greasy skillet where they dropped it and do the best they could with homespun makeshifts. That's mainly what they got married for in the first place. It was of course more reasonable and logical then, because there were not so many bridge parties and federated club wind-bag lecture courses to distract the domestic proclivities of the capable brides. There were not so many brush salesmen and vacuum cleaner demonstrators poking about on wash day, and a fellow could be pretty sure that the women were not on a sit-down strike listening to the serial story on the radio when the stew-pot should be simmering and the diapers drying.

OUR self-reliant foredads had no use for home demonstration agents, mechanical batter mixers, or powder puffs and stools in the kitchen. That's why all our grandmaws in those gilt-edged tintypes look so resigned and shiny-nosed. It's also explanatory why our prehistoric wedding pictures show the man seated comfortably while his wife stands up with a hand resting on his nigh shoulder blade. She's getting used to leaning on him to rest her legs (limbs) after doing 52 washings and ironings and 1,095 husky meals during her first year of married marathons—not counting a set of twins brought by a country doctor who called himself the "great deliverer," with no credit to the mother.

Modern men on the contrary need to know their way around the household far more than they are required to understand reciprocal trade agreements, the pros and cons of bigger navies, or what's wrong with the "groaned old party."

I know world-wise gents who let their wives press their pants because they can't unravel one of those trick ironing boards. I confess it is no easy task at that, being as finicky as teaching a calf to drink; and after attempting it a few times I signed up with the demon holding company for one of their electric contraptions to surprise my wife, of whom I am inordinately fond. All you have to do now is press a switch and it takes the tail right off your shirt.

WITH the women of this era launching boldly into all the sacred haunts of men and depriving heads of families of their lunch money, I see no hope for the masculine gender in a few more years. What boils me up is the crass indifference of the majority of our men to their impending doom. They still imagine themselves as acting the roles of their noble sires who went forth each morning with their bellies full of buckwheat cakes, armed with an axe and a shotgun, ready for trees or Injuns. Yet all our modern freeholders have to show that they are providers is a leather brief-case, and even the women tote hand-bags, so then what?

Sometimes I am slightly encouraged by the turn of the tide. I see that our own State university has four men students enrolled in domestic science out of about five thousand others marching to their downfall. I have a neighbor whose boy won a big prize in a cheese menu contest, but I shall warn him that cheese alone is constipating, and that he should broaden out. I know one farmer hereabouts who gave up showing cattle in disgust at the environment, and decided to adopt tastier tasks—so now he is showing off at our county fair with angel food cake and hooked rugs. He has nothing the matter whatever with his endocrine glands or his harmonic harmones, and I admire his skill even if the women claim he is an all-fired old nuisance. It just goes to show, that's all—some evidence of the rising renaissance to emancipate enslaved masculinity.

Women became emancipated some time ago, at least before *we* were wed.

These blabby photo mags of today show them in every conceivable, daring occupation in the realm of steeple chasing, shes on skis, and airplane stunting. Meanwhile you have to look long and fruitlessly to find a photo of our men folks excelling in the now neglected domestic arts.

TO be sure there are "Oscars" and other notable chefs whose soups and salads have tickled the salivary glands of generations, but I dare say any of those kitchen kings wouldn't fry an egg in their own homes. There'd be nobody on hand to tip or applaud them.

I have pondered on ways to encourage male domestic labor after the fashion of today's campaigns. I rejected the first hunch—to hold a culinary and home renovation contest—as being conducive to neighborhood jealousies with a depressing effect on the winners. My other idea was to nationalize a Men at Home Week with blurbs sponsored by salad dressing and kitchen kleener concerns. I copied that one from a farm paper, whose recent wash day for men campaign spurred the sale of motor sloshing machines beyond all expectations. But the trouble with all these artificial efforts is that women simply take advantage of the situation before the men really learn the ropes, and we end up in the same old stagnation.

BY the way, that farm paper I mentioned neglected its best opportunity to cut the crop surplus when they failed to get the women to exchange jobs with the men. It would have done more than Pope or McGill combined, and with Cotton Ed Smith thrown in, to ease the food flow and raise the prices. If persisted in for a summer the men would have prepared such miserable meals that the women couldn't have driven the cultivators or mowed the hay. And above all, it would have been perfectly constitutional!

If everybody's mother had the asthma or the neuritis, maybe more boys would become adepts at interior technic. My own early experiences in the labor of the home arose from maternal asthma, now called by the high-toned name, "allergy." Any kind of flour or baking powder dust bothered her, and hence my unwilling services were put to some use. I learned how to mix a lumpy mess of salt-rising bread and could do a Johnnie cake in a jiffy; yet the family all lived to quite an advanced age.

Old skills return occasionally when wife is absent or the girls rebel; but we have one convenience now that tempts me from my labors—the desk telephone. When I was a kid we either messed around the kitchen ourselves or starved.

But all this baking business stood by me well when I took up a claim in

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When, How, and Why Fertilize Your Lawn

By Howard B. Sprague

Agronomist, Agricultural Experiment Station, New Brunswick, New Jersey

THERE are literally millions of home owners in humid regions of this country who struggle unsuccessfully each year with the problem of producing a creditable lawn. They begin the season with high hopes, engendered by enthusiastic claims made by vendors of seed, fertilizers, and other materials, and by the natural urge that creeps into the veins of every individual when spring arrives. By midsummer the home gardener has all too frequently given up the struggle to crab grass, drought, disease, or other ills afflicting lawns. The regrettable part of this situation is that most of the disappointment, the waste of effort, and useless expense could be avoided by a better understanding of the requirements for growth of lawns.

This widespread failure on lawns may seem of small consequence to growers and dealers in agricultural supplies. To the individual home owner, however, the distress is just as great when the front lawn sickens and dies, as is the grief of the farmer when the crop on the east 40 fails. Moreover, in the aggregate, home owners represent an appreciable investment in supplies. For example, in the small State of New Jersey, there are approximately 500,000 home lawns of all sizes, in addition to a considerable acreage of grass in the public parks systems, on athletic fields, along highways, in cemeteries, and on the 150 golf courses of the State.

It is safe to say that the annual cost of materials used on turfed areas in the State is in excess of $5,000,000 annually, a large portion of which represents purchase of plant food in one form or another. The average home gardener has far less opportunity than the farmer to acquaint himself with the requirements for growing grass successfully, and consequently must lean very heavily on the advice of those furnishing his supplies.

Soil and Climate

Although the plant-food requirements of lawn grasses are relatively simple, they are in many respects unlike those of trees, shrubs, and flowers. The native vegetation of humid regions is composed largely of trees, and the soils and climate are suited to such plants. The natural grasslands of the prairie country are neutral to alkaline in reaction, deep and well aerated, rich in organic matter and available nutrients. By contrast, our humid eastern soils are rather strongly acid, relatively shallow and compact, and low in organic matter and nutrients. In addition, many home lawns are built not on true soil, but on excavated material deposited at the surface during construction.

One of the first essentials in feeding lawns is to provide adequate drainage, both at the surface and through the soil mass. Reasonably satisfactory aeration in the upper few inches of soil is necessary, and this can be assured by incorporation of a suitable type of organic matter. On lawns already established upon soils of inferior quality, semi-annual top-dressings with loamy soil will gradually correct this defect.

Nitrogen is unquestionably the most important element required by grasses. However, the mere application of nitrogen fertilizers may harm rather than aid the turf, unless the proper supplements are provided. The most essential of these supplements are lime, phosphates, and potash. Contrary to a firmly entrenched prejudice, all lawn grasses make more thrifty and durable growth on soils properly limed, than on strongly acid soils. Careful experiments have shown that even the bent grasses, long supposed to be acid loving, are unable to effectively utilize nitrogen in the form of ammonia compounds under acid conditions. Thus, in one carefully controlled test, the introduction of additional sulfate of ammonia to a well-balanced nutrient solution with strong acidity (pH 4.5) reduced growth nearly one-half; while the addition of an equal amount of nitrate of soda increased yields 20 per cent. When the acidity of the nutrient solution was corrected, sulfate of ammonia had no such harmful effect, and was fully satisfactory as a source of nitrogen.

Correct Acidity

The significance of this principle lies in the fact that a great majority of lawn soils are strongly acid, and that a large percentage of commercial fertilizers supply nitrogen in the form of ammonia compounds. In using such fertilizers, it is necessary to correct any excessive acidity well in advance, by the application of lime. In general, 50 pounds of hydrated lime or 75 pounds of finely ground limestone per 1,000 square feet, will usually prove adequate for a 2-year period. Moderate to strongly acid soils (pH below 5.5) are less satisfactory for grasses than mildly acid to neutral soils, due to the tendency of the former to produce a sod-bound condition. Acid soils are likewise less permeable to water, and thus greatly exaggerate the effects of droughts.

Too little attention has been paid to proper balancing of nitrogen with

A good lawn provides an appropriate setting for shrubs and flowers.

This bent grass lawn responded to good treatment and produced a beautiful green sward.

duced without corresponding improvement in the quality of sod left below the cutting level. The following table illustrates this point.

The soil on which the above tests were conducted was relatively fertile; even more striking results may be expected on poorer soils.

Fortunately for all concerned, it has been shown rather clearly that plant nutrients supplied in *soluble* commercial fertilizers are entirely satisfactory for turf culture under most conditions. Reliance on such *slowly available materials* as bone meal, tankage, dried manure, etc., is one of the chief reasons for the astounding vigor shown by crab grass and summer weeds. Such organic fertilizers release plant nutrients during the hot moist periods of summer when crab grass thrives, rather than in the spring and fall months during which the permanent turf plants derive most benefit from fertilizer applications.

phosphates and potash. Since nitrogen fertilizers give the most spectacular response, it has been assumed that these other elements were unnecessary. Soils well supplied with phosphates and potash, on which the use of such minerals will show little response, are exceedingly rare on home lawns and similar turfed areas. Even pasture sods, developed on true soils rather than excavated material, generally display a great lack of minerals. In 1936, a group of 26 pasture tests located on a wide range of soils, averaged little more than half as much growth from use of nitrogen fertilizers as from nitrogen supplemented with phosphate and potash. The use of complete fertilizers is important from the standpoint of the effect on type of growth produced. Nitrogen fertilizers alone tend to stimulate top growth at the expense of the density of the turf. Large amounts of clippings are pro-

Treatment	Amount of clippings	Amount of tops below clipping level
No fertilizer	100%	100%
Nitrate of soda	151%	109%
Nitrate, phosphate, and potash	164%	137%

Lawns become green considerably earlier in spring and remain luxuriant for a longer period in fall with soluble commercial fertilizers than with organic materials. By applying soluble fertilizers in very early spring, and again in early autumn when summer weeds are disappearing, the desired turf grasses can be strengthened without danger of stimulating the summer pests. This type of fertilization, together with the adoption of a proper

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Out of the Wealth Of Our Soils

By C. J. Chapman

Soils Department, Wisconsin College of Agriculture, Madison, Wisconsin

WISCONSIN has developed a great dairy and livestock industry. We have adapted our system of farming to a topographic and climatic heritage. It is perhaps the only type of farming that can survive. It has been said that Wisconsin is a State of great agricultural wealth. But the wealth of its agriculture is represented more in its fine barns, silos, and physical equipment than in the native or potential resources of its soils. In fact, we have built these fine barns, silos, and farm homes, have equipped these farms and have stocked them,—our fathers and grandfathers and their families have gained a living these past 50 to 90 years—all out of the native productiveness of soils which at the outset were not too well stocked with plant food.

And while it is true that our livestock system of farming has done much to preserve the fertility of our soils, yet there has been and still is a constant drain on the fertility of the soil. Not only is plant food being sold in the form of dairy products, livestock, and some cash crops, but even in a dairy system of farming we have been wasting fertility. Tremendous losses of plant food have been and are being incurred in the handling of the manure—losses amounting to better than $30,000,000 each year. These losses have been offset to some extent in the plant food gained through the purchase of mill feeds brought in from other States and through the purchase of some commercial fertilizers. But these gains are small compared to the total losses. In 1937 Wisconsin farmers purchased about 43,000 tons of commercial fertilizers, which at an average cost of $35 per ton would amount to only about $1,500,000.

Our farmers have been slow to

Colby silt loam soils of Wisconsin respond to potash. On the Vern Howard farm, Neillsville, Wis., 200 lbs. of an 0-20-20 fertilizer more than doubled the yield of oats. The residual benefit to alfalfa the following year resulted in a ton increase in the yield of hay.

recognize the need for repairing their soils. The average farmer spends several hundred dollars every year in the repair of his buildings, machinery, fences, and the purchase of new equipment. We seem to accept these general maintenance and repair charges as part of our necessary overhead, and it is true we must keep our physical plant in a reasonable state of repair.

But what about our soils? Should they not come in for their share of general maintenance costs? I am suggesting to my farmer audiences that at least $100 be spent every year for lime and fertilizers. Really this expenditure for fertilizers and lime may be looked upon as more or less of a capital investment as well as an annual repair charge. I point out to farmers that if they would spend as little as $100 each year for a period of 10 years, that at the end of that time they would have built up the productiveness of their soils by at least 25 per cent, and on some farms I am confident that they would see a doubling of the present feed production and livestock carrying capacity of their farms.

If every farmer in the State was to follow my recommendations and purchase, let's say, just 2 tons of fertilizer each year, we would create a market for nearly 400,000 tons of commercial fertilizer a year. And that is about the amount of plant food Wisconsin farmers should be using to break even with losses that are being incurred at the present time.

But how to sell this idea, how to get farmers to see the economy of investing some money in plant food? Well, that is the challenging task we extension specialists, county agents, Smith-Hughes teachers of agriculture, Federal A.A.A. and S.C.S. representatives, as well as hundreds of others engaged in the commercial end of actually selling these fertilizers, must work toward.

Dairying Endangered

I am convinced that unless something is done to awaken our Wisconsin farmers to the seriousness of their soil fertility problems and get them to do something about it, that our great dairy industry will eventually fail. I predict that the future prosperity of Wisconsin dairy farmers will be measured by the extent to which they follow out a soil improvement program.

As I look at the map of Wisconsin outlining the soil regions and visualize the rough, rolling topography of district No. 1, as I see the soils of this region becoming thinner and thinner with the work of erosion taking its toll, as I see the rills and the gullies cutting into the hillsides, as I see the lean, lank herds of dairy cattle in an over-stocked, over-grazed, over-crop-

ped system of farming, as I see the vast areas of sandy soils in central and parts of northern Wisconsin, located on this map in districts 4 and 5, as I see the abandoned farms, the sand blows, and struggling farmers eking out a bare existence on these depleted soils, as I visualize the stony, stumpy, humpy areas in district 7 with scattered settlements of hard-working, horny-handed farmers, and their forlorn wives and under-privileged children, and again as I view the desperate feed problems and declining fertility of that vast area of Colby soils in district No. 6, I can see a gigantic and never-ending job ahead in the accomplishment of a soil improvement program for these areas.

Even as I turn to districts No. 2 and No. 3 and visualize the opportunity for soil improvement in these more prosperous areas of diversified dairy and special crop farming, I can see unlimited opportunity for service in the field of soil improvement.

Need for Potash

There seems to be an ever-increasing need for potash on soils that years ago were supposed to be adequately supplied with total potassium. We have, of course, recognized for years the need for potash on our low bottom mucks, peats, dark-colored sandy and clay loams. Most of the sandy soils of Wisconsin are known to be deficient in potash, but we have been amazed to note the marked response to potash on some of our silt and clay loams.

In the north-central part of Wisconsin we have an area of silt loam that originally supported a heavy growth of hard wood timber. The soils of this area have been mapped as Colby silt loam and total something over 5,000 square miles. This area has developed into a very intensive dairy region. There are a good 30,000 farmers living in the area. Most of these farms have been developed within the last 40 years. The farmers have hewed their farms out of this "cut over" wilderness, and indeed we see today evidence of the great thrift and enterprising spirit of these late pioneers in their fine barns, silos, and farm homes. But something is happening to the farms of this area that is causing real concern to the farm leaders of Wisconsin. There has developed in the past few years a very serious feed problem. In fact, a most acute feed situation has arisen in this area. Drought has been a factor some years, but drought is only a part of the story. Clover failures and declining yields of corn and small grain are very much in evidence. The farm mortgage load is increasing.

Results with fertilizers on the Marshfield Branch Experiment Station have been pointing for years to the need for lime, phosphates, and potash. But even the results of the Marshfield Station have not been sufficient to arouse farmers in the area to the seriousness of their fertility problems.

Cooperative demonstrations with farmers in this Colby area have convinced us that the lack of fertility is the chief reason for this alarming feed shortage that has become so acute in recent years. The surprising and almost amazing results of these demonstrations show in every case a marked response to potash. In fact, it would appear that the lack of available potash in these Colby soils is more responsible for clover and alfalfa failures and the poor yields of grain and corn than is the lack of lime and phosphate, although all three seem to be needed. We have observed that the use of phosphates alone may even accentuate the need for potash.

In a demonstration set up in 1936 on the Vern Howard farm located near Neillsville, a comparison was made of straight 20 per cent superphosphate and 0-20-20. The field was limed at the rate of 3 tons per acre and seeded to a mixture of alfalfa and timothy with oats as a nurse crop. The year 1936 was unfavorable for small

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Safeguard Fertility of Your Orchard Soils

By F. W. HofMann
Agricultural Experiment Station, Blacksburg, Virginia

ANOTHER year rolls by making 25 years or a quarter century of experimentation with problems of orchard fertility at the Virginia Agricultural Experiment Station. Valuable results have been secured from these experiments, profiting immensely not only the fruit growers of Virginia but those elsewhere. The results secured from these experiments have provided practical information to fruit growers enabling them to proceed in the management of their orchard soils with greater assurances and efficiency.

These results show clearly and definitely that efficient management of an orchard soil cannot be conducted without a program of thoughtful soil fertilization. In such management the three essential plant-food elements, namely, nitrogen, phosphorus, and potassium must be provided in some form at some time in the average orchard soil. Earlier in the younger stage of tree growth for perhaps 10 to 15 years, the noticeable responses in apple trees will show up from nitrogenous application. From then on, however, some provision must be made for phosphatic and potassic supplies, not because these materials are not usually present in large abundance in many orchard soils, but because they are beyond the possibility of exploitation by the foraging activities of the roots, particularly of many apple tree varieties.

Five different apple orchards near those of the Virginia Agricultural Experiment Station plats at Blacksburg, Va., as well as numerous large, well-managed commercial orchards, both apple and peach have shown profitable gains due to proper attention to the needs for complete fertilizers. These apple orchards are mostly over 20 years of age, and each year as they grow older show the value of a complete fertilizer program. Instance after instance illustrating the full needs of older bearing apple trees is now coming to light, not only in Virginia and its adjoining fruit-producing sections, but from elsewhere. Even after only one season's treatment, apple orchards have yielded very profitable gains.

Interesting Results

The results of this past season of 1936-37 bring out some very interesting information in a fertilizer experiment on a neglected, 23-year-old York Imperial orchard near Blacksburg. This neglected orchard was selected because of the extreme malnutritional condition of these trees. In the fall of 1936 two sets of the trees received a nitrogenous application with no phosphorus or potash. Two other sets for respective parallel comparison received phosphorus and potash in addition to nitrogen. The complete fertilizer used was of a 10-6-4 proportion. The analysis indicated by the tag is as follows: *Mineral Nitrogen 97* per cent of the total derived from Sulphate of Ammonia—Nitrate of Soda. Organic

Nitrogen 3 per cent of the total derived from Cyanamid-Urea = *Avail. Phosphoric Acid* derived from Superphosphate = Potash derived from Muriate of Potash. The yields of one compared set after one season (1936-1937) are shown in Table I. A gain of about 2 bushels of fruit shows up in favor of the complete fertilizer series. These results are presented to show that as apple trees grow older they will be more likely to show the more outstanding responses to complete fertilizers. The greater benefits that can be secured from complete fertilizers will be brought out later in this article.

TABLE I

Row No.	Treatment	Yield in Bushels
1	Complete fertilizer	10
2	Nitrogen only....	8.23
3	Complete fertilizer	8.64
4	Nitrogen only....	6.64

It is also of interest to study results that have been secured with peach trees. Recently F. F. Cowart and H. L. Cochran have reported the results of their work at the Georgia Experiment Station in cooperation with the U. S. Department of Agriculture. The orchard from which the data were secured is of the Elberta variety and was set out during January 1929. The soil is typical of the Cecil sandy clay loam of the Piedmont section. The different fertilizer plats have received like treatments as to sprays, cultivation, and pruning. The fruit was purposely not thinned at any time.

Plat treatments included no nitrogen, 4 per cent, 8 per cent, and 12 per cent nitrogen. The phosphoric acid and potash content of the fertilizer was kept constant at 8 and 6 per cent, respectively. Nitrate of soda, sulphate of ammonia, and cotton-seed meal were used as sources of nitrogen, while the phosphoric acid came from 16 per cent superphosphate, and potash from muriate of potash. The basal rate of fertilizer application, 6 pounds of mixed fertilizer (N-P-K) per tree, was applied the first of March. It is well to call the reader's attention, particularly at this time of the year in anticipation of peach fertilizer needs, to the fact that Georgia investigators made their fertilizer treatments of

For heavy, lush growth of an orchard ground cover which later becomes valuable moisture-conserving organic matter, a complete fertilizer gives the most outstanding results.

such a nature as to throw some light also on the time and quantity of nitrogen application.

They explain that phosphoric acid and potash are less easily leached from the soil, and the time of their application need not give the peach grower as much concern as applications of nitrate of soda. Certain of these experimental plats received an additional application of nitrate of soda on June 1. Other plats receiving no nitrogen ripened the earliest, and ripening was progressively retarded as higher percentages of nitrogen were included in the fertilizer. The trees receiving a 4-8-6 fertilizer were of medium vigor, in good bearing condition, and ripened their fruits rapidly. Trees which received 8 and 12 per cent nitrogen were somewhat more vigorous, as evidenced by the larger number of peaches they produced, greater terminal growth, and the later date at which the heaviest picking occurred.

In these fertilizer investigations with peaches Cowart and Cochran call attention to the fact that though trees receiving phosphorus and potash with no nitrogen have yielded no more than trees left unfertilized, these results do not preclude the possibility that phosphorus or potash or both applied in combination with nitrogen may be beneficial over a period of years or may increase the carrying quality of the harvested fruits. With increased nitrogen applications, tree growth and fruit production were increased. The increased production on trees receiving the higher application for the 1936 season is due to the increased set of fruit and not to any increase in size of individual fruits. The 1936 growing season, which was particularly dry, was more adverse to fruit enlargement on trees receiving a large amount of nitrogen because of their greater leaf surface and a consequent greater demand for water.

During the previous growing seasons when the rainfall was more nearly normal and the water supply to the trees more nearly adequate, the fruits on trees receiving 4 and 8 per cent

The low state of vigor in the apple trees of this neglected 22-year-old York Imperial orchard is particularly noticeable in the foreground. All trees were subjected to conventional pruning and thorough spraying. Those trees in the plat receiving a complete 10-6-4 fertilizer combination produced, the season following application, 10 bu. per tree in one series and 8.64 bu. in another as compared to 8.23 bu. and 6.64 bu. for the nitrogen-only series. See table 1.

nitrogen attained larger size than the fruits of trees receiving other treatments. The development of color was adequate and essentially alike on all plats except those receiving 8 and 12 per cent nitrogen. On these plats the fruits did not develop as high color as on the other plats.

These peach fertilizer investigations from Georgia show that during 1936 and in previous years the most profitable fertilizer application among the treatments made in these experiments has been the use of a 4-8-6 fertilizer in the spring, supplemented by an additional pound of sodium nitrate applied June 1.

Need Complete Fertilizer

Superior results secured from complete fertilizers, as compared to nitrogenous application without phosphorus and potash, were reported some time ago by other investigators in peach sections similar to those in Georgia and Virginia on Cecil soil series. According to Rawl's observation in South Carolina, his demonstration with peach-tree fertilization, even though conducted for only 1 year, very clearly indicates that nitrogen alone is an improper fertilization practice in some of the peach orchards of South Carolina, and that significant responses were obtained from the addition of phosphatic and potassic fertilizers. The compared responses of fruit development are pointed out as probably the most striking phase of these peach fertilizer demonstrations.

According to Rawl the impressions of hundreds of peach growers, upon going over these demonstrations at and just before harvesting of the fruit, were that those plots receiving the three essential fertilizer elements produced practically 100 per cent fruit of desirable, marketable sizes, as contrasted with almost 100 per cent fruit of undesirable, market sizes in the sections with nitrogen without phosphorus and potash.

Close-up of a typical tree in the orchard photographed on the opposite page.

Of particular interest in Rawl's report are the chemical analyses made by Professor J. H. Mitchell of the South Carolina Agricultural Experiment Station. These analyses show that fruit harvested from the completely fertilized trees contained 21.7 per cent more total sugars and 31.7 per cent more sucrose than did the fruit from nitrogenous, non-phosphorus, non-potash treated trees.

Orchardists are beginning to realize more than they ever have before that much greater importance should be attached to the direct, superior benefits of complete fertilizers to fruit trees. This does not mean, however, that they should not also continue with greater zeal than ever in their efforts to improve the orchard soil, even though the benefits may not be derived by the fruit trees directly at that time. This applies especially to provisions for improving the humus content of the orchard soil. Just as Baker of Indiana recently comments in a report of his investigations to find out the relation of soil fertilization and soil moisture to growth and fruitfulness of apple trees under different systems of management, "Any satisfactory system of orchard soil management that will effectively promote and maintain optimum growth and production of apple trees must provide for the maintenance of an abundant supply of organic matter in the soil and for sufficient moisture for the use of the trees as their needs demand."

This statement aptly indicates the basic principles of vital concern to orchardists, especially when it comes to the management of a soil that is to provide amply for the moisture needs of fruit trees. After all what could an orchardist hope to do without an adequate supply of soil moisture? This question may appear entirely too naive, but then is it to be so easily dismissed?

Soil Moisture Vital

Let us briefly point out some of the vital needs of soil moisture in fruit growing. 1. Soil nutrients cannot be taken up unless they are in solution. 2. The normal physiological processes for fruit development would be impeded and even stopped without soil moisture. 3. Irregularity in soil moisture supplies with interrupted intake are altogether responsible for interrupted growth in the tree; checked fruit bud formation; poor fruit set; impaired size, color, finish, and quality of fruit; and development of water core, cork spot, and cracking of fruit.

One of the most frequent troubles incident to irregularity of soil moisture supplies at certain seasons of the year is the cracking of the fruit. This is most liable to occur shortly before maturity, when rains follow a period of drought during which the fruit has checked its growth. It is indicated by some authorities that apparently the checking of growth is accompanied by changes in the fruit skin, rendering it less elastic, so that when growth processes are accelerated, following a rapid moisture intake after a heavy rain, it is not able to expand at a rate rapid enough to make provision for the greatly increased turgidity of the tissue within. This has been found true in instances of the application of heavy, late irrigation following a protracted dry season. Peaches, plums, and most of the fruits of the stone class are especially subject to this cracking or fruit splitting. Frequently very serious damage occurs to Stayman apples because of such injuries.

This past season of 1936-37 near Blacksburg, Va., was an excellent one to study much in the way of the prevention of this fruit cracking. The season was characterized by its regular and even rainfall. With the exception of a week in May it rained on the average almost every other day throughout the entire growing season. There was a complete absence of fruit cracking in Stayman apples in this entire section. The very few exceptions were due to scab, cedar rust and other fungus pests, and on some weak, dying trees. Even in seasons of less regular rainfall, very little fruit cracking appears in the experimental plats which are liberally supplied with soil humus at this Station. Furthermore, the fruits in these plats are of more acceptable market size, of a more brilliant color with a higher, more attractive finish, more delectable in richer flavor, and decidedly finer in quality.

Soil moisture is of great value in putting fruit trees in a much more vigorous state to survive any adverse conditions both through summer and winter. Verner brings this out very significantly in a report of some of his observations made around West Virginia while connected with that Station.

In these reports of his observations he gives out the following particulars: "It is known that the depth and character of the root systems of fruit trees and the proportion of roots to tops are influenced by the normal water supply in such a way that a much reduced supply one season, while perhaps of sufficient quantity for trees long adapted to a low supply, may not be

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1. Tray from standard fertilizer plot. 2. Tray from check plot. 3. Tray from extra potash plot.

Soil Tests Improve Canning Crops

By William T. Ewen
Ontario Agricultural College, Guelph, Ontario, Canada

BELIEVING that soil tests point the way to a more intelligent fertilizer programme for canning crops, a cooperative experiment was carried out this past summer with canning tomatoes on the Canadian Canners Company farm near Aylmer, Ontario.

In May representative soil samples were taken from an 8-acre field on this farm and were analyzed by rapid chemical tests. Table I gives the results obtained. Since the soil throughout was low in available potash, the field was divided into three plots, (1) standard fertilizer, (2) check, and (3) standard fertilizer plus potash. The standard fertilizer was one commonly used in the Aylmer district for canning tomatoes.

Two weeks before planting, plots 1 and 3 received 100 lbs. of ammophos plus 37 lbs. of muriate of potash per acre, drilled into the soil. Each plot was planted with John Baer, Jewel's Chalk, and Bonny Best varieties. After planting, plot 3 received in addition 325 lbs. of muriate of potash per acre, cultivated in around the plants.

By mid-July there was a distinct difference in the growth and general appearance of the various plots. The plants on the plot which received

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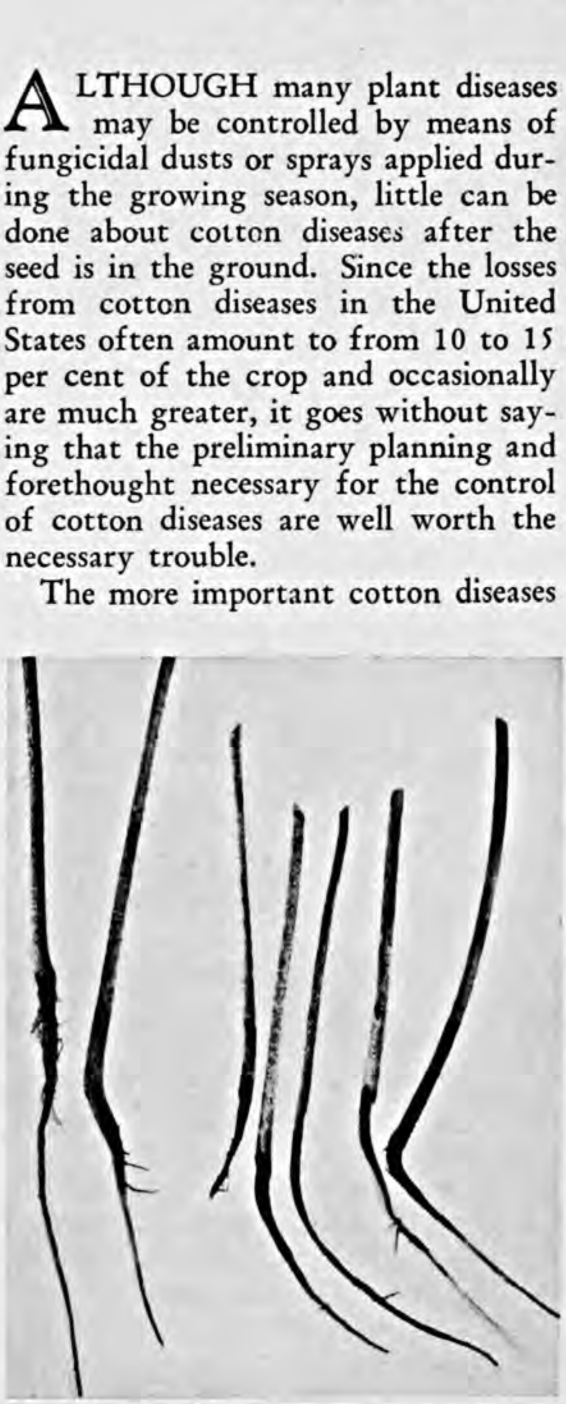
A Primer Explaining Cotton Disease Control

By V. H. Young
Agricultural Experiment Station, Fayetteville, Arkansas

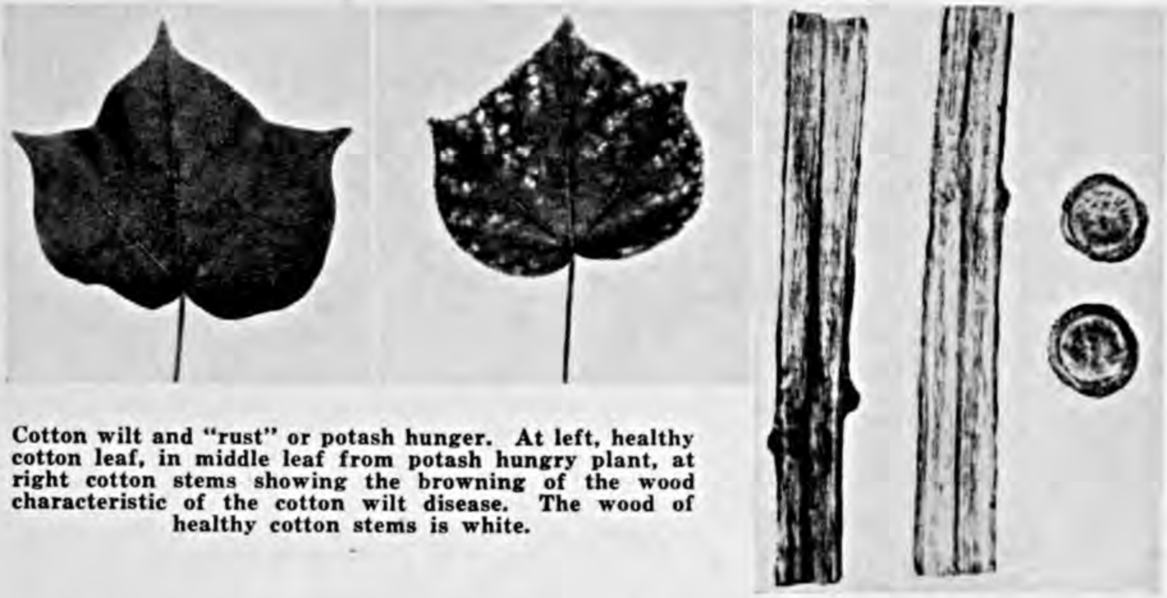
ALTHOUGH many plant diseases may be controlled by means of fungicidal dusts or sprays applied during the growing season, little can be done about cotton diseases after the seed is in the ground. Since the losses from cotton diseases in the United States often amount to from 10 to 15 per cent of the crop and occasionally are much greater, it goes without saying that the preliminary planning and forethought necessary for the control of cotton diseases are well worth the necessary trouble.

The more important cotton diseases of the United States are the Fusarium wilt, the Verticillium wilt, Phymatotrichum root rot, "rust" or potash hunger, root-knot or nematode disease, various seedling blights, damping off, which is commonly designated as "soreshin," angular leaf spot, and various boll rots often erroneously lumped under the term "anthracnose." Much boll rotting is actually a phase of the angular leaf-spot disease mentioned above, or is the result of the action of various other parasites which have obtained entrance into cotton bolls following infection with the angular leaf-spot bacterium or through insect or other mechanical injury.



A severe case of damping-off or "soreshin" of cotton. Early planting in cool, wet soils favors this disease. Seed treatments, later planting, and a good seed bed reduce damage from soreshin.

Of all the diseases mentioned above, Phymatotrichum root rot (known also as "Ozonium root rot" and "Texas root rot") and the Verticillium wilt of cotton are the only ones for which no really adequate control measures are now available. Damage from Texas root rot is almost entirely confined to the State of Texas and other more westerly States, and its control constitutes one of the major unsolved problems left to the cotton pathologist. Certain ameliorative measures, such as the use of heavy applications of green manure, are now becoming available, but since they are still in need of further development and standardization they will not be considered further here. No adequate control of any sort is yet available for the control of Verticillium wilt, but its distribution is fortunately of limited extent.



Cotton wilt and "rust" or potash hunger. At left, healthy cotton leaf, in middle leaf from potash hungry plant, at right cotton stems showing the browning of the wood characteristic of the cotton wilt disease. The wood of healthy cotton stems is white.

Most diseases of cotton, and especially those which are directly concerned with conditions in the soil or which obtain entrance from the soil, are of gradual development. Once they are well-established in a particular piece of land, it may be asserted with reasonable certainty that they will continue to become increasingly more destructive there, if proper measures for their control are not taken. It, therefore, behooves the cotton grower to know what cotton troubles are most serious on his land.

Disease and Soil Type

If that land is heavy, clay upland or rich, heavy delta soil, the Fusarium wilt of cotton and the root knot disease are apt to be of slight importance, but Verticillium wilt in partciular may be looked for in the heavier Mississippi delta soils. If the land concerned is of a sandy alluvial type, Fusarium wilt, "rust" or potash hunger, and root knot or nematode disease are a trio which is apt to cause serious losses. Seedling blights of one kind or another, soreshin, and boll rots of various types are widespread, and their severity may vary greatly from year to year and with varying conditions.

Space does not permit a description of the important cotton diseases, but it should be emphasized that accurate information regarding the presence of cotton diseases in years past is the first prerequisite for the construction of any adequate, cotton disease-control program. With this information at hand, one needs to lay plans sufficiently early to allow the proper selection of cotton varieties, to allow for treating of seed, proper fertilizer applications for an adequate control program, and if necessary to plan for disease elimination through rotations. Cotton diseases, it should again be emphasized, cannot be controlled to any extent after planting time.

The seedling blights and damping-off diseases of cotton are especially important in cool, damp seasons, and when cotton is planted too early. It should be remembered that cotton is a semi-tropical plant which is decidedly unfitted to thrive in cool weather. Consequently, when weather is cool and damp, the seed germinates slowly, the seedlings emerge from the soil with difficulty, and may be in such poor growing conditions that they fall an easy victim to attacks of various soil fungi and in some cases to fungi borne in or on the seed.

The control of seedling diseases is largely a matter of making conditions right for prompt and vigorous growth

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The corn on the left was fertilized with 100 lbs. of muriate of potash and 200 lbs. of nitrate of soda per acre, while that on the right received 200 lbs. of superphosphate and 200 lbs. of nitrate of soda per acre. Farm of J. B. Clayton, Falkville, Alabama.

Corn Can Be Grown On "Frenchy" Soil

By J. T. Hall

Teacher of Vocational Agriculture, Falkville, Alabama

IN THE north Alabama counties of Franklin, Lawrence, Morgan, Madison, and Jackson are located a number of areas of soil with a black surface and a bluish subsoil which are officially classified by the Soil Survey as Hollywood. It is a heavy clay, unsuited to cotton production, but makes good yields of corn when properly fertilized.

To farmers who cultivate these areas, however, the name given this particular soil type means little, but the descriptive term, "frenchy land," is readily recognized and needs no further explanation to them. Designation in this manner started years ago when knowledge of the value of fertilizer was limited. It was noted that without its use many attempts to grow corn met with failure because a large portion of the plants turned whitish, or the leaves developed alternate green and white stripes, and the stalks frequently fell to the ground before maturity.

This is commonly known, of course, as "frenching" and led to the application of the term to all areas where corn plants were affected in this manner.

While there has been little official experimental work in these areas, for years farmers have been following a plan of fertilization which has become

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Truck-crop Farming In Mississippi

By F. J. Hurst

Editor, Agricultural Extension Service, State College, Mississippi

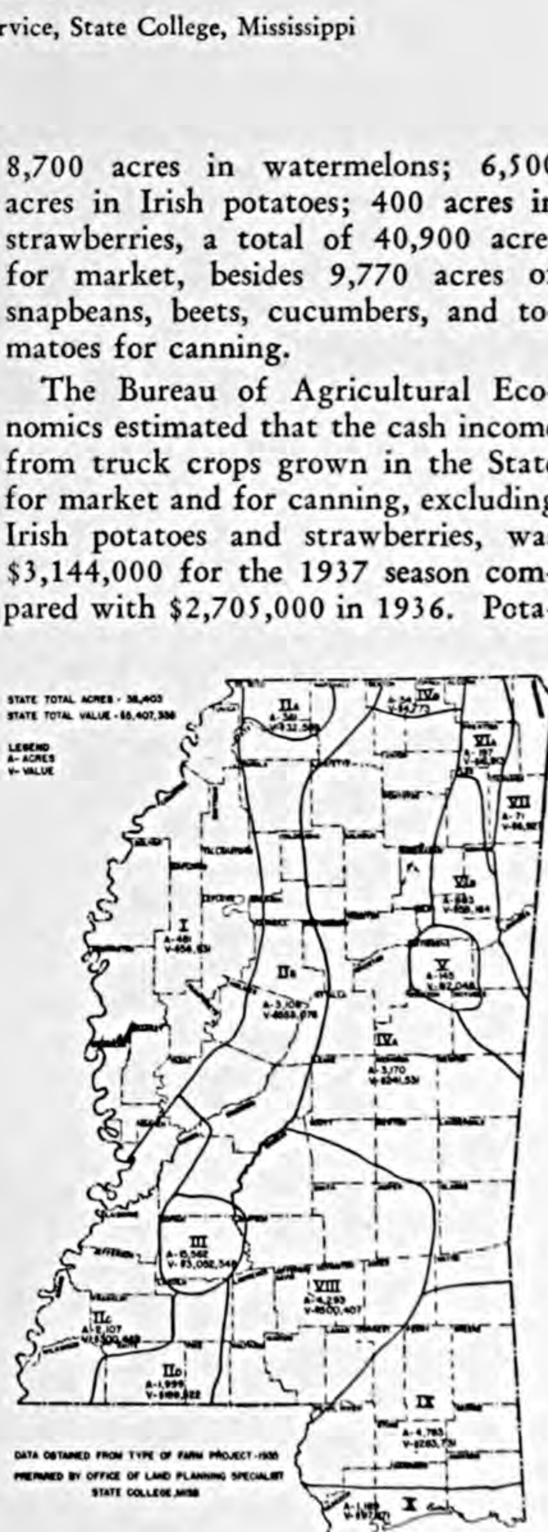
TRUCK-CROP farming is important in Mississippi because of the acreage cultivated, the income received, the employment given labor other than people who live on the farm, the market afforded for products of local industries, especially fertilizer and box factories, and the volume of freight furnished the railroads.

Type of farming areas in the State have recently been mapped by the Mississippi experiment station, the Bureau of Agricultural Economics, and the Agricultural Adjustment Administration under direction of C. O. Henderson, land planning specialist of Mississippi State College. This map shows that commercial vegetable production is centered in the Copiah County truck area. But during recent years truck-crop farming has been developed on a considerable scale in other type of farming areas, either as specialized truck farms or as a major enterprise on diversified farms.

Smith, Covington, and Yalobusha counties have become noted for production of watermelons. About 20 counties are growing Irish potatoes on a commercial scale. Tomato acreage has been increased in Hinds and Jefferson counties. Vegetable production has become a major farm enterprise in Marion County since establishment recently of a canning plant at Columbia.

In 1937 Mississippi producers planted 6,000 acres in snapbeans; 6,400 acres in cabbage; 3,000 acres in green peas; 9,500 acres in tomatoes; 8,700 acres in watermelons; 6,500 acres in Irish potatoes; 400 acres in strawberries, a total of 40,900 acres for market, besides 9,770 acres of snapbeans, beets, cucumbers, and tomatoes for canning.

The Bureau of Agricultural Economics estimated that the cash income from truck crops grown in the State for market and for canning, excluding Irish potatoes and strawberries, was \$3,144,000 for the 1937 season compared with \$2,705,000 in 1936. Pota-



toes and strawberries brought $322,000.

While production of most of the major truck crops was less than in 1936, better prices for cabbage and tomatoes pushed the 1937 income 16 per cent above that of 1936. A record crop of potatoes brought a very low price per bushel, and the cash income from this source was considerably less than for the smaller 1936 crop.

The accompanying diagram which shows the amount of plant food removed by different crops presents an interesting study. It will be noted that with the exception of beans, larger quantities of potash are removed by the different crops than either nitrogen or phosphorus. The removal of large quantities of potash by crops and erosion, coupled with the fact that until recent years mixed fertilizers usually carried a lower percentage of potash than of the other plant-food elements, may account for what is commonly described as "potash hunger" on some soils and the marked response of many crops on such soils to liberal applications of potash fertilizer, or a complete fertilizer high in potash.

Unfortunately many truck farmers in the principal trucking area of Mississippi have neglected terracing their farms, too little of the land has been planted to soil-conserving crops, and erosion has taken a heavy toll of soil fertility. As a result, increasing amounts of commercial fertilizers have been used and average yields have not been as high nor the quality of crops as good as where soil-building programs have been followed and the humus content of the soil maintained.

Copiah County growers alone purchased 13,354 tons of mixed fertilizers and other fertilizer materials, such as nitrate of soda and muriate of potash, in 1937 according to notifications filed by fertilizer manufacturers with the State Department of Agriculture.

Fertilizer Practices

A study of fertilizer practices followed by Copiah County growers last year showed that they used from 1,200 to 1,800 pounds of 3-8-5 or 4-8-4 under tomatoes and side-dressed with a mixture of nitrate of soda and potash. For cabbage, 1,500 to 2,000 pounds of 4-8-4 were used per acre, being applied before planting, and the plants side-dressed with 200 pounds of nitrate of soda. From 1,500 to 1,800 pounds of 4-8-4 per acre were most commonly used under beans and peas.

In field fertilizer tests conducted in 1937 by Lotterhos and Huber, large operators in Copiah County, 1,500 pounds of 4-8-8 fertilizer per acre produced larger yields of better tomatoes and returned a greater profit than 1,500 pounds of 4-8-4.

Following a three-day conference of fertilizer manufacturers, farmers, and agriculturists in Jackson last fall, the grades of fertilizers registered and sold in Mississippi were limited to conform as nearly as possible to the mixtures recommended by experiment stations. The grades adopted are as follows: 4-8-8, 6-8-8, 3-8-5, 4-8-4, 6-8-4, 6-12-6, 0-12-6, and 10-0-10.

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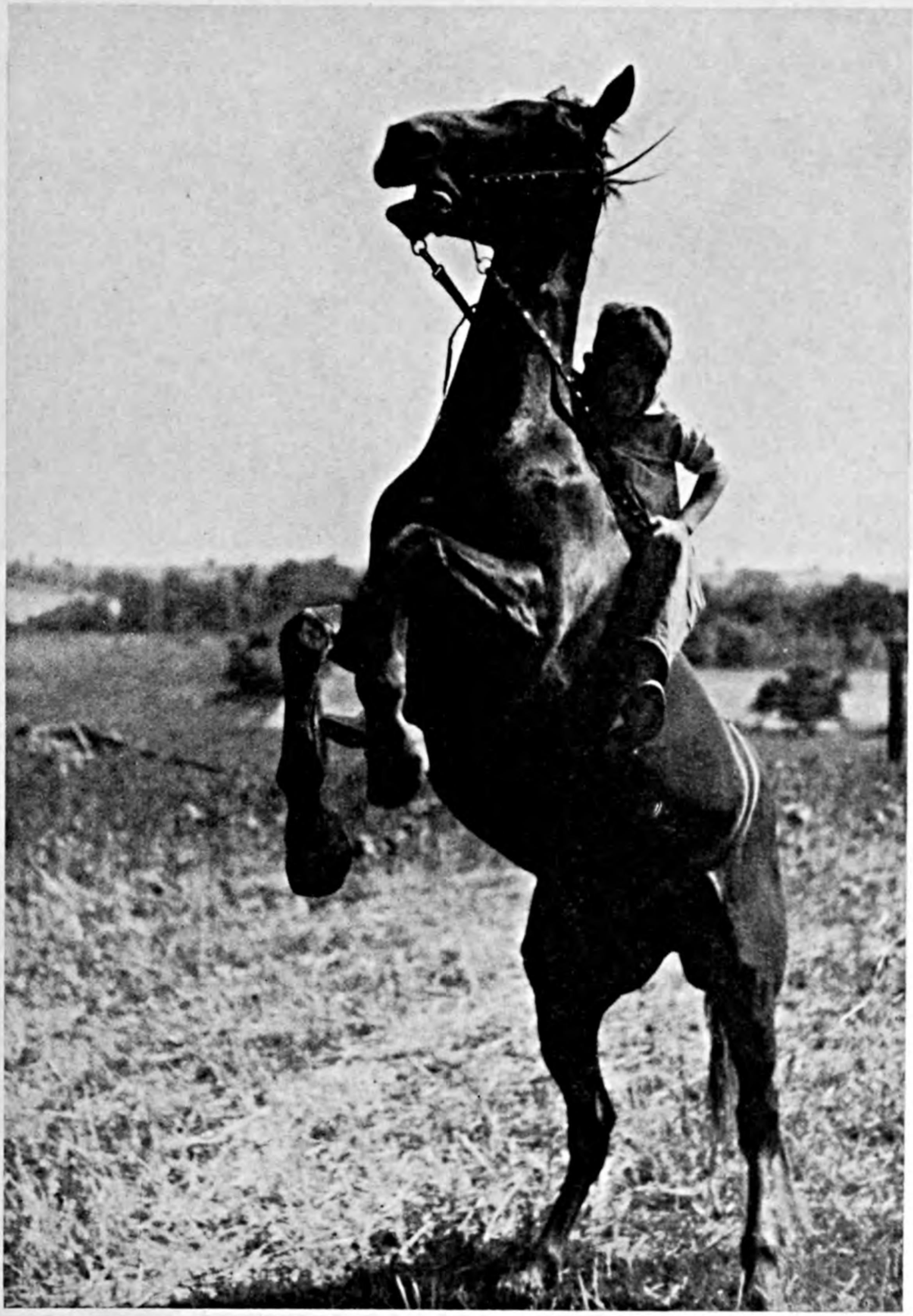
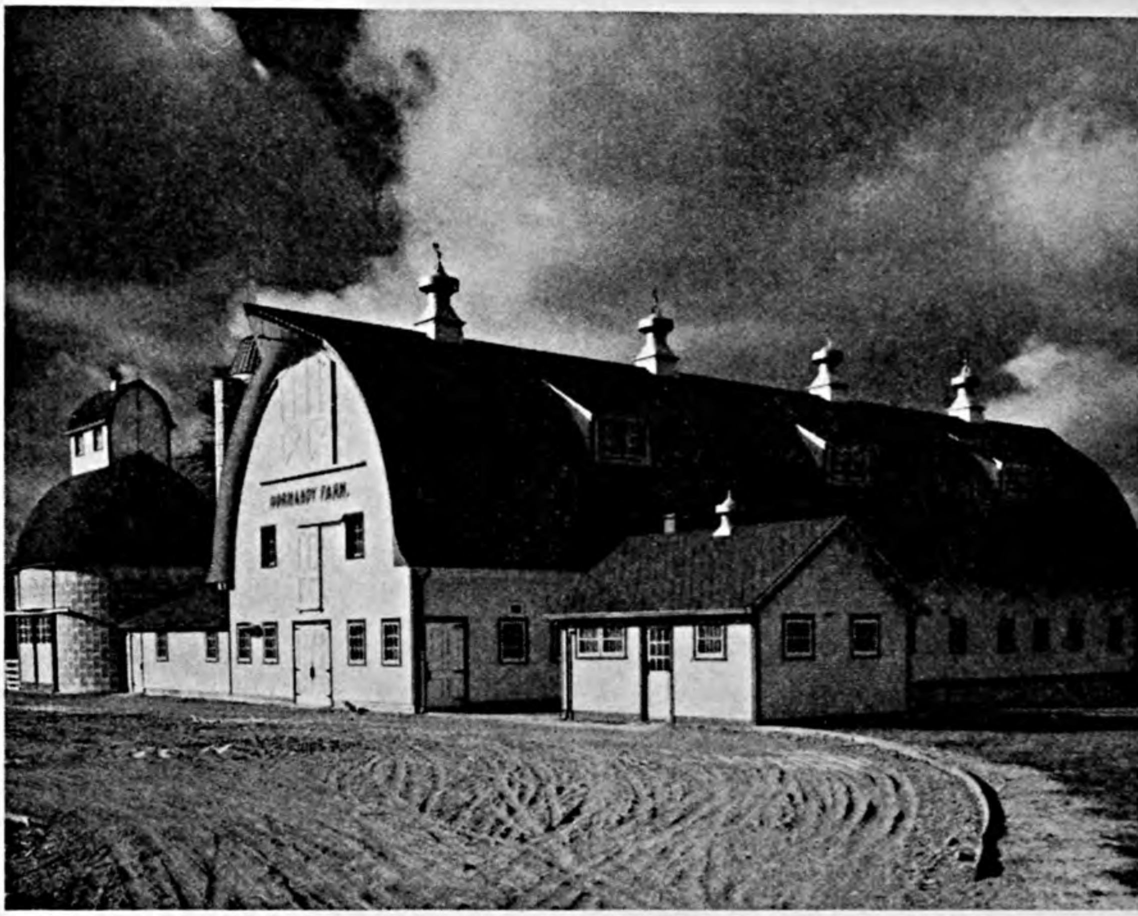
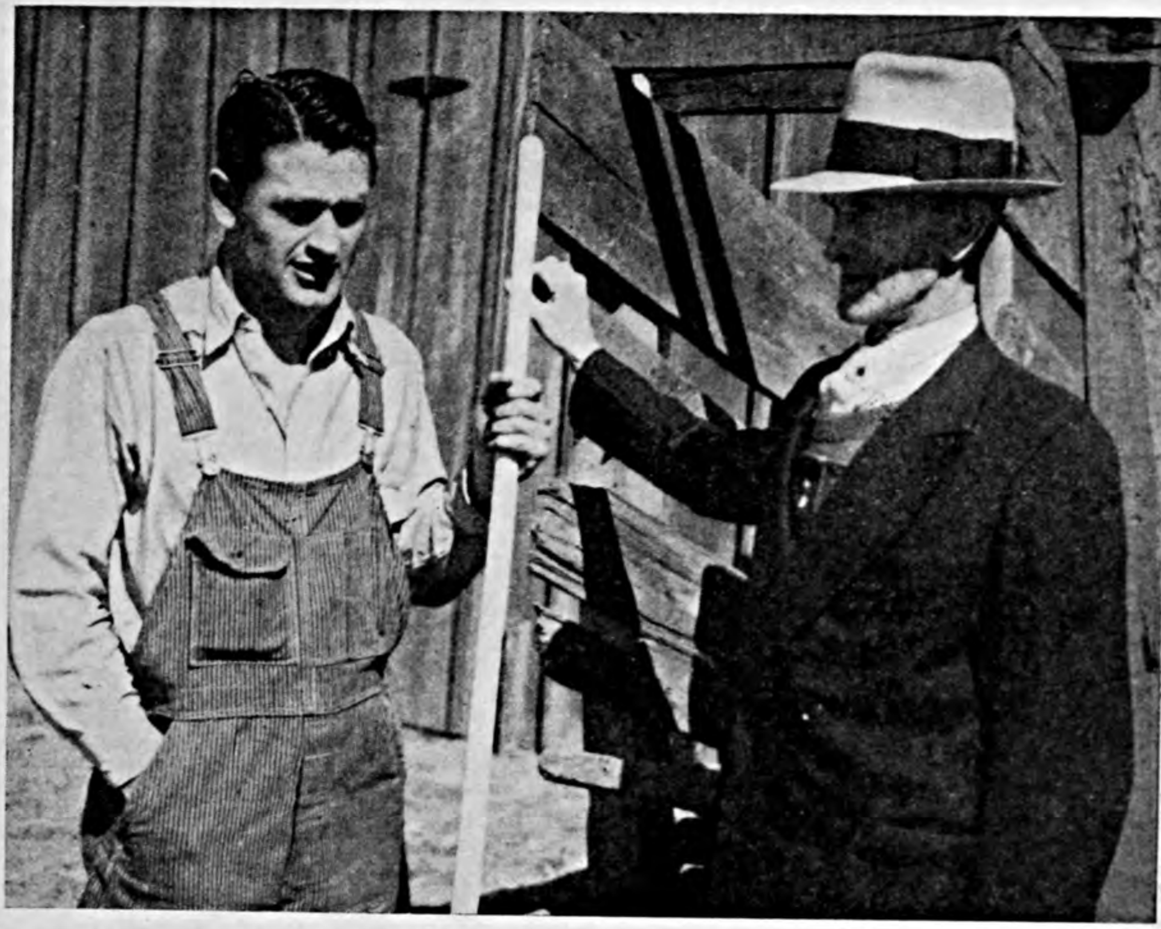
PICTORIAL



A REAL COWBOY MUST "STICK."



Above: Modern buildings do much to lighten chores.
Below: He's a balky, temperamental fellow.



Above: Farming involves a lot of pro and con.
Below: Anxiety reigns in this "breadline."

Left: Preparation for spring work requires much contemplation and planning.

Below: Kansas farmers on a "wolf drive." When one round-up is finished, hunters are transported to the next location by truck.

The Editors Talk

Don't Wait for SOS (Signs of Starvation)

In the emphasis being given to easily recognized signs of starvation for certain plant-food elements as shown by crops growing on soils deficient in these elements, it must be remembered that serious decreases in yields and quality will occur before these symptoms appear. In other words, signs of starvation represent extreme deficiencies. Profitable response to fertilizers can be obtained long before the plants tell what they need.

Growers should not wait for the SOS. Farming soils to the point of depletion of plant food is an old concept dating back to the days of new frontiers and almost unlimited virgin land which could be put into production when the other wore out. The newer concept is maintenance of building up the riches of our soils to meet the necessities of efficient and low-cost production and the scarcity of virgin soils within our boundaries.

Evidence of the need for wider recognition of the newer concept is seen in the observations of a writer published in the March issue of Country Home Magazine. This article is particularly interesting since it deals more specifically with the increasing need for potash in the Midwestern states where only a relatively few years ago the rich new soils were believed to contain inexhaustible supplies of this plant-food element.

"Millions of acres in ten of the most fertile states of the Middle West will hoist danger signals this summer on the crops they produce," this writer predicts. "These fore-runners of disaster must be heeded or this rich area will suffer the consequences of diminishing crop yields and declining crop quality.

"After a tour of inspection I have come to the conclusion that the ten central Corn Belt states are in urgent need of 1,500,000 tons of potash annually, in order to restore the potash that is being taken from the soil.

"I have seen these warning signals waving in the fields of these states. They are easy to recognize. Where the soil is low in potash the leaves of growing corn are fired along the margins, and yellow streaks appear between the veins. Stalks were weak, ears have soft cobs and chaffy grain; the whole field has a dull green look to it. Alfalfa shows its hunger for potash by the appearance of small white spots about the size of a pinhead on the lower leaves. Potato leaves roughen, pucker, curl up at the edges and turn yellow. Soybeans mottle and yellow, and the leaves of all other crops brown and wither where potassium is deficient.

"Only a veritable snowstorm of potash can sidetrack onrushing trouble. To move the amount of potash used up by each year's crops in these ten Midwestern states would require six trains of 50 cars, each carrying 25 tons of potash, running every day of the year except Sundays. To get an idea of the rate at which this valuable plant food vanishes, burn a shock of wheat or a bushel of corn, and look at the amount of ashes. These ashes are soil that has been used by the crops. Thirty per cent of them is potash."

To further substantiate his observations, the writer says, "I asked soil scientists in states I visited how much potash is needed to replace the rapidly vanishing supply. Director C. A. Mooers, at the Tennessee Agricultural Station, advises 25 pounds to the acre for potash-deficient soils of his state. Dr. S. F. Thornton of Purdue University summed up the needs of Indiana at a like amount of potash for each cropped acre. Similar suggestions are offered for potash-deficient soils in other states.

"To supply 25 pounds of potash on every acre of cropped land in the ten Central states calls for the use of 1,500,000 tons of pure potash, 7,500,000 tons of 0-20-20 phosphate-potash fertilizer, or 25,000,000 tons of 2-12-6 nitrogen-phosphate-potash fertilizer."

To illustrate how far growers are from a realization of the losses taking place and the need for maintenance practices, he says, "Last year in the ten states which I investigated, farmers bought and applied around 60,000 tons of potash, only a little over one pound for each acre of cropped land. Twenty times that amount would not be too much."

Farm-soil Mapping

It is one thing to own soil and quite another thing not only to own it but to know it, even to the point of making a picture of it. Few farmers have gone to such thoroughness in the study of their resources as to have their soils mapped. Therefore additional credit should be given that already accorded Elmer Christenson of Fremont, Michigan, as being the first in Michigan to complete a 4-H club project in farm-soil mapping. He spent all of his available extra hours last summer mapping 13 fields totaling 160 acres, and incidentally became one of the best amateur soil-map makers that Michigan State College specialists have ever found.

Through cooperation with the county agricultural agent and members of the soil-conservation department of the college, the boy set up maps showing lime requirements of each field, made an erosion-survey map, a soil-type map, and a base map of the farm. Each one shows accurate outlines, fence lines, and measured areas differing within fields. He found that lime requirements range from none on six fields to a demand for 20 tons of marl for a field containing 9.4 acres. He set down 1936 and 1937 crop yields of the various fields so that results of future cropping and management changes can be measured.

Without doubt this young man has started a scientific as well as thoroughly practical understanding of the possibilities of increased profits from those 160 acres. Careful and planned management will follow, to the end that the soil which had the benefit of those "extra hours" will be enriched. If the wealth of our nation is in our soils, the completion of this project and the influence it may have on similar projects are contributions in keeping with those from many other important 4-H club projects which have attracted the nation's attention and commendation.

REVIEWS

This section contains a short review of some of the msot practical and important bulletins, and lists all recent publications of the United States Department of Agriculture and the State Experiment Stations relating to Fertilizers, Soils, Crops, and Economics. A file of this department of BETTER CROPS WITH PLANT FOOD would provide a complete index covering all publications from these sources on the particular subjects named.

Fertilizers

"Pasture Fertility," Agr. Ext. Serv., Urbana, Ill., Mimeo. AG-531, Jan. 13, 1938, F. C. Bauer.

"Nitrogen—The Major Cause in the Production of Spotted Wheat Fields," Agr. Exp. Sta., Manhattan, Kans., Tech. Bul. 43, Oct. 1937.

"Effects of Superphosphate Upon the Yield and Earliness in Maturity of Cotton," Agr. Exp. Sta., Raleigh, N. C., Bul. 314, Nov. 1937, C. B. Williams, T. S. Buie, and S. V. Stacy.

Soils

¶ A number of excellent publications prepared by agricultural leaders in several States depict how the Agricultural Conservation Program for 1938 offers farmers much needed information on restoring the fertility of their land, protecting it against the abuses of erosion, cropping systems that exhaust the soil, and adjusting the production of cash crops to meet consumer's requirements.

Typical of these is North Carolina Agricultural Extension Circular 219, entitled, "S—O—S" (Save Our Soil) giving valuable suggestions of the State Extension specialists for farmers to carry out in building up their farmland while earning their payments. "To obtain the full payment, credit is allowed toward the soil-building goal for certain soil-conserving practices, agreed upon by the committee and the farmer as being best suited for each individual farm. The practices counted toward this goal include most of those for which direct payments were made in 1937, such as growing legumes and winter cover crops, liming, applying potash and superphosphate, improving pastures and woodlands, and terracing." The new program will count each practice as a certain number of acres toward the acreage set up as the soil-building goal. Deductions from the farmer's payment will be made where he falls short of reaching the goal on each acre.

Specific information on what constitutes a sound soil-building program is interpreted in simple language by the crop experts.

"Soils of Judith Basin County, Soil Reconnoissance of Montana, Preliminary Report," Agr. Exp. Sta., Bozeman, Mont., Bul. 349, Dec. 1937, L. F. Gieseker.

"Soil Erosion Survey of Pennsylvania," Agr. Exp. Sta., State College, Pa., Bul. 354, Feb. 1938, Austin L. Patrick.

"Soil Conservation, A Philosopher's Viewpoint," Agr. Ext. Serv., Burlington, Vt., Cir. 97, Jan. 1938, George Dykhuizen.

"Soil-Building Practices Applicable in Massachusetts," U. S. D. A., AAA, Washington, D. C., NER-203-Mass., Dec. 11, 1937.

"Soil-building Practices Applicable in Vermont," U. S. D. A., AAA, Washington, D. C., NER-203-Vt., Jan. 15, 1938.

"Soil Survey of Greer County, Oklahoma," U. S. D. A., Washington, D. C., Series 1932, No. 21, Oct. 1937, A. W. Goke and R. E. Penn.

"Soil Survey of Boyd County, Nebraska," U. S. D. A., Washington, D. C., Series 1933, No. 9, Oct. 1937, W. J. Morgan, F. A. Hayes, and R. H. Lovald.

"Soil Survey of Keya Paha County, Nebraska," U. S. D. A., Washington, D. C., Series 1933, No. 10, Oct. 1937, W. D. Lee, F. A. Hayes, S. R. Bacon, and R. H. Lovald.

Crops

¶ Alfalfa is easier to start and is more productive on good fertile soils, but if carefully limed, inoculated, and fertilized, it often does well on land that is far from rich, according to J. B. R.

Dickey in Pennsylvania Agricultural Experiment Station Circular 180, "Growing and Harvesting Alfalfa in Pennsylvania." In any event, the soil must be well-drained. If the soil requirements are properly satisfied, good crops are made under the cool and humid conditions that prevail in the East, even though the crop is especially adapted to a warm and semi-arid climate. The only climatic handicap of the Eastern grower is greater trouble with grass and weeds which results in shorter lived stands.

Unless the soil is sweet it is not worthwhile to attempt to grow alfalfa. Soils having a very high lime requirement should be seeded to more acid-tolerant crops, and moderate amounts of lime applied for several years so as gradually to decrease acidity to a point where alfalfa can be grown. The crop does best on soils that have been deeply sweetened by repeated limings. Neglect of proper inoculation very frequently is the cause of alfalfa failure. Using pure cultures of inoculants is the easiest method of inoculation.

Like other legumes, alfalfa responds most strongly to phosphoric acid and potash. If properly inoculated, the crop can supply its own nitrogen after becoming well established. An application of about 400 pounds of a fertilizer carrying 2 to 4 per cent nitrogen and good percentages of phosphoric acid and potash is advised when seeding without a nurse crop on land which is not especially fertile. Where sown with winter or spring grain, the grain should be well fertilized. Where stands are to be mown for some years it seems very profitable to top-dress with phosphate or phosphate and potash. The fertilizer applied to the grain or the new seeding should be adequate for the first year or two that the alfalfa is mown. Later, an application of 300 or 400 pounds of superphosphate, 0-12-5, 0-10-10, or similar material put on in the spring or after harvesting has sometimes shown marked stimulation to growth and production and has also greatly reduced the amount of winter injury.

Other practical information on time and methods of sowing the crop, time of cutting, curing, pasturing, and alfalfa to control obnoxious weeds are given in the publication.

¶ E. C. Westbrook sums up the pertinent details involved in the production of Sea Island cotton in southern Georgia in Agricultural Extension Circular No. 268, entitled "Sea Island Cotton Culture." Because of the recent fair prices and favorable yields secured, considerable interest in reviving this almost extinct industry in the old Sea Island belt is being manifested. There are still the same obstacles standing in the way of the success of this crop that caused its virtual disappearance a few decades ago, notably, the boll-weevil, purity of strain, etc. Pure seed of a superior strain of Sea Island cotton is the first essential in its successful production, the author points out. The seed must be kept pure from harvest to planting time. Furthermore, plantings should be isolated at least a mile from upland cotton to prevent cross pollination, and the cotton ginned where only Sea Island is hauled to prevent possible mixture with other seed. The simplest, most practical, and economical way to produce this type of cotton may be through community cooperation.

It is believed by the author that the methods of land preparation and fertilization which give satisfactory results with upland cotton should also be suitable for Sea Island cotton. Good judgment will be the farmer's best guide. From 300 to 500 pounds of a 3-9-5 fertilizer applied before planting should give good results. An application of a nitrogen-potash top-dresser at chopping time should be profitable on sandy land. Instructions on the preparation of the seed before planting, cultivation, weevil control, and handling the crop are also given in the Circular.

"Forty-sixth Annual Report (July 1, 1934 to Dec. 31, 1935) of the Agricultural Experiment Station of the Alabama Polytechnic Institute," Agr. Exp. Sta., Auburn, Ala., M. J. Funchess, Director.

"Connecticut Straightneck, A New, Early, Productive Summer Squash," Agr. Exp. Sta., New Haven, Conn., Cir. 119, Jan. 1938, Lawrence C. Curtis.

"Vegetable Gardening in Georgia," Agr. Ext. Serv., Athens, Ga., Bul. 462, Feb. 1937, R. L. Keener.

"Illinois Corn Performance Tests . . . 1937," Agr. Exp. Sta., Urbana, Ill., Bul. 440, Jan. 1938, G. H. Dungan, R. O. Snelling, W. J. Mumm, J. H. Bigger, and A. L. Lang.

"Growing Fruit for Home Use," Agr. Ext. Serv., Urbana, Ill., Cir. 482, Dec. 1937, Victor W. Kelley.

"Green Peas for Illinois Markets," Agr. Ext. Serv., Urbana, Ill., Cir. 483, Jan. 1938, J. W. Lloyd.

"Inspection of Agricultural Seeds," Agr. Exp. Sta., Lafayette, Ind., Cir. 231, Oct. 1937, H. R. Kraybill, State Seed Com.

"Nutrient Solution Methods of Greenhouse Crop Production," Agr. Exp. Sta., Lafayette, Ind., Cir. 232, Nov. 1937, R. B. Withrow and J. P. Biebel.

"Design of Agronomic Experiments for Plots Differentiated in Fertility by Past Treatments," Agr. Exp. Sta., Ames, Iowa, Res. Bul. 226, Nov. 1937, H. C. Forester.

"The Massachusetts Commercial Vegetable Grower," Agr. Ext. Serv., Amherst, Mass., Vol. 1, No. 9, Jan. 1938.

"The Quarterly Bulletin," Agr. Exp. Sta., East Lansing, Mich., Vol. 20, No. 3, Feb. 1938, P. J. Schaible, Ruth Griswold, J. A. Davidson, and E. J. Miller.

"Northeast Minnesota Cooperative Field Crop Tests," Agr. Exp. Sta., Duluth, Minn., Mimeo., Dec. 1937.

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"Management, Harvest, and Sale of Pine Timber For Pulpwood," Agr. Ext. Serv., Raleigh, N. C., Ext. Cir. 218, Dec. 1937, R. W. Graeber.

"Better Methods of Seeding Meadows," Agr. Exp. Sta., Wooster, Ohio, Bul. 588, Dec. 1937, L. E. Thatcher, C. J. Willard, and R. D. Lewis.

"The Bimonthly Bulletin," Agr. Exp. Sta., Wooster, Ohio, Vol. 23, No. 190, Jan.-Feb. 1938.

"50th Annual Report for the Fiscal Year Ended June 30, 1937," Agr. Exp. Sta., State College, Pa., Bul. 352, Oct. 1937.

"Peach Culture in Pennsylvania," Agr. Ext. Serv., State College, Pa., Cir. 179, Aug. 1936, John U. Ruef.

"Forty-ninth Annual Report, 1936," Agr. Exp. Sta., College Station, Brazos County, Tex., A. B. Conner, Director.

"Blackberry and Dewberry Varieties in East Texas," Agr. Exp. Sta., College Station, Brazos County, Tex., Bul. 558, Jan. 1938, H. F. Morris.

"Home Orchards," Agr. Ext. Serv., College Station, Tex., B-73, 1937, J. F. Rosborough.

"Hotbeds for Home Gardens," Agr. Ext. Serv., College Station, Tex., C-110, 1937, J. F. Rosborough.

"Permanent Pastures for Texas Farms," Agr. Ext. Serv., State College, Tex., B-82, R. R. Lancaster.

"Legumes for Texas," Agr. Ext. Serv., College Station, Tex., C-118, Louis Franke.

"The Cultivated Cranberry in Washington," Agr. Exp. Sta., Pullman, Wash., Bul. 349, July 1937, D. J. Crowley.

"Shelterbelts for Windblown Soils," Agr. Ext. Serv., Madison, Wis., Cir. 287, Jan. 1938, F. B. Trenk.

"Production of Chicory and Endive," U. S. D. A., Washington, D. C., Leaf. 133, Oct. 1937, W. R. Beattie.

"Production of Parsley," U. S. D. A., Washington, D. C., Leaf. 136, No. 1937, J. H. Beattie.

"Rhubarb Forcing," U. S. D. A., Washington, D. C., Leaf. 137, Dec. 1937, J. H. Beattie.

"Production of Garlic," U. S. D. A., Washington, D. C., Leaf. 138, Nov. 1937, J. H. Beattie.

"Production of Roselle," U. S. D. A., Washington, D. C., Leaf. 139, 1937, J. H. Beattie.

"Production of Peppers," U. S. D. A., Washington, D. C., Leaf. 140, Dec. 1937, J. H. Beattie and S. P. Doolittle.

"Yield and Quality of Sugar Beets From Various Rotations at the Scotts Bluff (Nebr.) Field Station, 1930-35," U. S. D. A., Washington, D. C., Cir. 444, Nov. 1937, S. B. Nuckols.

Economics

¶ H. R. Kraybill, State Chemist and Seed Commissioner at Purdue University, in his annual fertilizer report, gives 226,887 tons of commercial fertilizers as the total sold to Indiana farmers during the year 1937. Detailed tables covering 221,187 tons and showing the spring and fall tonnages of each analysis sold are provided. It is estimated that 5,700 tons were sold by companies not reporting their individual analyses. The total tonnage represented by tag sales was 274,640 tons. This suggests two possibilities—that fertilizer companies doing business in Indiana were over-optimistic with respect to expected volume, or that some companies failed to report their entire sales. However, the compilation is extremely useful and provides a very good year-to-year comparison of fertilizers sold in the State.

The leading analysis, according to the tables, is 2-12-6, representing 103,239 tons of the total reported, or 47 per cent of the total sales. The next most important grade was 0-12-12, with 12,307 tons. Other analyses constituting significant tonnages were 0-14-6, 0-20-20, 0-10-10, 4-24-12, 3-12-12, 2-8-16, 2-8-10, and 2-12-2. The sales in Indiana were very evenly divided between spring and fall, 110,787 tons being reported for spring and 110,400 tons reported as fall sales.

Even though tag sales were about 20,000 tons less in 1936, the total tonnage reported was greater than in 1937 by approximately 17,000 tons. In 1936 it was reported that 103,725 tons were sold in the spring and 134,665 tons in the fall. In that year 2-12-6 constituted 45 per cent of the total, and the next leading analysis was 2-12-2.

¶ According to the recent publication of the Massachusetts Agricultural Experiment station, Control Series, Bul. No. 90, "Inspection of Commercial Fertilizers," by H. D. Haskins, fertilizer sales during the 12 months ending July 1, 1937, exceeded the same period in 1935-36 by about 10,000 tons, the respective tonnages being 74,274 and 64,481. Of the total sales in 1936, 48,527 tons were in the form of mixed fertilizers and 24,004 tons were chemicals and materials unmixed, the balance of 1,743 tons pulverized and natural manures. Plant-food sales in 1936-37 were 4,163 tons of nitrogen, 6,540 tons of phosphoric acid, and 4,333 tons of potash, as compared to 3,659 tons of nitrogen, 5,419 tons of phosphoric acid, 3,816 tons of potash the year previous.

The leading grades in this State are 5-8-7, 4-8-4, 4-8-7, 7-6-6, 6-3-6, 4-8-10, and 4-8-8, with 5-8-7 heading the list with 14,206 tons. Only 901 tons of the mixed fertilizer sold within the State contained less than 14 per cent available plant-food.

¶ Even though the fertilizer industry is still in its infancy insofar as the State of Minnesota is concerned, a rather complete and useful report covering fertilizers sold in Minnesota is published by the State Department of Agriculture, Dairy and Food. According to the 1937 report, 12,385 tons of commercial fertilizers were sold within the State, of which 5,813 tons contained all three of the major plant foods, 50 tons contained only nitrogen and phosphorus, and 3,160 tons contained only phosphorus and potash, while 2,571 tons were phosphate fertilizers, the balance being small tonnages of organic, nitrogenous, and potash fertilizers. The 1937 tonnage compared to 9,898 tons in 1936, 10,776 tons in 1935, 9,165 tons in 1934, 7,256 tons in 1933, 9,319 tons in 1932, and to the peak year 1931 of 17,697 tons. In 1937 about 264 tons of nitrogen, 2,022 tons of phosphoric acid, and 1,236 tons of potash were consumed in Minnesota fertilizers. This compares with the peak year 1931, when 402 tons of nitrogen, 2,581 tons of phosphoric acid, and 1,772 tons of potash were consumed. According to the report, by far the greater part of the fertilizers used in Minnesota is sold in the spring.

¶ The Pennsylvania Department of Agriculture in General Bul. No. 547, Fertilizer Report for 1936 state that according to the 1936 applications for registration, 295,048 tons of all classes of fertilizer were sold during the year 1935, which compares to 267,987 tons sold during 1934. In 1936 licenses were issued to 123 different manufacturers, covering 954 brands of which 727 were mixed fertilizers and 227 were for base materials. Of the total tonnage sold in 1935, 214,333 tons were complete fertilizers, 52,890 tons were superphosphate fertilizers, and the balance included small tonnages of other types. It is estimated that in 1935 about 6,800 tons of nitrogen, 32,959 tons of available phosphoric acid, 13,707 tons of potash, or a total of 53,466 tons of plant food were supplied to Pennsylvania farms in the form of commercial fertilizers. This was 47,806 tons more than was contained in the 1934 tonnage. In commenting upon the results of official samples analyzed in 1936, it was noted that approximately 8 per cent were found to be deficient in one or more elements of plant food to the extent of .2 per cent. However, proportion of deficiency was lower than in the year 1935.

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"Michigan Agricultural Outlook for 1938, Agricultural Economic News," Agr. Exp. Serv., East Lansing, Mich., No. 16, Jan. 1938.

"Minnesota Farm Business Notes, Marketing Margins on Minnesota Agricultural Products," Agr. Ext. Serv., St. Paul, Minn., Mimeo. 182, Feb. 20, 1938, W. C. Waite and W. B. Garver.

"The Conservation of Montana's Irrigated Lands," Agr. Exp. Sta., Bozeman, Mont., Bul. 350, Dec. 1937, P. L. Slagsvold and H. H. Lord.

"Analyses of Commercial Fertilizers," Agr. Exp. Sta., Bozeman, Mont., Bul. 352, Fer. Rpt. 2, Jan. 1938, James T. Sparling and Edmund Burke.

"Production of Crops and Livestock on the Newlands Project 1912 to 1936," Agr. Exp. Sta., Reno, Nev., Bul. 146, Dec. 1937, F. B. Headley.

"Farm Economics," Cornell Univ. Agr. Ext. Serv., Ithaca, N. Y., No. 105, Feb. 1938.

"Farm Tenancy and Rental Contracts in North Dakota," Agr. Exp. Sta., Fargo, N. D., Bul. 289, Nov. 1937, Cap E. Miller and Willard O. Brown.

"Department of Agriculture of Oregon Bulletin," Salem, Oreg., No. 74, Feb. 1938.

"Farm Business, An Agricultural Classification of Vermont Lands," Agr. Ext. Serv., Burlington, Vt., Vol. 4, No. 6, Dec. 1937, John A. Hitchcock.

"Department of Agriculture-Immigration of Virginia," Richmond, Va., Bul. 356, Feb. 1938.

"Agricultural Outlook for West Virginia Farms and Homes, 1938," Agr. Ext. Serv., Morgantown, W. Va.

"Commercial Fertilizers, Report of Inspection Work," W. Va. Dept. of Agr., Charlestown, W. Va., Bul. (N. S.) 4, June 1937, T. B. Leith.

"Stopping Waste in Farm Surpluses, How the Federal Surplus Commodities Corporation Serves the Welfare of Producers and Consumers," U. S. D. A., AAA, Washington, D. C., MI-2, 1938.

"Questions and Answers on the Agricultural Adjustment Act of 1938 as It Applies to Cotton," U. S. D. A., AAA, Washington, D. C., 38-Cotton-1, Feb. 1938.

"Quality of Cotton Ginned in Alabama, Crops of 1928-36," U. S. D. A., Washington, D. C., June 1937, W. B. Lanham, F. H. Harper, and Nora B. Clyde-Burton.

"Quality of Cotton Ginned in Georgia, Crops of 1928-36," U. S. D. A., Washington, D. C., Dec. 1937, W. B. Lanham, F. H. Harper, and G. E. Miller.

"Grade and Staple Length of Cotton Produced in Louisiana, 1928-34," U. S. D. A., Washington, D. C., Oct. 1936, W. B. Lanham, C. C. McWhorter, and I. M. Skinner.

"Quality of Cotton Ginned in Mississippi, Crops of 1928-34," U. S. D. A., Washington, D. C., Feb. 1937, W. B. Lanham, F. H. Harper, and Marguerite Dodson.

"Quality of Cotton in Arkansas and Missouri, 1928 to 1935," U. S. D. A., Washington, D. C., July 1937, W. B. Lanham, R. C. Soxman, and Virginia E. Gilliam.

"Quality of Cotton Ginned in South Carolina, Crops of 1928-36," U. S. D. A., Washington, D. C., Dec. 1937, W. B. Lanham and F. H. Harper.

"Quality of Texas Cotton, Crops of 1928-35," U. S. D. A., Washington, D. C., March 1937, W. B. Lanham, G. E. Miller, and Norma L. Goudy.

Pat—"What do you charge for a funeral notice in your paper?"

Editor—"Fifty cents an inch."

Pat—"My Heavens, man, my poor brother was six feet tall."

"Men who don't play golf don't know what they're missing," says an enthusiast. Many men who do play golf know perfectly well what they are missing, and still can't hit it.

Theory and Practice in The Use of Fertilizers

IN STRIDE with the phenomenal progress in the manufacture and use of fertilizers during the past decade is the thoroughly revised edition of "Theory and Practice in the Use of Fertilizers," by Dr. Firman E. Bear, formerly Professor of Agricultural Chemistry and Soils, Ohio State University (John Wiley and Sons, Inc., New York, $4.00). Like the preceding edition, this new book is a broad treatise on subjects pertaining to the science of soil improvement through the efficient use of fertilizers. The simplicity in style employed by Dr. Bear in the text arrangement adds a great deal to the readability of this book.

Historical Approach

Before one clearly understands the numerous theories involved in the study of the science of soil fertility, it is imperative to reminisce through the early pages of history to grasp the real concept of our modern principles. This Dr. Bear skillfully does in the introductory chapters. At the end of each of the 20 chapters comprising the book are found a number of selected references from eminent authorities who lent outstanding contributions to the subjects with which the various chapters deal. While the general scope of the new book is somewhat the same as the previous ones, several chapters are entirely rewritten to conform with the more recent investigational findings, and a chapter on "trace" elements is added. This new edition thoroughly covers the advancements made in the fertilizer industry. Among these are the recent developments in the domestic production of potash and other chemical fertilizers.

The author is conscious that much still remains to be done before a really scientific use of fertilizers will be possible. Scientific research is continually adding to newer concepts of soil improvement by means of artificial fertilizers. Many of our comparatively recent beliefs have been altered or disproved. Experience has shown us that it is impractical to gather all the needed nitrogen from the air through growing legumes as some formerly believed feasible. Likewise, the use of the cheaper forms of phosphate as phosphate rock is now recognized to be less economical for most of our soils than was previously contended. And the author points out that Hopkins and his followers were in error with reference to a number of points in theory concerning the ability of the soil to supply potash for plant growth. The minor elements were once considered "plant poisons," because when used in more than small doses they were likely to be injurious to crops. Soils over wide areas are at the present time so deficient in one or more of these "trace" elements that they must be used in some form to avoid crop failure.

Reference Manual

In the chapters dealing with these and the related topics, the reader is given much valuable information that will serve a useful purpose in the growing of economical yields of the standards crops. This book is a splendid reference manual for students and everyone concerned with fertilizer theory and practice.

"We Are Growing Into, Not Outgrowing, Age of Wood"

"We are not outgrowing the age of wood," says the United States Forest Service. "In fact, according to present indications, we are only growing into it."

At the Forest Products Laboratory, maintained at Madison, Wis., by the Forest Service for research into the problems of wood utilization, scientists are testing the practicability of prefabricated houses of wood, to be built by mass production in factories and erected complete in a week or less. The laboratory also is improving methods of making joints and fastenings so that timbers can be used more efficiently for bridges, arched halls, and hangars.

Is Renewable

"One of the advantages of wood as a raw material," says Dr. Warren D. Brush of the Division of Forest Products, "is that it is renewable. With sound forestry we can grow successive crops; we can keep up the supply forever."

About 50 billion board feet of wood is used in the United States in an average year. To better visualize what that means, Dr. Brush used a boardwalk 40 feet wide and an inch thick as a yardstick. Fifty billion board feet would be enough to make such a walk as long as the distance from earth to moon.

More than one-half this wood goes into building construction. The second largest use of wood is for fuel. Millions still rely on wood to heat their homes and cook their meals. A most important use of wood is paper for books, magazines, and newspapers. The United States uses more than 4,000,000 tons of newsprint a year—200 pounds for each person.

"Newsprint, however," says Dr. Brush, "uses only about one-third of the wood-pulp production. The rest comes from the mills in myriad forms—as writing paper, as cartons for cereals, butter, ice cream, and hundreds of other products; as paper napkins, cups and plates; and as paper sacks, an unending list of articles used daily to cushion the rough angles of existence. Experts predict that by 1950 we will be using, for all purposes, 25,000,000 tons of wood pulp annually—twice our present consumption."

Truck-crop Farming in Mississippi

(*From page* 22)

The mixtures most commonly used in the trucking area are 3-8-5, 4-8-4, and 4-8-8. In special areas of the State where 4-10-7 and 4-8-8 have been used altogether for potatoes and watermelons, the 4-8-8 will largely be used. It was agreed that this mixture was just as well adapted for these crops and at the same time was slightly cheaper.

Both farm experience and agricultural research indicate that truck crops in general should be fertilized with a high-grade complete fertilizer analyzing from 4 per cent to 8 per cent potash. Also that the 4-8-8 is the mixture to be used on crops where the 4-10-7 has been used heretofore.

Most of the tomato crop and a large

portion of the cabbage crop are grown on small bottoms or valleys and second bottoms, as these soils contain more moisture. On most of these soils, as well as on the more sandy soils, farmers can use the maximum amount of potash recommended.

Of general interest is the wide distribution of tomatoes and cabbage. The Bureau of Agricultural Economics reported that in 1937 tomato shipments were made to 198 cities in 32 States and the District of Columbia and Canada. States leading in purchases of tomatoes included Pennsylvania, New York, Illinois, Massachusetts, Michigan, and Virginia.

Cabbage was shipped in carlots to 149 cities in 33 States and Canada. Cities taking the largest volume of tomatoes were New York, Philadelphia, Pittsburgh, Detroit, Baltimore, Cincinnati, Montreal, St. Louis, Washington, Nashville, Toronto, Indianapolis, Louisville, and Memphis.

Corn Can Be Grown on "Frenchy" Soil

(*From page* 20)

almost a standard practice. Usually a complete fertilizer is used, but it was found that none of the mixtures available carried what was regarded as enough potash, so they were built up by the addition of a quantity of one of the potash salts.

In order to determine the plant-food requirements of corn on this soil type as accurately as possible, a demonstration was arranged last year with J. B. Clayton, a prominent farmer of Falkville, with FFA Chapter of the Falkville High School cooperating. It is perhaps more proper to call the test which was conducted an experiment, because the most uniform soil available was selected, the land was measured accurately, the fertilizer was weighed carefully, and the yields were recorded properly.

Appearance of the crop was observed throughout the growing season, and it was noted that plots which received potash had a dark-green color and gave every indication of normal development. On the other plots the corn was yellow and under-sized, and presented a marked contrast in appearance. As the plants neared maturity, those which did not receive potash began to fall down, and nearly half were on the ground at harvest time. The accompanying photograph shows two of the plots as they appeared just before the corn was gathered.

The treatments of the various plots and the per-acre yields are as follows:

Plot No.	*Treatment*	*Amount per acre*	*Yield*
1	Muriate of potash	100 lbs.	28.0 bus.
2	Muriate of potash	100 lbs.	31.9 bus.
	Nitrate of soda	200 lbs.	
3	Nitrate of soda	200 lbs.	14.4 bus.
	Superphosphate	200 lbs.	
4	Muriate of potash	100 lbs.	33.8 bus.
	Nitrate of soda	200 lbs.	
	Superphosphate	200 lbs.	
5	Nitrate of soda	200 lbs.	17.5 bus.
6	No fertilizer		16.9 bus.
7	Superphosphate	200 lbs.	27.6 bus.
7	Muriate of potash	100 lbs.	

It is our purpose to continue this experiment with perhaps the addition of plots in which higher amounts of potash are used. The possibility that larger applications might be profitable was apparent when it was observed that complete control of lodging was not obtained with the amount used in this test.

Closely associated with the Hollywood soil in this section of the State in its apparent plant-food requirements is the Colbert series. While the latter is adapted to a greater diversity of crops, demonstrations and experiments indicate that the response to the different fertilizer elements is very similar.

A Primer Explaining Cotton Disease Control

(From page 19)

of cotton seedlings, so that they may just as promptly as possible push through the soil and grow out of the susceptible seedling stage. This can largely be brought about by first putting soil in as good a condition of tilth as possible with a mellow, warm seedbed, and second by avoiding excessively early planting. Waiting until the soil warms up sufficiently to allow prompt germination and rapid emergence may make all the difference between a ragged stand or no stand at all and a perfect one.

Seedling Diseases

Recently other methods of combating seedling diseases have been devised. The de-linting of cotton seed with sulphuric acid not only disinfects the seed but also promotes rapid water absorption and prompt emergence. This treatment has found greatest acceptance in the irrigated sections of the Southwest, as a control for seedling diseases and also for the control of angular leaf spot of cotton. In cool weather and in soggy, wet soils, acid de-linted seed has not always given complete satisfaction.

The use of organic mercury dusts has become increasingly popular, particularly in the more easterly cotton States, for the control of seed borne diseases of cotton, such as angular leaf spot, and also for the control of soil borne parasites, and has given excellent results both with respect to the control of seedling blights and angular leaf spot. In all probability this measure should prove of benefit when cotton is to be planted early, especially in heavy soils and when serious outbreaks of angular leaf spot and boll rots have occurred the previous season and the seed is either badly contaminated with disease germs or is of low germinative power. Combinations using acid de-linted seed or machine de-linted seed and organic mercury dust are promising measures for the control of seedling blights, angular leaf spot, and boll rots.

As has been previously said, Fusarium wilt, "rust" or potash hunger, and root-knot or nematode disease form a trio of highly destructive diseases commonly prevalent in some of the best, sandy alluvial cotton soils of the South. Nearly 50 years ago Doctor George F. Atkinson of the Alabama Experiment Station, one of the great trail-blazers in the study of cotton diseases, discovered that the true cause of cotton wilt was a fungus which penetrated the water tubes of the roots and stem from the soil. He reported also that when root knot or nematode disease with its swollen, unsightly roots is present, cotton roots become greatly weakened and highly susceptible to attacks of the cotton-wilt fungus. This finding has been amply and repeatedly verified since that time, and it is now recognized that when soil is badly infested with the root-knot disease, the nematodes must first be eradicated from the soil before any of the other measures devised for the control of cotton wilt will be successful.

Nematode Control

Unfortunately, no adequate method of getting rid of nematodes on a large scale has been found except by starving them out of the soil through a rotation of at least 2 years, using some nematode-resistant crop. This method will be successful only if clean cultivation is practiced, since many of the common field weeds are susceptible to the root-knot disease and serve to maintain the soil infestation. Crops useful for such a rotation will vary with conditions and the part of the country concerned. Some of the important resistant crops are small grains, corn, sorghum, Iron, Brabham, Victor and Monetta cowpeas, Laredo soy beans, peanuts, and crotalaria. Experience has further shown that it is wise to avoid extremely susceptible crops, such as Whippoorwill cowpeas, in cotton soils even if traces of root knot are present, since the soil is apt to become so heavily infested with the nematodes that cotton cannot be grown there successfully for several years.

Potash Hunger

If root knot has not been present previously, or has been largely eradicated by the proper rotation, the next consideration should be the question of "rust" or potash hunger. This disease of cotton is widespread in the sandy soils of the cotton belt and in that part of the cotton area adjoining the Mississippi River and has been shown to be commonly a factor in greatly increasing the severity of cotton-wilt attacks. Whether or not "rust" is associated with cotton wilt, it is itself a serious disease which must be controlled before cotton will do its best.

The yellowing and reddening of cotton leaves, early dropping of the foliage, and premature death of cotton plants, accompanied by failure of the top bolls to mature, which are characteristic of "rust" or potash hunger, all signify a profound upsetting of the normal processes going on within the cotton and cannot fail to greatly reduce the yield and quality of the cotton crop. Fortunately potash hunger can, in the large majority of cases, be completely controlled by the use of potash-containing fertilizers, the actual amount necessary varying greatly with local conditions. In Arkansas, where this problem has been studied for many years, it has been shown that relatively high amounts of nitrogen and phosphate with low amounts of potash may be of little benefit for the control of either "rust" or cotton wilt, and that unbalanced applications without any potash at all may actually greatly increase the severity of both "rust" or potash hunger and cotton wilt. On the other hand, well-balanced mixtures or potash alone have given excellent control of both "rust" and cotton wilt.

The building up of the humus of the soil through the use of green manures has been shown to have highly beneficial effects with respect to cotton "rust." On the other hand, repeated removal of potash from soil through harvesting of leguminous crops for hay over a period of years often so completely upsets the balance of fertilizing elements in the soil that it greatly intensifies the severity of potash hunger and cotton-wilt attacks.

The cotton-wilt disease is widespread in the coastal plains regions and in the sandy alluvial river valley soils of the cotton belt. Injury varies from mere traces to practically complete losses. This latter condition most often results when highly susceptible cotton varieties, such as Half and Half, Acala, or Mebane are planted on nematode-infested or potash-deficient soils.

Cotton Wilt

As has been previously mentioned, attacks of the root-knot nematode seriously damage cotton roots and render them highly susceptible to invasion by the cotton-wilt fungus. In planning a control program for the cotton-wilt disease, it must be recognized that cotton wilt cannot be successfully controlled unless root knot or nematode disease has been controlled. Further, it should be remembered that in parts of the States of Arkansas, Mississippi, and Tennessee, and in certain other localities, it has been shown definitely that the control of potash hunger through the use of potash-containing fertilizers greatly reduces the incidence and severity of the cotton-wilt disease. Consequently,

Control of cotton wilt and "rust" or potash hunger through the application of muriate of potash. At the left only acid phosphate was used. All plants were severely affected with "rust," and more than 40% showed cotton wilt. At the right, perfect control of potash hunger and only a trace of cotton wilt as the result of applications of muriate of potash alone. Note that the foliage is in perfect condition and that the top bolls are maturing and opening well. On soil as "weak" as this, much better results were secured when potash was a part of a well-balanced mixture.

in many localities it is also necessary to plan a system of balanced fertilization with potash-containing fertilizers as a part of the program for cotton-wilt control.

Finally, having provided for the control of root knot and "rust" or potash hunger, cotton wilt control also requires the employment of a cotton variety suitable to one's particular locality; a variety which is sufficiently resistant to the cotton-wilt disease that when the other factors mentioned above (i. e., the control of root knot and rust) have been taken care of, the incidence and severity of the wilt disease is reduced enough to make losses unimportant. This does not mean that the most resistant variety available need always be employed since, under many conditions, varieties which are only moderately resistant, such as Arkansas Rowden 40, 2088, or 4056 possess sufficient resistance and are otherwise better suited to certain conditions, giving them preference to more resistant varieties. However, under the more severe cotton-wilt conditions particularly of many coastal plains areas, the most resistant variety available is none too resistant. Here strains of Dixie 14, Dixie Triumph, Cook, Clevewilt, and similar varieties are needed. In general it may be said that there are wilt-resistant varieties suitable to every cotton section of the South where cotton wilt is present and that there is no need to use susceptible varieties of cotton, such as Half and Half, Delfos, Acala, Mebane, and the like where cotton wilt is sufficiently serious to cause commercial losses.

Summarizing briefly, we may say that cotton disease control requires first careful observation in previous years so that one may know rather definitely just what diseases are causing losses. If root knot is one of them, a rotation looking toward its elimination is necessary. Second, the grower must lay careful plans for the use of proper wilt-resistant varieties, the necessary fertilization, and the required seed treatments before the rush of the planting season. Finally, he must resist the temptation of excessively early planting and must, so far as possible, prepare a warm, mellow, seed bed which will encourage prompt germination and emergence and rapid growth out of the susceptible seedling stage. Let it be emphasized again that after the seed is planted it is too late to start a cotton disease control program.

Soil Tests Improve Canning Crops

(*From page* 18)

TABLE I

Plot	pH	NO_3	Ca	Mg	P	K
1. Standard fertilizer, surface	6.8	M+	H	H	H	VL
Standard fertilizer, subsoil	7.0	M+	H	H	H	VL
2. Check, surface	6.8	M+	M	H	H	VL
Check, subsoil	6.6	M	L-M	H	H	VL
3. Extra potash, surface	6.8	M+	M	H	VH+	VL
Extra potash, subsoil	6.6	M	L-M	H	VL	VL

VL—very low; L—low; M—medium; H—high; VH—very high.

extra potash were a darker green and were more vigorous but showed, on an average, only one set of fruit per plant, whereas the plants on the plot with the standard fertilizer treatment were smaller, a lighter green color, and had two or more "sets" per plant.

As the season progressed the plants on the extra potash plot retained their vigor, and the leaves remained green until they were killed by frost, while the leaves on the other two plots died early in September.

The writer in company with the farm manager made a careful survey of the plots on September 14. Although yield records were not taken, the maturity and quality of the fruit and approximate percentage of diseased fruits were noted. At this time, plot 1 showed 60 to 70 per cent infestation of Phoma and bacterial soft rots, few green tomatoes, a large percentage of rough fruits, together with a considerable amount of "leather end." The check plot showed somewhat less disease and fewer rough or cull tomatoes. On the other hand, the extra potash plot showed 5 to 10 per cent green tomatoes, very little disease, larger and much more uniformly sized fruit.

The accompanying photograph shows representative samples of fruit taken from the various plots. Soil samples were taken at the end of the season, and the results of rapid tests are given in Table II. Because the extra potash had been applied as a surface application, it was considered desirable to sample the surface layer at a depth of 1 to 4, and 4 to 7 inches to determine whether or not it had penetrated to the full depth of the

TABLE II

Plot	NO_3	Ca	Mg	P	K
1. Standard fertilizer, 1—4"	trace	L-M	H	H	L
Standard fertilizer, 4—7"	trace	L-M	H	M	L
2. Check, 1—4"	trace	M-H	H	L-M	L
Check, 4—7"	trace	M-H	H	M	VL
3. Extra potash, 1—4"	trace	L-M	H	H-VH	M
Extra potash, 4—7"	trace	L-M	H	H-VH	M

surface soil. For the sake of uniformity all three plots were sampled in the same way.

The tests at the end of the season show that the soil from the plot receiving potash in addition to the standard fertilizer had the available potash supply considerably improved in spite of the heavy crop produced. In view of the improved quality of the fruit and freedom from disease on this plot, it would appear that for potash-deficient soils in this locality, larger amounts of potash in the tomato fertilizer are necessary to meet soil and crop needs.

Out of the Wealth of Our Soils

(*From page* 11)

grain, but in spite of drought and excessive heat there was a remarkable response to the fertilizer. Tabulated below are the results of this demonstration.

that the straight phosphate treatment had accentuated the potash hunger in the alfalfa on this plot. The alfalfa plants were dwarfed and stunted, and showed not only the early symptoms

1936 RESULTS

Treatment	Rate per acre	Yield per acre grain	Yield per acre straw	Bushels increase grain	Pounds increase straw	*Value of inc. grain + straw	Cost of fertilizer	Net profit per acre
Check.....	......	10.5 bu.	472 lbs.	......	......	....	....	....
0-20-0.....	225 lbs.	16.8 bu.	870 lbs.	6.3 bu.	398 lbs.	$4.74	$2.75	$1.99
0-20-20....	225 lbs.	23.4 bu.	1,020 lbs.	12.9 bu.	548 lbs.	8.64	5.25	3.39

* Oats valued at 50c per bushel. Straw valued at $8.00 per ton.

However, the residual benefit to the alfalfa and timothy hay crop in 1937 gave us our biggest surprise. On the plot which had received the 0-20-20 treatment there was a good crop of hay, but where no fertilizer had been applied (lime only) the crop of hay was very poor—in fact, a mangy, potash-hungry, sorry looking sight. Where superphosphate alone had been applied the alfalfa was but little better, although the timothy seemed to be a somewhat heavier crop than on the check plot. It was strikingly apparent of potash starvation, but dried up prematurely. Following is a tabulation of the results in 1937 and the total net value of the increases for 1936 and 1937.

From the above data it will be noted that there has been a net gain of $16.72 over and above the cost of the fertilizer, and there should be still further benefits in 1938 and 1939, if the alfalfa does not winter-kill. Furthermore, the heavier growth of alfalfa will add more nitrogen to the farm; the extra tonnage of alfalfa will make

1937 RESULTS

Treatment	Yield of alfalfa	Increase	*Value of increase	Total net value of grain and alfalfa increases
Check......................	1,777 lbs.	....	....	....
0-20-0......................	2,444 lbs.	667 lbs.	$4.00	$5.99
0-20-20......................	4,000 lbs.	2,223 lbs.	13.33	16.72

*Alfalfa valued at $12.00 per ton.

more manure which will add to the fertility of the farm as a whole.

I am positive that the results recorded above can be duplicated on thousands of farms in this north-central area. In fact, hundreds of such demonstrations have been conducted on a wide range of soils scattered over southern, central, and north-central Wisconsin during the past few years, and they all tell the same story—perhaps not in quite as spectacular a way as noted in this Colby soil area, but it is strikingly apparent that our soils are wearing out, that our feed shortage problems are vitally associated with waning fertility.

Residual Profits

Fifty-one demonstrations were set up last year (1937) on small grain (many of the fields seeded to alfalfa and clover). In 49 out of the 51 demonstrations the increase in the yield of grain more than paid for the fertilizer, and the entire cost of the fertilizer was charged against the grain crop. This is hardly fair, for we know that the residual carry-over on seedings or other crops will add further to the returns on the fertilizer in the 2 or 3 years following. In most all of these 51 demonstrations we made a direct comparison of 20 per cent superphosphate with a mixture carrying potash. In a high percentage of cases the plots receiving potash in addition to phosphate not only gave larger increases, but the net return was greater. The benefits to the alfalfa and clover crop in 1938, and perhaps 1939 and 1940, will add further to the benefits from potash, since alfalfa and clover are heavy feeders on potash.

And so the influence of all of our work for the achievement of a sound soil improvement program will in time bear fruit and may be compared, I believe, to the influences of a good home, good environment, high ideals and education on our children of this generation, on the future citizenry of this country. We all know that by and large our efforts will have a profound influence, that if we keep talking, thinking, working, and striving for the accomplishment of our desires for good, in time we shall achieve our aims. A quotation to which I frequently refer, the thought of which was dramatically told in Hawthorne's story, "The Great Stone Face," is expressed in the following words by James Allen, "The vision that you glorify in your mind, the ideals you enthrone in your heart, this you will build your life by, this you will become."

Safeguard Fertility of Your Orchard Soils

(*From page* 16)

sufficient for trees accustomed to much more. This was no doubt an important factor in the injury experienced here in 1930.

"It is notable, however, that on deep soils in good physical condition, capable of storing a large reserve of moisture from late fall and winter precipitation, trees of all varieties withstood the drought without injury. In some instances heavy crops of fruit of good size and good color were matured. The drought has thus emphasized the lack of soil moisture-holding capacity as one of the greatest inherent weaknesses of orchards of this region.

"The orchards suffering most from this are on high ground or on hillsides where erosion has worn the soil thin, on shallow shales, and on limestone soils made shallow in places by the outcropping of rock. A few instances of injury were observed on deep, low lying soils with a high water table in which, however, in normal years abundant surface moisture from drainage of the higher surroundings had encouraged shallow rooting. When the trees in one such location were removed late in 1931, the root systems were observed to be very shallow and very small in proportion to the tops of the trees."

Similar observations were made throughout Virginia. It was almost a parallel in the association of these weaker, drought-injured trees and the still more serious injury and even final demise due to the subsequent low winter temperatures. The vast majority of trees that were unable to survive the following winter were those principally weakened by the previous summer drought. The more vigorous trees, particularly those in situations abundantly supplied with soil humus, came out with very little apparent injury. A very convincing set of observations, bringing out the effectiveness of soil humus in mitigating against winter injury, appeared in the data of a paper prepared by Dr. L. P. Batjer for the Pittsburg meeting of the American Society for Horticultural Science in 1934. These data are presented herewith as Table II. They show that in 22 cases out of 24 in one group and 13 out of 18 in the second, or 35 cases in 42, no winter injury occurred in the soils with the higher per cent of organic matter.

Further instances indicating injuries during the winter in soils low in humus are contained in the observation reported last year, 1936, by Anthony, Sudds, and Clarke of Pennsylvania. They report "A higher percentage of trunk injury on both apples and peaches was seen in an orchard along the Schuylkill River below Reading. Here excessive cultivation has resulted in heavy erosion and a low state of fertility in the orchard. The only factor which seemed to be associated with apple-tree winter injury was low vigor which was usually due to poor soil."

From the various observations made

TABLE II. Relationship of Per Cent Loss on Ignition in the Hoosic Soil to Root Injury of Young Apple Trees During the Winter of 1933-34.

Group 1			Group 2		
Pair No.	Uninjured trees in row 9 (Former fence row)	Nearest dead tree	Pair No.	Uninjured trees other than row 9	Nearest dead tree
	1	2		3	4
1	5.53	5.00	1	5.24	4.15
2	5.87	5.25	2	5.31	5.01
3	5.41	4.10	3	6.10	5.39
4	6.13	5.39	4	3.58	4.64
5	5.79	5.44	5	4.28	4.07
6	5.62	5.92	6	5.08	4.43
7	5.86	4.80	7	3.73	4.64
8	5.38	4.06	8	5.65	4.90
9	5.58	4.63	9	3.84	3.20
10	5.45	4.55	10	3.56	2.86
11	5.37	3.79	11	3.74	3.59
12	5.75	4.08	12	5.13	4.30
13	5.12	3.92	13	5.23	5.24
14	5.32	4.03	14	5.17	4.95
15	4.69	3.82	15	5.45	3.94
16	4.80	4.16	16	3.72	3.44
17	4.06	4.08	17	5.23	4.64
18	4.35	4.21	18	4.92	4.94
19	4.60	3.69			
20	4.38	3.91			
21	4.10	3.14			
22	4.04	3.98			
23	4.65	4.18			
24	5.50	4.53			

Following one season of a 10-6-4 fertilizer combination at the rate of 10 pounds per tree, badly neglected trees of low vigor and little fruit production produced as high as 25 bu. per tree. The cost of this fertilizer is about 25c or 1c per bu.

here and numerous cases cited elsewhere, it would appear advisable to get liberal amounts of humus into the orchard soil. How may the fruit grower best handle the orchard soil to maintain a liberal supply of such material?

Use of Ground Cover

Although orchard soils under clean tillage may show for some time much better results in tree growth and fruit production, there are for apple orchards some very decided advantages in a modified sod system of ground cover. The advantages of clean cultivation, even in a fairly fertile soil abundantly supplied with humus, especially in controlling competition from ground cover growth of weeds and securing aeration, are finally offset by many ill effects that develop with continued cultivation.

Where cover crops, sods, and mulches are utilized, there is greater reduction of rapid run-off of rainfall, reduction of washes due to erosion; and chances are better for greater penetration of rainfall with a greater retention of such moisture over a longer period. However, a very heavy, unbroken, or uncracked sod orchard cover as well as competing cover crops, especially during the development of fruit when the demands of trees for soil moisture are at their highest peak, have great disadvantages. Heavy unbroken sods also invite the fire and mouse hazard. But with some modification a system of maintaining a sod or ground cover can be made to give the best practical results, especially for apple trees 5 years and older.

Judging from the excellent results secured in the orchard plots conducted by the Virginia Agricultural Experiment Station around Blacksburg, Va., it would be very profitable for most orchardists to adopt those practices which bring about a system of growing strong, luxuriant ground-cover vegetation, subject to the greatest possible amount of control, should it compete seriously in any way with the fruit trees. It would be well to insure conditions for quick, rapid growth particularly through fall and early spring.

In many respects a careful system of growing rye will almost be sufficient, particularly when supplemented with other volunteer growth. Rye has many valuable advantages. It can be made to grow vigorously in the fall with a production of efficient, soil-binding roots. This crop is ready to grow with a rapid start early in spring. While it is making this rapid growth, the soil moisture needs of the apple tree are less rigid. Even in years of low spring precipitation, it has been found that a ripening rye crop is not a very serious competitor with the fruit trees. As the rye crop ripens, its ability to compete with the stronger root-foraging powers of the trees progressively diminishes. Furthermore, a stand of rye as it develops through to a ripened crop is most admirably adapted to catch and prevent rain run-off. More generally gains made from such water retention to the fruit trees planted in such a crop are far greater than what is taken away from them by the rye crop.

Later in the season after ripening, this rye crop can easily be dragged down or disked, seed, straw, and all. Later a volunteer crop will come up. This mulch of rye straw is very effective in the summer retention of soil moisture and at the most critical growing and crop-developing period of the fruit tree. To get the most out of such a rye crop it should be liberally fertilized with a complete fertilizer. The writer has secured an excellent result with a 10-6-4 fertilizer.

A rye crop can also be supplemented with other ground cover crops of a perennial nature, especially those that may come up voluntarily in the fall. Among these are many of the common grasses and legumes which, under Virginia conditions, will soon develop into heavy sods if permitted. It is best, however, to discourage any tendency towards sod binding, even though all efforts should be employed to get quick, succulent, lush growth.

In the maintenance of orchard ground covers to get the most practical results in improving the water-holding properties of the orchard soil, no better provision can be made than using adequate amounts of fertilizers containing not only nitrogen but also phosphorus and potash. Agronomists far and wide give us an abundance of proof that such a fertilizer practice gives the greater yields. The experiments of Evans in Ohio with the fertilization of timothy meadows show a production of 3,731 pounds of air-dry hay for 120 pounds of nitrate of soda, 240 pounds of 16 per cent acid phosphate, and 80 pounds of muriate of potash to the acre. Comparing this to the adjoining plats receiving no phosphorus or potash but 120 pounds of sodium nitrate, the yield was 3,180 pounds of hay, and a 5-ton application of farm manure yielded 3,264 pounds of hay.

Results secured at the Virginia Agricultural Experiment Station also show higher yields where complete fertilizers are applied to various agronomic crops. Over a 22-year period, 1914-1936, the following results have been secured at this station near Blacksburg, Va.: 2.14 tons of clover hay per acre with NPK combination, as against 1.01 tons where only N was used, and 2.43 tons grass hay for NPK against 1.13 tons for N only. In these treatments 308 pounds of a nitrogenous source of fertilizer per acre were used. To this amount of nitrogenous fertilizer 438 pounds of acid phosphate and 200 pounds of muriate of potash were added for the complete fertilizer application.

Fertility Safeguards

Summarizing this discussion on orchard soil-fertility safeguards, it would be well to call attention to the following salient points:

1. For healthy, vigorous, and productive growth, it is absolutely essential that fruit trees be adequately supplied with nitrogen, phosphorus, and potassium in the soil.

2. Fruit trees deprived of nitrogen show up in such deficiency as follows: (a) terminal growth of young apple trees shows small yellowish-green leaves and reddish petioles which form narrow angles with the stem; (b) relatively small leaves with red pigmentation usually present on veins and petioles; (c) short and slender current growth of stem and twigs; (d) slender roots with yellowish cortex on new growth.

3. Fruit trees deprived of phosphorus show up in such deficiency as follows: (a) foliage abnormally dark green, especially the young leaves, older leaves tend towards mottling and appear lighter than the younger leaves; (b) usual tendency towards high, purplish-red pigmentation in both stem and leaves, especially near the ends of the twigs; (c) tendency of leaves to develop a tough texture and form abnormally sharp angles with the stems; (d) slender twigs; (e) tendency for the appearance of abnormally small, dark-green leaves and considerable purplish-red pigmentation on foliage and stem of the growing tips.

4. Fruit trees deprived of potassium show up in such deficiency as follows: (a) relative slender twig and stem growth sometimes in the absence of appreciable restricted linear growth; (b) tendency towards the development of relatively smaller leaves; (c) development of marginal leaf "dry-back" starting first on leaves growing on the lower half of the current stem; (d) with greater degree of marginal leaf "dry-back" newer leaves tend to become smaller and thinner than under normal conditions; (e) tendency toward root and twig "die-back"; (f) tendency of fruit to be subject to a greater degree of "spotting."

5. Under field conditions the greater direct profits come from the applications of the various nitrogenous fertilizers to fruit trees.

6. Under field conditions the more noticeable direct responses of fruit trees to complete fertilizers come after their fifteenth year and especially under conditions of root crowding.

7. Soil moisture control and retention by means of the incorporation of ample amounts of organic matter are of vital concern to all fruit growers. The best insurance in such orchard soil management is ample fertilization of the ground or cover crops with complete fertilizers.

When, How and Why Fertilize Your Lawn

(*From page* 8)

height of cut of 1 inch or longer, and reseeding with adapted grasses to repair injuries, constitutes the most effective method of controlling crab grass.

The following recommendations for feeding lawns have been devised for humid regions in the northeastern quarter of the United States, as the result of extensive tests conducted by the New Jersey Agricultural Experiment Station over a 10-year period.

Home gardeners frequently require advice on the need for uniform distribution of fertilizer over the lawn surface. Since fertilizers move downward into the soil and do not penetrate laterally, areas not actually covered by fertilizer derive no stimulating effect.

Kind of soil	Fertilizer analysis	Amount to apply lbs. per 1,000 sq. ft. Early spring	Early autumn
Average to poor lawn soils	5-8-5 5-10-5 4-12-4	10 to 20 lbs.	10 to 20 lbs.
	15-30-15	3 to 7 lbs.	3 to 7 lbs.
Fertile soils, well supplied with phosphates and potash	8-6-4 10-8-6 10-6-4	5 to 10 lbs.	5 to 10 lbs.

Burning the turf with even the most concentrated fertilizers may be avoided by uniform distribution at a time when the grass leaves are completely dry. Applied in this manner, the material sifts through the leaves onto the soil, without injury to the turf. Artificial watering after fertilization is not essential where this practice is adopted.

Where the home lawn has failed, it will pay to inquire into the fertilizer practices. Turf grasses respond to rich, fertile, soil, and will endure much harsh treatment if properly fed with available plant nutrients during the cool seasons of the year.

On Being Domestic

(*From page 5*)

the west. To be sure, fried taters, ham and eggs, and murky coffee deprived me of vitamins, although I didn't know then what ailed me, thinking it was love or prairie fever. Tiring of this porky fare, I purchased a packet of hail-stone tapioca. I dumped it in a soup kettle and started the fire of buffalo chips. Everything was lovely except my supply of empty dishes in which to deposit the ebullient lava of pudding which kept frothing over the top. By night fall as the coyotes howled in derision, I had filled all the cups and saucers, sugar bowls and pitchers, and was about to start on the wash boiler, when the fire went out. Ever since then I have never doubted the Christian parable of feeding the five thousand, only I believe they must have used tapioca.

WHILE advocating greater self-reliance for the men folks as one good reason for becoming adepts around the homestead, it occurs to me that some women just naturally resent interference on the part of all interlopers, even such harmless and well meaning ones as husbands.

As brides they resent it because of a constant suspicion that you are trying to graft on some of your mother's deft and artful methods to make the new tree of life more fruitful and aromatic. They declare it to be the inalienable right of new wives to experiment with expensive flour and baking powder even at the risk of a bilious better-half.

In my own case that period of trial and error was surprisingly brief, considering that my bride had so little culinary practice beforehand. For the life of me I cannot recall a single batch of cemented cookies, or gawmy pie-crust, or liver-corroding omelets to harass my honeymoon. And through the subsequent years, with something like 20,000 menus she has planned and served to me and countless eager friends and sponging relatives, I should be the last man in the world to suggest an invasion of the kitchen. She knows it, and I know she knows I know it. I'd much prefer to advise others to try it.

It is her belief that if a man wishes to be useful around the house, let him install a simple tool-chest and do the fixing that belongs to the realms of man. She will set the table and do the salads, thank you, if only somebody with horse sense and a strong wrist would pack that leaky faucet, loosen a tight drawer, or clean up the sticky gas stove. But no, I stand around gawking at the kettles and inhaling the incense with no more of an eye to the needful jobs than a preacher in a brewery.

I harbor no resentment at her attitude. If I had done a successful task for society 20,000 odd times like she has, and got better and better at every lick of the measuring spoon, there is no manner of doubt as to the superiority complex I should acquire forever more.

If the manual training courses had been more universal or if we had picked fathers with natural mechanical aptitude, I am sure many odds and ends jobs would be well adjusted in our homes without having to hire some union man to leave his tools and tracks all over the premises. And my wife resents that as much as having me around. But we are growing resigned to my clumsiness. You get ingenuity by inheritance or environment, or sometimes by a little of both. My nearest ancestors were evidently not gifted with manual dexterity, while our old school board in my youth thought "vocation" sounded too much like "vacation," and made us keep our noses stuck in books. So a poor excuse is better than no alibi. Though sometimes even a good alibi fails to soothe the ego.

ONE of my neighbors is constantly flaunting his talents with the tool-kit, particularly at critical times when I cannot afford to appear actually useless. I am rather helpless to meet him in rebuttal or revenge, for he doesn't play bridge or golf, and he is too dense to sense the utter depths of his defeat in any debate with me on what ails the farmer.

I hear him knocking and sawing and grinding at all uncouth hours of the day and night, and even on Sundays. My wife keeps repeating how proud and satisfied the neighbor woman is over her new hall-tree or sewing-cabinet; and in the summer time the fellow puts up a small tent on the lawn where he can show off, and slaps together bird baths, rose arbors, and picket fences. Next to being married to a genius the worst luck is being neighbor to one, and as a matter of fact I am in both boats at once and nearly sunk!

Wiseacres argue long and hard that compulsory military training is a good antidote for wars and a boon for home preparedness, but a sure cure for family wars and a certain aid to domestic bliss would be to compel every man child to take courses in cooking, carving, and carpentry—and forget the salutes and uniforms!

WHEN all else fails and our training is lacking, we can always fall back upon the passive attitude of just "being domestic." I mean by that pretending that you thoroughly enjoy mooching around in arm chairs, trying to get your mind off the office long enough to listen to something the kids have to chatter about. He who can slam his sanctum door and leave for home with no hang-over grouches or ponderous problems to enmesh him has come a long ways to glory.

I think I can measure up to this fairly well. Whether through inertia or low energy quotients, I do not cater to midnight poker shindigs, keno parties, or sessions in the pool hall or bowling alley. They are negative virtues no doubt, to be indifferent to such recreations, while the angle of thrift and self-denial attached to their renunciation gives one a sort of happy glow. Anyhow it allows me full time to get better acquainted with my family, whom I only see at best for about four waking hours out of twenty-four. And considering what it costs to run the outfit, that's a small enough time return on the original investment. In other words, I never could see how some dads could plunk down hard-earned simoleons on a domestic scene and only go there to snore.

All of which reminds me, I've got to pay my taxes this week and order another tank of oil—which are my public assurances that in spite of shortcomings, I am still able to be somewhat useful around the home!

SOLO CELEBRATION

The Negro was dressed up in his best clothes and was strutting majestically up and down the street.

"Are you not working today, Sambo?" asked a passer-by.

"No, suh," replied Sambo. "I'se celebrating my golden weddin'."

"Then you were married 50 years ago today?"

"Yassah."

"Well, why isn't your wife celebrating with you?"

"My present wife, suh," replied Sambo, in dignified tones, "ain't got nothin' to do with it, her's the fourth."

American Tourist (to Canadian Northwest Indian)—"White man glad to see red man. White man hopes big Chief is feeling tip top this morning."

Indian (calling)—"Hey, Jake, come here and listen to this bozo; he's great!"

SURPRISE ENDING

A parrot was sitting in the salon of a luxurious liner watching a magician do tricks. The magician served notice that he was now going to do a trick never before accomplished. He pulled up his sleeves and proceeded to make a few fancy gestures. Just at that moment the ship's boilers blew up. Five minutes later, as the parrot came to floating on a piece of driftwood, he muttered: "Damn clever, d a m n clever."

An Englishman, Irishman, and a Scotchman entered a cafe and ordered beer. When served each glass of beer had a fly in it.

The Englishman used a spoon to take his out.

The Irishman blew his out.

The Scotchman wrung his out.

Old Man: "I'll give you a dime, little girl, if you give me a kiss."

Little Girl: "Pooh on that stuff—I can get a quarter for taking castor oil."

His first day on the job, the colored hallboy dashed excitedly up to the register desk.

"De man in room seben has done hang himself!"

Clerk: "Hanged himself? Did you cut him down?"

Hall Boy: "No sah! He ain't dead yet!"

A sailor, after placing some flowers on a grave in a cemetery, noticed an old Chinaman placing a bowl of rice on a nearby grave, and asked: "What time do you expect your friend to come up and eat the rice?"

The old Chinaman replied with a smile: "Same time your friend come up to smell flowers."

Dog Catcher: "Little boy, do your dogs have licenses?"

Boy: "Yes, Sir! They're just covered with them."

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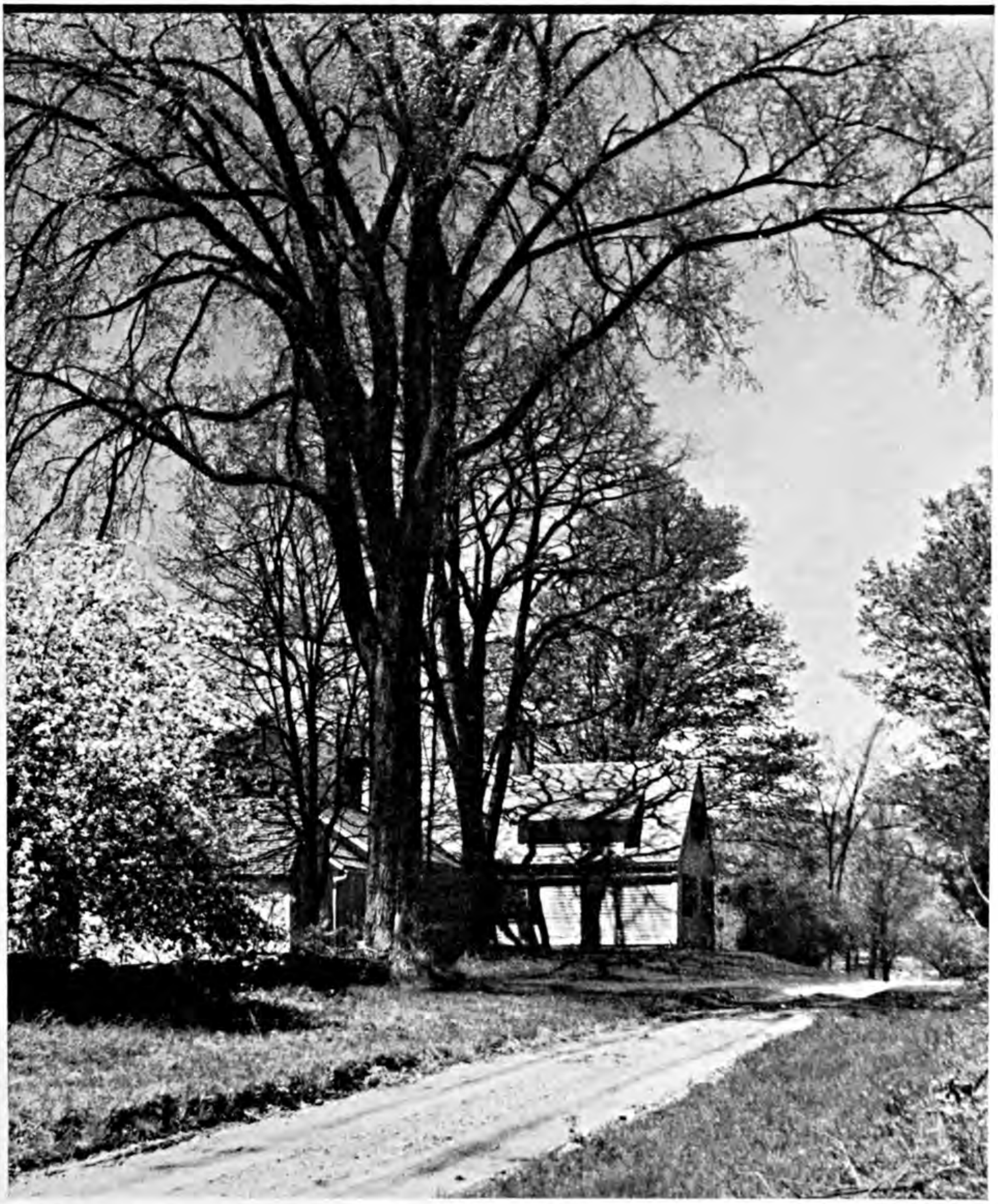
April 1938 10 Cents



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R. H. STINCHFIELD, *Editor*

Editorial Office: Investment Bldg., Washington, D. C.

VOLUME XXII NUMBER FOUR

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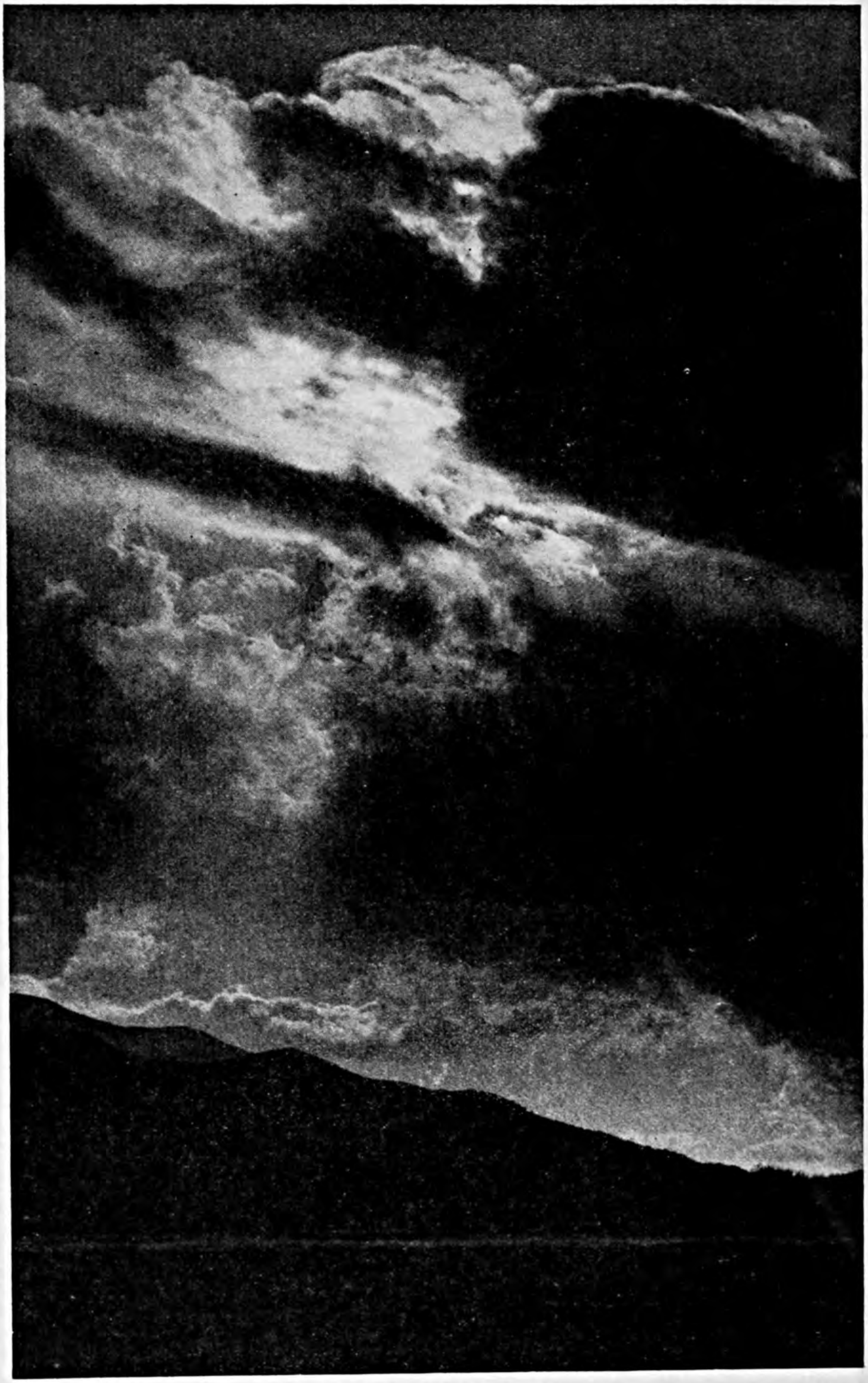

TEMPERAMENTAL APRIL.

Better Crops with PLANT FOOD

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VOL. XXII WASHINGTON, D. C., APRIL 1938 No. 4

Hope and courage spring anew in—

Vernal Visions

Jeff McDermid

BECAUSE spring gives us middle-aged gentry a new lease on life, whether we deserve it or not, I know of no topic just now which we may freely discuss with less chance of violent disagreement. We might easily become overwrought on naval preparedness, government pump-priming, the proper application of fertilizer, or how much pruning the orchard requires, but it stands to reason we all dote on spring, with special emphasis on us who do our doting in northern latitudes.

Plenty of us old buzzards who have quarreled with winter weather are prone to forget that a little cold storage sometimes preserves a good article longer than one might expect to keep it in good shape for protracted hot spells. This applies to us even as it does to Grandpap Jim Fry of Claremont, North Dakota. The United Press claims he celebrated his ninety-eighth birthday consuming his wonted menu of salt pork and corn whisky, and he jigs and sings ballads for relaxation, weighs 190 pounds, and can snipe a squirrel at 50 paces with a 22 caliber rifle. His advanced age and strong stomach can apparently be laid to the longevity of his family and their extreme hardiness amid the alternating blizzards and hot chinook winds of the prairies. We doubt extremely that Florida or California can boast, like Grandpap Fry, of any sister who lived to be 117 or a mother who lingered long enough to greet 120 happy spring revivals.

Most always we get our first hint of spring while we are snuggling abed some night in late March. Probably we have got callouses on our hands from shoveling snow and cracking ice-bergs at the back stoop, and blisters on our heels from clumping around in gummy overshoes; so when we heave in the coal and hoist ourselves onto the tick this March evening, nothing seems further away than Oregon and roses.

YET just as we are almost counting the last sheep over the fence and wishing wife's feet were warmer and her breathing less sonorous, we hear the slapping of rain drops above us. No, not the icy, bitter, sleety kind this time, but the gentle patter of a soft shower, borne on clouds driving up somewhere from Dixie, showing us that because we couldn't take that trailer trip to balmy Alabama, the good old South is going to share some of its great gifts with us up here among the busted water-pipes.

Down she comes, sloshing on the shingles and making you think of bull frogs, bare feet, and bittersweet, and soothing you to slumber with dreams of sunny trout brooks, pansy beds at the kitchen door, and corn on the cob.

Or maybe some night the spring rain stops and toward dawn you rouse up sleepily to hear something coming straight down out of the vast sky spaces, the ghostly call notes of the birds of passage, migrating wedge-shaped northward through the dusky void—the welcome flight of those wild geese whose return to your State is the signal for more happiness than any spring election ever promised or performed. And the morning after you put on the oatmeal a little sooner, give the kids a broader smile than usual, and tell them to look at the purple crocuses below the window, pushing up through ice-bound, sodden leaves.

Did you ever stop to think that as man or woman grows older and approaches the "sear and autumn leaf" and then finally stumbles regretfully into his winter period, that person (just like the winter itself) begins to long for spring as he never did in the summertime of life? And you can't blame it all on slow circulation and "rheumaticks" either.

I guess we all remember how Mother and Father looked forward to spring with a persistent expectancy that puzzled us young ones. We got along quite well pelting snow-balls and thawing out our toes. The rash wind blew roses in our cheeks and brought us running noses, but it seldom frayed our nerves or gave us any lasting impression of being imprisoned or bored. I can see Mother yet as she perused some magazine with descriptions of balmy climates where some more lucky neighbor dallied during the winter solstice. And Father would have gnashed his teeth (had there been any to gnash) when he got photos from Uncle Edgar showing that worthy relative mowing his lawn at Pasadena while we were treading ice paths to the barn each January morning.

MY FOLKS were both of old New England ancestry and had the rigor of northern climate bred into their marrow; but as the telling years advanced upon them, they hungered for some land of perpetual summer. I believe they would even have discounted flies and mosquitoes for a taste of some such surcease.

I am afraid their chief reliance during the short and murky days of winter proved to be the free collection of sales literature, with which lonely farm houses were bombarded by the postman. Those numerous and highly illuminated catalogs, resplendent in all the imagery of lithographic art, gave them hopes which low finances kept them from fully realizing—yet in the darkened theater of my parents' lives their advent on our shelves was the real overture before the curtain rose to the chorus of spring song.

Seed and nursery catalogs, paint and fence bulletins, garden almanacs and

floral brochures, each accompanied by its pink and yellow order blanks and "guarantees"—these almost always started my folks on long mental excursions planning for the adornment of some favored nook or the replenishment of some barren spot—all in the zeal of humble, home-loving companionship. How we ever got along without soil-conserving committees, rural social planners, and bumptious interviewers in those days so long ago and far away is now a mystery to me. We waxed content on small picking and thanked our spring stars it was no worse.

I am sure you were called upon like me to seize a stub pencil and help Father figure out the cost items and the totals entailed in the completion of a horticultural mail-order. Then when it was hiked up toward eight or nine dollars, Father would regretfully scan the gaudy promises made for certain moon vines, wonder berries, and hybrid roses and close the list with a heaving sigh of painful self-denial. Mother would then add her mite for new double marigolds and variegated sweet peas, and the family was then ready to pay its annual tithe to its arboreal ambitions. The hens usually provided the petty cash for this delightful deal, and this fact probably gave them a proprietary right to scratch-time out of the flower beds afterwards.

THERE returns to us a hint of something heroic and pathetic in the remembrance that as a rule the hopeful plans which our parents doted on in April were flattened and frustrated when the harvest time arrived. Mother had repeatedly planted crescents and diamonds of annual posies to grace the front-yard corners and the driveway at the west, only to have them overrun by dogs and chickens, usurped by arrogant weeds, and sadly neglected in the mundane round of baking, canning, and washing in the ruck of midsummer duties. During the early summer evening she found a breathing spell with her trowel amid the flowers, but later in the season she was too limp for extra labor after sundown. She would come outside in her calico dress and faded apron, wiping her matted brow and smiling with wistful perplexity at the evidences of bravery shown by a few of the hardier blossoms peering proudly above the stinkweed and pusley. The long, tangled grass and the litter of fallen twigs and brown leaves dotting the lawn that looked so promising in spring caused her some mental reactions no doubt, but she usually kept them to herself and stuck to her duties like a soldier in the army. Added to my regrets on these occasions come memories of my own lamentable laziness. If one

(*Turn to page* 46)

Profitable Cows Need Productive Pasture

By Delmar S. Fink
Assistant Biologist, Agricultural Experiment Station, Orono, Maine

WHY is pasture improvement a topic of active discussion today? Fundamentally, because during past years we have overlooked the part played by pasture in a dairy-cow-breeding program. We have bred our cows to produce, annually, several thousand pounds more milk than they did under natural conditions. But we have not improved, either in quality or quantity, her natural feed, *pasture*.

The result—dairy farmers now know that feed on ordinary permanent pasture will not maintain the production of a 300-pound-butterfat-producing cow. The feed is not there in sufficient quantity, it is not good enough, it does not meet her requirements.

Coordinate Needs

We cannot expect permanent pasture, which has received no attention from man, to feed a cow that has been highly developed for milk production by man. Suppose we go back to nature. In the great woods of northwestern Maine there is little pasture, as we ordinarily think of pasture. There are, however, thousands of deer living in this great forest (annual kill by hunters 20,000, estimated population 106,000). They reproduce freely, travel miles for feed, grow fat, live long, and, incidentally, "remain very active." About the only time there is a deer-feed problem is when the snow is exceptionally deep. The story would be different, at least from the standpoint of feed requirements, if man were to breed the deer to produce 10,000 or 15,000 pounds of milk annually. Ordinary permanent pasture may be excellent deer-feeding grounds, but we are dealing with 1,000-pound cows producing many thousands of pounds of milk annually.

Pasture Is Cheap Feed

The place to produce cheap milk is on pasture. It does not take much time to fertilize a permanent pasture, and that is about all the labor involved to grow the crop. Compare this with growing corn for silage, and we find the cow doing from 85 to 95 per cent of the work. If pasture is abundant she is more than willing to do most of the work. There is little justification, in view of the fact that pasture of one kind or another can be made available during the entire growing season, to barn-feed hay and ensilage during the pasture period.

The dairyman, fully aware of the above, is ready and anxious to put into practice a sound pasture-improvement program.

For the optimum growth of any crop, pasture included, the soil must contain a rather definite amount of readily available plant-food elements. Soil fertility improvement is fundamental to pasture improvement on the average New England dairy farm.

The relation between permanent pasture productivity in Maine, as indicated by vegetation present, and soil fertility, as indicated by the amount of available N, P, K, and Ca in the surface soil, is given in the table below.

permanent pasture in Maine will regularly furnish an abundance of green feed for the milking herd from about

A SURVEY OF SEVERAL HUNDREDS OF ACRES OF MAINE PERMANENT PASTURES SHOWING THE POUNDS OF AVAILABLE N, P, K, AND CA IN THE SURFACE SOIL AT VARIOUS LEVELS OF PRODUCTION. SOIL SAMPLES OBTAINED DURING MIDSUMMER.

Pasture rating	Per cent vegetation			Pounds available plant food			
	White clover	Grass	Weeds and bare ground	NO_3-N	P	K	Ca
Poor	4	37	59	0	0+	50—	1,000—
Medium good	21	58	21	6	25—	50+	1,000+
Good	37	54	9	20	25	100—	1,000+
Excellent	53	45	0.9	60	25+	150	2,000

Most of the permanent pastures in Maine would be rated poor. Nature has laid down a carpet of poverty grass, hawkweed, and daisies to protect, as best it can, these neglected grazing lands for posterity. If they were not grazed, nature would cover them with forest vegetation.

The hesitancy, on the part of the farmer, to fertilize these poor pastures may be due to a lack of understanding in regard to the part played by improved permanent pasture in a dairy-farm roughage program. Excellent

May 10 to July 10. Later, depending on rainfall, it may furnish about 30 more grazing days, giving a total of 90 days. In other words, of the entire 150-day pasture season in Maine, a highly productive permanent pasture can furnish only about 60 per cent of the season's pasturage. We have been in the habit of turning our cattle to pasture for the entire season.

At present there are from 1 to 3 or more acres per cow being devoted to permanent pasture on the average New England dairy farm. Maine's

Fig. 1—Good feed produced by the application of 600 lbs. of 5-8-7 potato fertilizer in the pasture of A. G. Johnson, Bangor, Maine. The net profit of the fertilized area exceeded the net profit of the unfertilized by $33.01 an acre. Four acres fertilized furnished 1,088 cow-days grazing compared with 1,029 on 7 acres unfertilized.

Fig. 2—Phosphorus alone applied at the rate of 120 lbs. per acre produced this scanty pasture growth.

approximately 150,000 head of dairy cattle roam over 1,500,000 acres in the course of one season. That all of this pasture need not and should not be improved is not fully appreciated by the dairy farmer. A productive permanent pasture will furnish at least 180 cow-pasture days per acre, or 75 to 100 per cent of the total feed requirements per cow per day, depending upon the cow's lactation period. Obviously, it must be grazed at two cows per acre, if it yields 180 cow-pasture days per acre and there are only 90 days during which the feed is suitable for the milking herd. There is little object in having more than one-half acre per cow. Improved permanent pasture is a crop, and as such should be distinguished from the wild-life sanctuaries we have been calling permanent pasture. We need a new word to distinguish improved permanent pasture from the millions of acres of rough, droughty, rocky, unproductive, truly forest land, which is referred to as pasture land.

In selecting land for permanent pasture improvement one should not overlook the fact that it will take less fertilizer, and therefore cost less, to build a real pasture on land which is in a fair state of fertility to start with. By all means, land devoted to permanent pasture must be at least medium heavy in texture; light, droughty soils are not suitable. We should select for improvement the best acres available, just as we select for herd improvement the best cows in the herd.

Season Program

On most dairy farms there is the possibility of devoting a portion of the crop land to pasture purposes. Dairymen are barn-feeding roughage during much of the pasture season in amounts almost equal to winter feeding. A sound, all-season, pasture program will lower barn roughage requirements. More adequate fertilization, particularly of the meadowland at the time of seeding down, and subsequently with annual top-dressings of fertilizer, will do very much towards meeting

Fig. 3—Application of 120 lbs. of phosphorus and 120 lbs. of potash produced lush pasturage.

the winter roughage requirements on fewer acres. In this connection it only need be mentioned that top-dressing meadows, 2 or more years old, with 50 pounds of nitrogen per acre, representing 250 to 300 pounds of a straight nitrogen fertilizer (depending upon its per cent nitrogen content), will regularly give 1,500 pounds to a ton more of better quality hay per acre.

If the proper acreage for improved permanent pasture has been located on the crop land of the farm, the fertilizer practice to follow should be determined from a chemical analysis of the soil. We know there is only one way to determine the worth of a cow and that is to weigh and test for butterfat the milk she produces; just so, the only way to determine quickly and accurately the productivity of a field is to test the soil for its available plant-food content. If a cow proves unproductive there is little we can do about it. She still has a real value, however, in that we can sell her for beef. If an acre of land proves unproductive it has little real value to anyone. We can, however, make it productive through adequate fertilization. A soil test, accompanied by recommendations of a soils specialist, will give accurately the procedure to follow.

Fertilizer Treatments

If the proper acreage, representing the best portion, of the old permanent pasture is to be used, a soil test is not so essential as the first step in improvement. The average Maine permanent pasture today does not have the inherent ability to furnish the necessary amounts of any of the major plant-food elements for reasonable production. The initial treatments, at least for the first 2 years, should be a generous top-dressing of complete fertilizer, for example, 500 pounds of an 8-16-16, or its approximate equivalent per acre. This is not a particularly heavy application of fertilizer. The standard 10-ton-per-acre farm manure treatment for crop land, the manure fortified with 30 pounds of 20 per cent superphosphate per ton, is about

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Mississippi Soil Types And Their Preferences

By Stanton W. Davis
Assistant Extension Horticulturist, State College, Mississippi

FORTUNATELY or unfortunately, depending upon the angle from which viewed, nature was liberal with Mississippi when dispensing soils.

The United States contains 13 major soil divisions or areas, 6 regions, and 7 provinces. Of the 7 soil provinces of the whole country, 4 are found in this State. The Atlantic and Gulf Coastal Province is the largest, embracing the major part of the State. It is located, as its name indicates, along the Gulf Coast and extends up the eastern side of the State. The next or River Flood Plains Province takes in the delta soils along and adjacent to the river. The third or Loessal Province is located east of the River Flood Plains Province and immediately adjacent to it. This province is spoken of as Brown Loam Area and extends along the delta foothills. The fourth and last, the Limestone Valley Province, barely crept into the State in the northeastern part of Tishomingo County.

Each of these has definite characteristics, and contains a number of different soils. In fact, Dr. Clarence Dorman, an authority on Mississippi soils, has identified more than 150 soil types. These soils are often different in their composition, and thus present a complex problem to the farmer. It is not unusual for him to find several of these soil types on his cultivated acres. He, too, has noticed the difference in yield of the crops planted on the various soils. A recognition of this difference in yield causes a question to bob up. Does each of the different soils, he wonders, contain the essential plant foods in the same amounts? Is there a difference, he asks, in the kinds of plant foods most abundant in the sandy loam soils on the hill, the black heavy soil down in the creek bottom, and the poor-yielding field on the north forty that the county agent calls Susquehanna?

Adapt Soil to Crop

When he gets busy thinking on this problem he is naturally led to a kindred question: Am I proceeding wisely, he wonders, in presuming that one fertilizer, say a 4-8-4, is equally good for all crops and on all soils, or should these elements vary with different soils and crops? There must be a difference, he thinks, in the amount of plant food contained in the different soils or in the requirements of the various crops, for it is common knowledge that on most soils nitrogen stimulates plant growth, phosphorus hastens the ripening process, and cotton rust can be prevented by a liberal application of potash. These things being true, there must be a variation in the plant-food content of the different soils or else a difference in the fertilizer preference of certain crops. Either would mean the same to the farmer, financially, as it would necessitate increasing the deficient or preferred elements as the case might be.

With several different soils to identify on his farm, crops best suited to each to determine, and the plant-food availability to reckon with, is it any wonder that the farmer becomes perplexed, confused, confounded, and at last hopelessly "balled up"? Only by a careful study of the experiment stations' reports and by comparing their soil types with those on his farm is he able to proceed wisely in solving his production problems. For instance, the research workers at the Delta Experiment Station at Stoneville have found that most soils of the River Flood Plains Province are, for practically all crops, deficient only in nitrogen. That is unless the soil has been in cultivation for a long time. But just east of this area along the delta foothills in the Loessal Province there is a definite potash deficiency, as shown by the fact that cotton rust is common. These soils respond readily to potash.

For several years county agents have, with the cooperation of farmers in their counties, run various fertilizer tests, but in the spring of 1937 definite plans were made for determining the response of various soils to potash when applied to sweet potatoes and cotton. The county agents in 14 counties cooperated with 18 farmers in making potash tests on sweet potatoes. These 14 counties were distributed from one end of the State to the other and involved many different soil types. The applications of additional fertilizer were at the rate of 100, 200, 300, or 400 pounds of muriate of potash to the acre in addition to the regular application. The additional potash was added to a given area in the regular planting. All conditions as to time of planting, method of planting, spacing, and culture were identical with the remainder of the potato crop.

Sweet Potato Results

In production these soils ranged all the way from Susquehanna, which is described in "Soils of Mississippi" as "A poor soil, low agricultural value," to Red Bay, which is rated as one of the best hill soils.

The results obtained from the sweet potato tests were both enlightening and gratifying. They were gratifying in that they indicate the possibility of producing much heavier yields than are now being gotten, and enlighten-

Soils deficient in potash respond readily to high potash fertilizers. Left: 600 lbs. of 6-8-4 per acre (note the cotton rust). Right: 600 lbs. of 6-8-8 per acre.

ing because they indicate that a much higher application of potash is necessary on some soils, while they suggest that the addition of heavy applications of potash on other soils is useless expenditure of the farmer's money.

On the Susquehanna soil there was an actual decrease in the yield, while on all other soils a decided increase was registered, ranging from an increase of 133 bushels per acre down. The highest yield obtained from plots receiving the extra potash was 487 bushels per acre, and of the 14 farms completing the tests five made more than 300 bushels per acre where the extra potash was used. Not only was there a decided increase in the yield, but the percentage of No. I potatoes was higher than under the regular farm practice. The check plots averaged 63 per cent, while those receiving the additional potash averaged 73 per cent No. I's.

Results With Cotton

The county agents and vocational agriculture teachers in more than 20 counties cooperated with farmers in getting a check on the response of cotton to additional potash, under regular field practice. This was in addition to the fertilizer tests that have been run at the experiment stations for several years past and of which more will be said.

These cotton tests were made on many soil types and were no less illuminating than were the potato tests already discussed. The writer recalls vividly one demonstration that he saw. It was on Lufkin Silt Loam and on the same farm on which a potato test was made.

The potatoes in this particular test showed an increased yield of 77 bushels per acre. The check plot of cotton fertilized with 600 pounds of 6-12-6 made a yield of 840 pounds seed cotton per acre, while the adjoining plot fertilized with 600 pounds 6-8-8 produced 1,260 pounds per acre, or an increase of 420 pounds as a result of increasing the potash from 6 to 8 pounds per hundred pounds of fertilizer. (Naturally we assume that no increase resulted from decreasing the phosphorus from 12 to 8 pounds per hundred.) The check plot fertilized with 6-12-6 had many immature bolls and many bolls that had matured but only partly opened. All the foliage was dead long before frost, while the area fertilized with 6-8-8 had fully matured its bolls and stood loaded with green leaves when frost came.

A test conducted on Magnolia Silt Loam was no less responsive. In this the regular practice of applying 600 pounds of 4-8-4 gave a yield of 1,230 pounds per acre, but when the analysis was changed to 4-8-8 and the same amount used the yield was stepped up

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TABLE I—ANALYSIS TEST—EAST MISSISSIPPI—SCOOBA—LUFKIN FINE SANDY LOAM

Treatment	Seed cotton per acre	Increase over no fertilizer	*Value of crop	Gain over no fertilizer	Cost of fertilizer	Profit over fertilizer
600# 4-8-4	954	400	$38.16	$16.00	$7.86	$8.14
600# 4-8-0	765	211	30.60	8.44	6.99	1.45
600# 4-8-8	1,116	562	44.64	22.48	8.70	13.78
600# 4-8-12	1,053	499	42.12	19.96	9.57	10.39
600# 0-8-4	765	211	30.60	8.44	5.58	2.86
600# 6-8-4	972	418	38.88	16.72	8.97	7.75
600# 8-8-4	959	405	38.36	16.20	10.11	6.09
600# 4-4-4	878	324	35.12	12.96	12.96	5.97
600# 4-12-4	1,075	521	43.00	20.84	20.84	12.14
600# 4-0-4	850	296	34.00	11.84	11.84	5.72
No fertilizer	554	...	22.16	....	....	....

* Value at 4c per pound for seed cotton.

Corn on Alkali Soils Responds to Potash

By B. M. Kilpatrick
Iowa State College, Ames, Iowa

APPLICATIONS of potash fertilizer on northern Iowa high-lime or so-called "alkali" soils have given profitable increases in both the quality and quantity of corn in demonstrations conducted during the past few years.

"Alkali" is the term used to designate soil areas where there are high concentrations of calcium carbonate or bicarbonate, and also other salts, deposited on the surface by evaporation of water as a result of draining of swamps, sloughs, lakes, and ponds left by glaciation in the Wisconsin and Iowa soil drift areas. Alkali occurs in thousands of acres of soils in northern Iowa and, according to estimates, is a more or less serious problem in some 40 counties in the northern section of the State, occurring most frequently in the Webster and Clyde soil series.

These alkali areas are commonly referred to by farmers as "hot." The areas vary in size from a few rods square, such as those found at the edge of a small pond that has been drained, to occasionally as much as several hundred acres. The highest concentration of salts is usually found at the edge of these ponds or depressed areas and may be noted by whitish deposits in the spring or summer. Some of these "hot" spots have shown an acid-neutralizing value as high as 40 per cent, 2½ tons of this soil having a neutralizing value equivalent to about 1 ton of good limestone. Of the

Fig. 1—Placement of potash fertilizer with side-dressing method. Applied after potash starvation symptoms appeared.

essential plant food elements—nitrogen, phosphorus, and potassium—nitrogen seems to be highly available, phosphorus may or may not be highly available, and potassium is usually unavailable.

The high concentration of "alkali" salts seems to lock up the potash in an insoluble combination which plants, especially corn, cannot assimilate. Corn planted on these areas germinates, but soon after coming up begins to show marginal firing of the leaves. Many plants die, and those that live produce small, immature stalks with short internodes and small, chaffy, immature ears of low feeding value. Oats seem to grow better than corn, but usually develop scantily

Fig. 2—Clark Clement field, Garner, Iowa, June 1937. The four rows to the left received no fertilizer. The fifth row to the left and rows to the right received potash fertilizers applied with planter attachment.

filled heads and heavy straw that is likely to lodge badly.

Soon after these areas were drained, trial and error methods showed that heavy applications of strawy manure helped to correct the difficulty. Heavy applications of manure, however, supplied an excess of nitrogen for these spots, which were already high in nitrogen. When applications of manure were heavy enough to correct the difficulty, other parts of the farm were slighted.

Application Important

In 1925 some work was done on broadcast applications of muriate of potash in Hardin County with good results. Later some broadcast plots were established on "hot" alkali soils with varying rates of potash and phosphate applied separately and in combination. Good results were obtained the first year or so with potash when applied at heavy rates, but later on the potash which had been applied seemed to become as insoluble as the original potash in the soil. A few years later hill applications of potash fertilizers made with a planter attachment brought satisfactory results.

In 1935 after starvation symptoms had appeared, side-dressing applications on corn were made with a garden planter resembling a cultivator on a number of plots in the northern part of the State. The purpose of these tests was not to find a supplementary method of applying fertilizer, but to discover whether potash could be applied profitably to corn after symptoms of starvation appeared. With this machine potash was applied at a depth of 2½ to 3 inches—the approximate depth at which the fertilizer would be applied with the cultivator attachment—and as close to the row as possible. Figure 1 shows the placement of the fertilizer in side-dressing the corn plant. An average increase of 15 bushels per acre was obtained in 1935 on plots where potash was applied between June 10 and July 10. In 1936, a dry season, plots of the same type were again tried, using an early June and an early July application. Work on these plots gave an opportunity for increased attention to the study of potash deficiency symptoms on corn plants.

This work demonstrated that if potash deficiency symptoms are recognized early in the season and potash is applied, a profitable crop can be grown on these soils. If the supply of available potash in the soil is very low, corn plants will show damage very early in the season. However, on some alkali soils having a small amount of available potash, the deficiency does not show up until later in the season. This was especially noticeable where farmers had used a fertilizer combination containing some potash but not enough to carry the plant through to maturity. The plant was normal and green when it started out, but as it became older it developed marginal firing of the leaves and at maturity a stunted stalk and ear.

In these tests the questions of how close to the row the application could be made and how much potash per acre could be used to side-dress the corn before injury to the plant might occur were answered. On some of the plants 500 pounds to the acre were used with satisfactory returns and no detrimental results. On one plot in particular a row of corn was selected and muriate of potash applied as close to both sides of the row as possible at a rate of 500 pounds per acre. As a result the fertilized row produced strong, normal stalks and well-developed ears, while the unfertilized corn around it showed typical potash deficiency symptoms and very low yield.

Following is a summary of the 1936 results:

Average of 9 farms	Average net increase per acre above cost of potash
100 lb. 50% muriate of potash S. Dr. early June	\$4.31
200 lb. 50% muriate of potash S. Dr. early June	4.60
100 lb. 50% muriate of potash S. Dr. early July	2.41
200 lb. 50% muriate of potash S. Dr. early July	.58

Muriate of potash figured at \$2.28 per 100 pounds.
Corn values: Marketable corn at 90c and 45c for poor quality unmarketable.

Fertilizer demonstration plots conducted in 1937 were again of two types—(a) with cultivator attachment, (b) with planter attachment.

In the planter attachment plots the

Fig. 3—Clark Clement field, Aug. 3, 1937. Left: 120 lbs. of 0-9-27 applied with planter attachment. Center four rows, no fertilizer. Right: 120 lbs. 0-20-20. Fertilized rows, normal height and green color. No fertilizer, short, immature plants and marginal firing.

fertilizer comparisons varied according to the degree of alkalinity of the soils. For those conducted on the less alkaline soils, a combination of 0-20-0, 0-20-10, and 0-20-20 fertilizers at an approximate rate of 120 pounds was used. For those conducted on more alkaline areas, a combination of 0-20-10, 0-20-20, and 0-9-27 at the same rate was used. The season was very wet in this area at corn planting time. On the "hot" spots where the fertilizer was used, however, the corn came up quicker and grew faster. The corn that was unfertilized showed typical yellowing of the edges and tips of the leaves early in the season. Many hills on the unfertilized plots died early. Plants that survived on the unfertilized areas had typically stunted stalks, short internodes, and short, chaffy, immature ears of low feeding value.

Several of the plots were checked with the farmers' combination of fertilizer, such as 0-12-12 or 0-14-14 applied at rates of approximately 75 to 100 pounds. It was quite noticeable that these combinations and the 0-20-10 did not contain enough potash to carry the plant through to maturity. These plots started off much better than those not fertilized and seemed to have enough potash until about the middle of July, when firing showed up on the lower leaves and in the tips and margins of the upper leaves. In contrast, all of the plants on plots treated with 0-20-20 and 0-9-27 remained normal and green.

Typical Demonstration

A typical planter attachment demonstration on "hot" alkali was located on the Clark Clement farm near Garner in Hancock County. This field of about 25 acres was quite alkaline, showing an acid-neutralizing value of 25 to 30 per cent over most of the field. Plots of 4 rows each of 0-20-10, 0-20-20, and 0-9-27 at a rate of approximately 120 pounds per acre were used with 4 unfertilized

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Fig. 4—Ray Frye field, Dows, Iowa, Aug. 3, 1937. Left: no treatment. Right: 200 lbs. muriate of potash side-dressed June 8 with cultivator attachment after potash starvation symptoms had appeared.

1% organic matter 3% organic matter

Illustrating the influence of organic matter upon the crop-producing power of a Norfolk fine sand. Each pot received a complete fertilizer.

New Approaches to Potash Fertilization

By Jackson B. Hester

Formerly Soil Technologist at the Virginia Truck Experiment Station, now connected with the Campbell Soup Company, Camden, New Jersey

SO SERIOUS a question of potash exhaustion did not exist under the old system of agriculture where inhabitants practically lived on the farm and sold away no great quantity of material. Today large quantities of vegetable crops move into the great cities from the Coastal Plain section of the United States, and with these crops large quantities of potash move away from the soil.

For example, with every 600 bushel baskets of spinach (acre yield) approximately 97 † pounds of K_2O are removed from the soil; for 600 bushel baskets of collards, 79 pounds per acre; for 525 bushel baskets of kale, 47 pounds. When it is considered that eastern Virginia alone sends away on an average each year 1,301,000 bushel baskets of spinach, 766,000 bushel baskets of kale, 26,000 tons of cabbage, 10,957,000 bushels of potatoes, 4,270,000 bushels of sweet potatoes and with them 8,383,000 ‡ pounds of K_2O, the potash fertilization of vegetable crops on Coastal Plain soils becomes an interesting problem.

This quantity of potash represents

† Calculated from analyses of crop grown on the station farm.

‡ Based on the estimated yield for the past 5 years.

83,830 tons of 6-6-5 fertilizer mixture and does not include leaching, fixation, and the utilization and removal by many other crops. The estimated usage of mixed fertilizer in the Norfolk section is 60,000 tons. Therefore, from the standpoint of fertilization, leaching as well as fixation in a difficultly available state must be considered and met, if the crop is going to be adequately fertilized with potash.

pH 4.4 5.4 6.2 6.7

Illustrating the crop-producing power of a Portsmouth loamy fine sand at various pH values. Each pot received a complete fertilizer.

Since this has been going on for a number of years it is evident that more potash is being removed from the soil than is being added.

From the standpoint of potash fertilization for vegetable crops, the 97 pounds of potash removed by spinach represents the equivalent of approximately a ton of 6-6-5 (N-P-K) fertilizer mixture. However, a 600-bushel yield of spinach is slightly more than the average yield for this crop in the Norfolk section but not the maximum, which brings up the discussion of potash fertilization and crop-producing power.

Nitrogen has often been referred to as the most elusive of the major plant nutrients. Perhaps second to nitrogen is potash, and from the standpoint of the leaching of the bases potash is, in many instances, second to calcium. Thus, potash is subject to leaching on Coastal Plain soils in rather large quantities. Potash also is subject to fixation by the soil colloid in a difficultly available state, to a degree perhaps second to magnesium.

Leaching and fixation are the unknown factors in the case, for it has been shown that if a soil is expected to produce 600 bushels of spinach it would be necessary to add only about 200 pounds of muriate of potash were it not for these factors. But since leaching and fixation are factors, and since these factors vary from soil to soil, a host of problems are presented. Some of these problems will be discussed in view of the present knowledge of potash research.

Maintain Potash Supply

The average Coastal Plain soil carries between 2,000 and 8,000 pounds of total potash per acre in the top 7 inches or plowed surface. This is far less than the quantity carried by many of the heavier types of soil in the United States. For instance, it is not uncommon for the heavier types of soil to analyze 2 per cent in total potash. This represents approximately 40,000 pounds per acre 6-inch basis.

When it is considered that approximately 5,000 pounds of K_2O represent the average total potash content in the plowed area of the Coastal Plain soils and that this has been subjected to 40 to 50 inches of rainfall each year for many years and has changed but little, not a great deal can be expected from the reserve supply. Consequently, the application of potash to the soil is of paramount importance. No one wishes to apply more potash than will prove profitable, but everyone is interested in applying the necessary quantity.

The common definition of a fertile soil is one that is producing or capable of producing fruitfully and abundantly. From inference it might be said that a soil is fertile from the standpoint of potash when it possesses sufficient potash in a readily available state to produce an abundant crop. That is apparently a very simple and adequate definition until one begins to look into the question of fertilization. What is the yardstick for measuring the quantity of potash to make a soil productive from the standpoint of potassium?

a situation existed that gave a perfect condition for maximum production, space alone would be the ultimate limit of production. That is, all the plant material that could occupy the space of 1 acre would be the maximum production of that acre. The first limiting factor in the Coastal Plain section is likely to be the soil and the second the climate.

Maximum Producing Power

A soil has a certain maximum crop-producing power if given the proper climate. In order to investigate this problem a series of soils was brought to the greenhouse for investigation. The soil was screened and placed in 2-gallon earthenware crocks. It was used in its natural state, limed to produce various degrees of acidity, and was then fertilized uniformly with nitrogen, phosphorus, and potash, watered adequately, and planted to various crops. These data are given in Table 1, from which the maximum crop-producing power can be calculated for a given degree of acidity.

TABLE 1—THE RELATIVE CROP-PRODUCING POWER OF THREE SOIL TYPES

Beets		Strawberries		Spinach		Lima beans		Kale	
pH	Yield dry weight, grams	pH	Yield dry weight, grams	pH	Yield dry weight, grams	pH	Yield dry weight, grams	pH	Yield dry weight, grams
Portsmouth—13.5 per cent organic matter, 5 per cent clay									
4.0	0.1	4.0	1.3	4.0	0.1	3.9	11.2	4.1	0.02
6.2	13.3	5.9	9.6	5.8	6.1	6.7	41.2	6.3	9.7
Bladen—1.8 per cent organic matter, 12 per cent clay									
4.2	0.0	4.4	1.6	4.4	0.0	4.2	8.5	4.2	0.1
6.1	8.4	5.6	6.7	5.4	3.5	7.0	29.2	6.4	7.1
Norfolk—1.0 per cent organic matter, 5 per cent clay									
5.5	0.2	5.2	0.0	4.8	0.0	5.0	11.5	5.1	0.3
6.2	4.5	5.6	2.4	5.5	3.9	5.2	25.5	5.8	1.7

Infertility, on the whole, is easier to investigate than fertility, because it presents a specific problem. The question of investigating the infertility of a soil in respect to a given nutrient brings up the question of the crop-producing power of the soil. If

Take for instance the crop-producing power of the Portsmouth soil for beets: at pH 4.0 it is almost negligible, but at pH 6.2 it is 13.3 grams of dry matter per pot or about 15 tons of green weight per acre. Thus, if unfa-

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Mr. Pender (right) and friends inspect a 5-year-old asparagus field.

Mr. Pender Specializes In Asparagus

By John Miley
Williston, South Carolina

HE MAY be called the "king with many crowns," as he sells more than 1,000,000 asparagus crowns annually. With such a record behind him, T. R. Pender, of Williston, S. C., might easily lay claim to the title of "largest asparagus-crown producer in the United States," or in the world for that matter. But growing "titles" does not interest him so much as his active work with the local Boy Scout troop and the operation of a general farm which produces cotton, corn, small grain, and watermelons, besides asparagus.

However, his work with asparagus is our chief concern here. A comparison of his results in the beginning with those at the present time tells its own story of progress. In 1917 Mr. Pender planted 2 acres to asparagus, using 25 pounds of seed to produce 40,000 marketable crowns per acre. Now he plants 40 or more acres every year with only 7 pounds of seed per acre and produces about 25,000 marketable crowns per acre. Where he used to pack 2,000 crowns in an average fertilizer sack (2-bushel size) to ship to market, he now puts 1,000 crowns in a beet pulp sack (7-bushel size) for shipping. This means that he is not only producing more asparagus with less seed, but he is getting larger crowns which bring a better price on the market.

It speaks well for the Mary Washington variety of seed that Mr. Pender has used this type of asparagus exclusively in his plantings. Now he sells his own seed—about 5,000 pounds annually—a large amount of which finds its way to California. He sells crowns in every asparagus-producing State in the Union, including the Hawaiian Islands, and has shipped to British Columbia, Montreal, Canada, and the Dominican Republic. However, Delaware, New Jersey, and Maryland buy the bulk of his crowns. Keenly interested in new developments, Mr. Pender became associated with the experiment in growing winter asparagus, which is being conducted at Belle Glade, Fla., and supplied the crowns for this test.

How does he cultivate his own asparagus? What methods and means has he employed to bring about such startling improvements over those 1917 results? In other words, what is the story behind his success? As is usually the case, simple and sound practices developed over a period of years and adjusted to the changing demands of the crop are the story.

Mr. Pender says that a good Marlboro sandly loam soil as free as possible from grass and weed seed and with subsoil 12 to 18 inches below the surface is an ideal soil for the production of crowns. Thorough preparation, breaking about 8 inches deep and harrowing until mellow, is necessary. About the middle of February open the rows with a 6-inch shovel, 36 inches apart, apply 600 pounds of a 5-7-7 (NPK) fertilizer per acre, and make a small ridge. About the last of February, in this section of the country, harrow the field and plant the seed, placing one seed to a hill about 1½ inches apart. Then cover with 2 inches of soil, or deeper if planting is done late in the spring. It will take about 7 pounds of large seed per acre.

Frequent Cultivation

Cultivation should be started when the seed are up to a good stand, and should be frequent to keep the topsoil loose and to kill weeds and grass. If grass or weeds are allowed to get among the plants, it has to be removed by hand, and then some of the asparagus plants will be destroyed. The last cultivation should be made the first part of September, and it should leave the plants on a small ridge about 3 or 4 inches above the level.

The first application of nitrate of soda, 30 to 40 pounds, should be made at the time of the second plowing. About 4 weeks later put out 60 to 70 pounds of soda. About the first of July apply 700 pounds of a 5-7-5 (NPK) fertilizer. A final application of fertilizer, 150 pounds of muriate of potash and 125 pounds of nitrate of soda, is spread about the middle of August.

In December and January the crowns are plowed up, graded,

This 90-day-old asparagus is carefully tended.

counted, and packed for shipment. Only the large, healthy crowns are worth planting, as asparagus is a perennial, and the crowns put out are expected to produce for several years. If the crowns are to be kept out of the soil for any length of time they should be stored in a dark, cool, dry place.

For setting out the crowns, Mr. Pender believes that a good, well-drained sandy loam soil with subsoil at least 12 inches deep will produce asparagus profitably, provided it receives good treatment. It is much easier and cheaper to plant asparagus crowns in fertile soil than to plant them in poor soil and try to build it up afterwards. The crowns should be planted during the dormant season, in this section it is usually done in February.

Prepare the soil thoroughly, with rows from 6 to 6½ feet wide. Open the rows about 10 inches deep, place the crowns (eyes turned up) in the bottom about 20 inches apart, and cover them with 2 inches of soil. Do not allow implements to run over or animals to walk on the crowns, because they will injure them. Next, fill the furrow about half full with well-rotted compost. About 1,500 pounds of a 5-7-7 (NPK) fertilizer should be used in two applications, putting out half at planting time and the other about the first of June. Some farmers use an additional application of 200 pounds of nitrate of soda and manure salts about the first of August. Frequent cultivation is necessary to keep out weeds and grass, and at the last cultivation the rows should be almost level with the surface of the soil.

Fertilization and cultivation should be about the same the second year as the first. These first 2 years are the most important in producing high-yielding asparagus, which means that you must have large, strong, healthy crowns, you must have an almost perfect stand, and you must feed those crowns and treat them kindly by not disturbing the feed roots and buds or eyes by cultivating or allowing weeds and grass to crowd them.

Cutting begins the third year after the crowns have been put out. The season in this section usually begins the last part of March and extends to the tenth of May. Plant a summer legume between the asparagus rows after cutting season, and each year add as much organic material as can be worked into the soil. The asparagus beetle is something to watch out for, as it can break a stand the first 2 or 3 years after putting out.

Extra Quality Profitable

In the fouth year of cutting the yield should average 35 crates per acre, 60 crates per acre for the fifth year, and from the sixth through the twelfth year of cutting 100 crates per acre can be produced. In grading the cuttings there are three qualities: "choice" asparagus which makes 90 spears to the bunch, "fancy" which makes 45 to the bunch, and "colossal" which grades about 25 to the bunch. With a liberal use of balanced fertilizer and good cultivation, much of the choice would be colossal. Since you can cut, grade, and bunch about four bunches of colossal in the same time as one bunch of choice, and one bunch of colossal will sell for at least as much as two bunches of choice, it seems well-worth the extra care and fertilizer needed to produce the extra quality.

When rust began causing damage to their asparagus, farmers started using extra potash. They realized the possibilities of asparagus as a money crop and that it was a hardy feeder and needed a comparatively large amount of fertilizer and all the barnyard compost available. Somehow, they began using 1,000 pounds or more of 5-7-5 (NPK) fertilizer before cutting and

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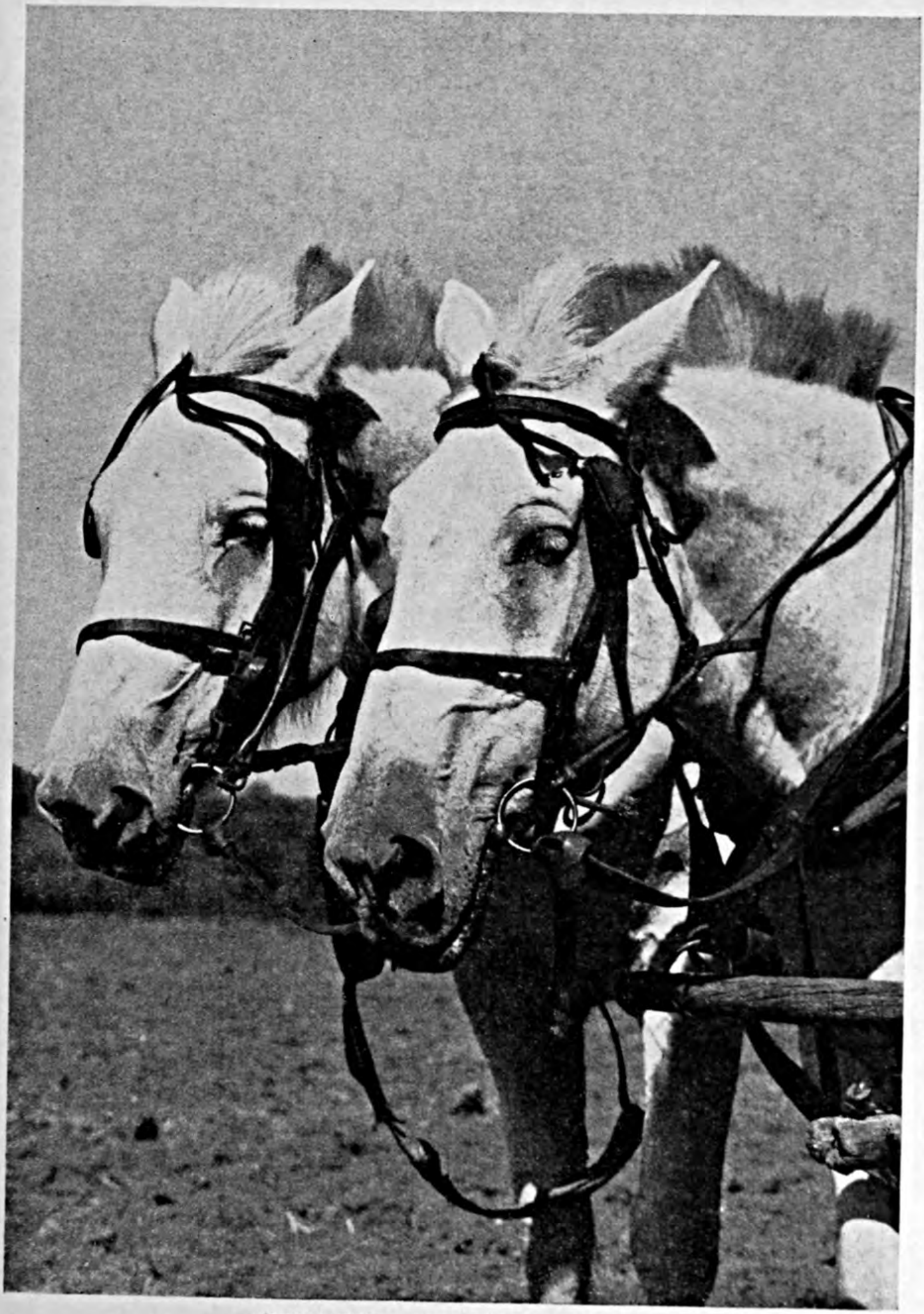
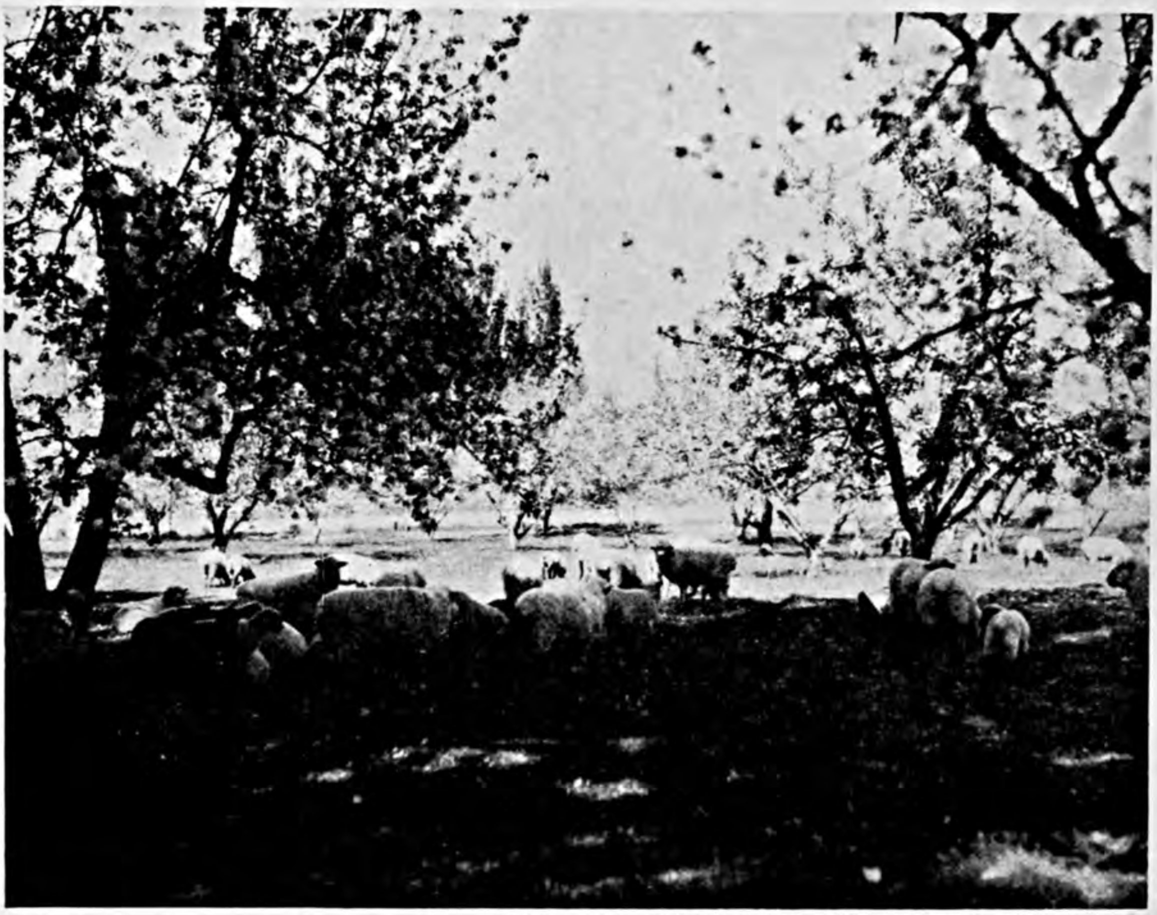
PICTORIAL

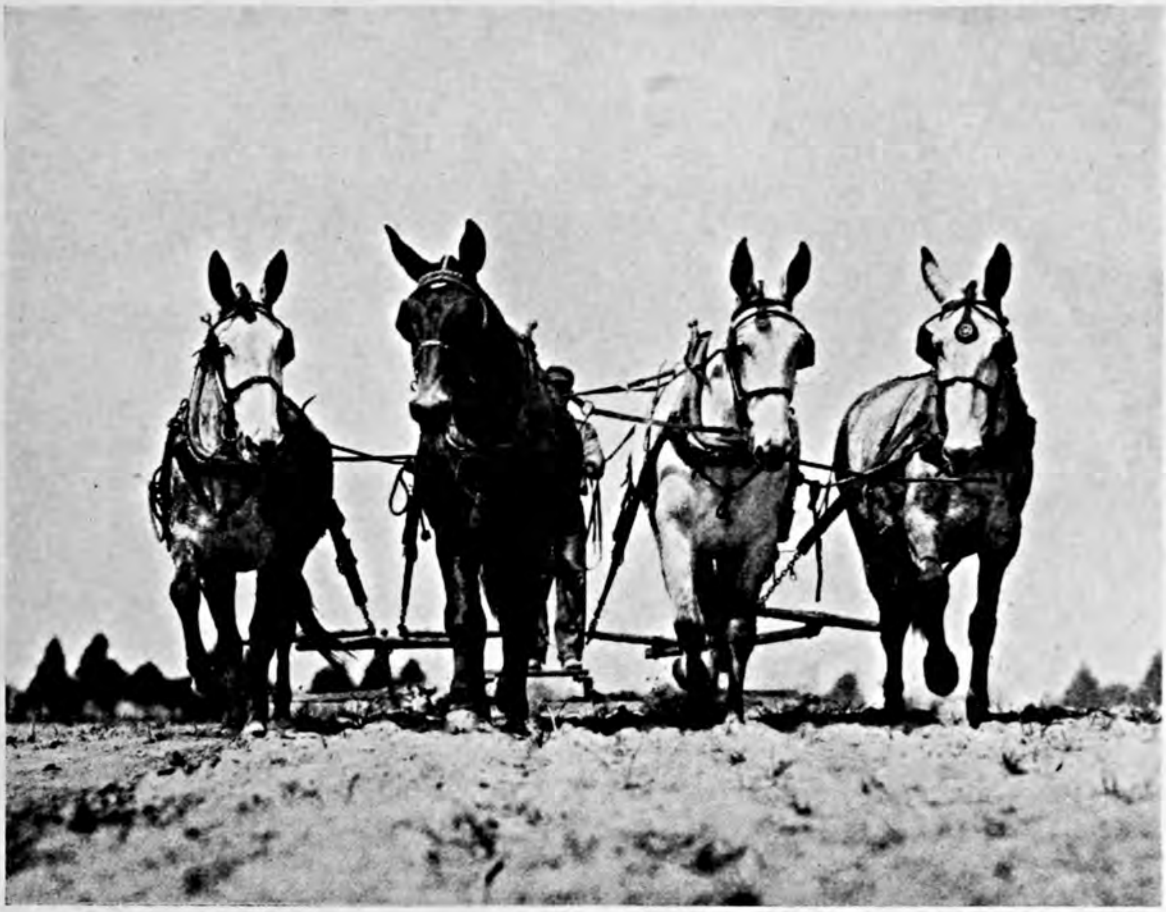


THEY LOOK ALIKE AND ACT ALIKE.

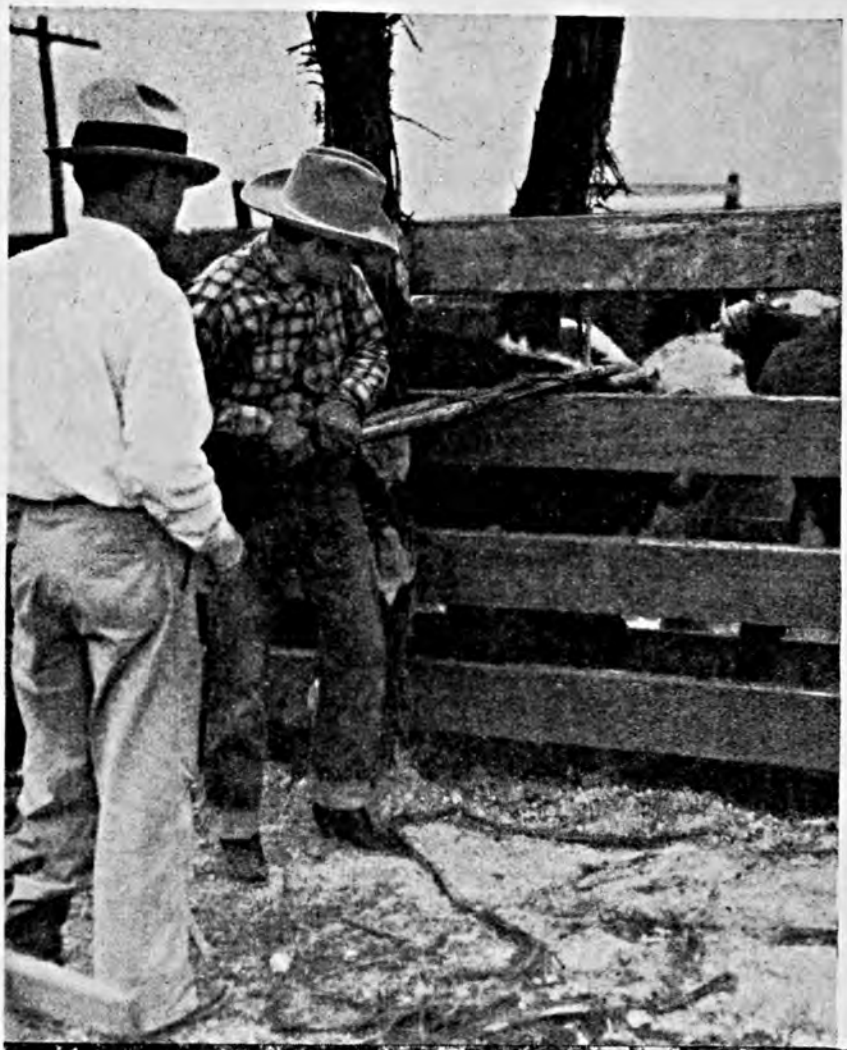


© Agricultural Department of the Union Pacific Railroad.

Above: Spring comes to Idaho. Below: Early stubble fires call for quick action.

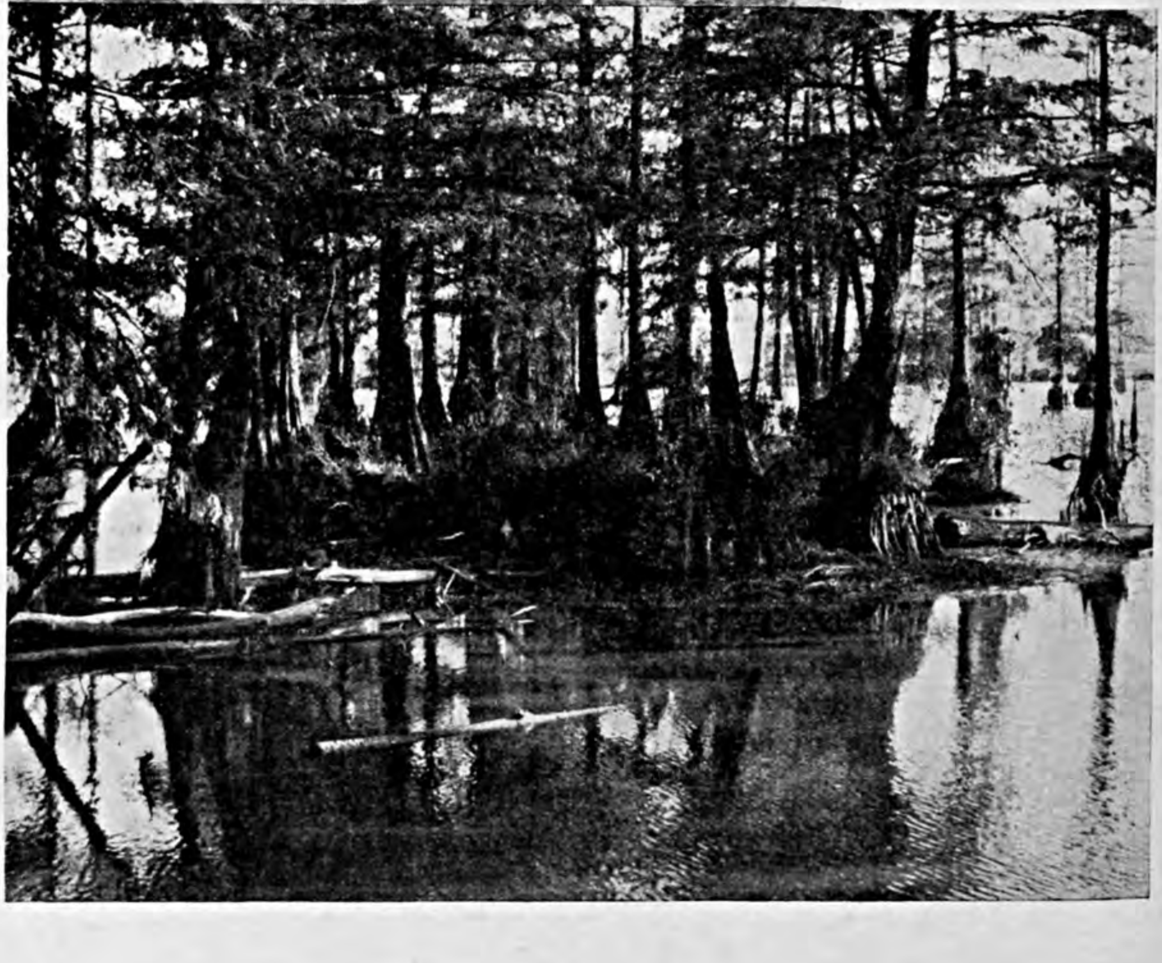


Though tractors are seen throughout the country, there's still a need for good farm-power animals.



Left: The modern way: clipping horns on one side, branding on the other.

Below: The long, lazy, afternoon quiet in an Arkansas swamp.



The Editors Talk

Stretching the Fertilizer $

A fertilizer dollar can be stretched. More and more evidence of the economies to be effected in the careful choosing of plant food is coming to light. Important in these investigations is the practicability of using higher analysis fertilizers, and an article by J. J. Skinner, Senior Biochemist, U. S. Department of Agriculture, published in the April issue of the *Progressive Farmer*, well points out and graphically illustrates instances where substantial savings were obtained from increasing the units of plant food in fertilizers purchased.

"We need to recognize first of all that distribution costs, which include cost of bags, labor, taxes, freight, sales costs, dealer's profit, trucking to the farm, mixing, and a few other items, are practically the same per ton (about $12) regardless of the fertilizer bought," Dr. Skinner says. He then goes on to compare prices of low analysis fertilizers with those of higher analysis mixtures, as well as costs of fertilizers made from various sources of plant food, and shows how millions of dollars might be saved on the fertilizer bill of the South.

In the early years of fertilizer usage, analyses were necessarily low because the materials available for making them were of such nature that concentrated fertilizers could not well be prepared. Later when high analysis fertilizers began to come on the market, many feared that the use of such analyses would possibly cause burning, as it was known that low analysis fertilizers applied in amounts large enough to provide plant food necessary for optimum requirements would cause burning unless very carefully applied. Furthermore it was felt that the high purity of the concentrated materials used in the manufacture of high analysis fertilizers would make them less suitable from the standpoint of supplying certain impurities which were contained in low analysis fertilizers and which might be beneficial to plant growth and conducive to large yields.

Research and educational work on methods of application of fertilizers together with the possibility of now making high analysis fertilizers with a total concentration of salts no higher than formerly are dispelling the fear of burning. Thorough experiments conducted by Skinner, Mann, Collins, Batten and Bledsoe in North Carolina, South Carolina, Virginia and Georgia, reported in *Soil Science*, have shown that if the physiological acidity is properly corrected, high analysis fertilizers formulated from high grade chemicals give as good or better yields than the lower analyses. The trend to the use of higher analyses is definitely upward and should be supported by everyone in an advisory capacity.

Dr. Skinner, writing particularly to Southern farmers, cautions his readers: "When considering your fertilizer problems remember that:

"1. Your fertilizer should contain adequate quantities of calcium, magnesium, and sulphur, as well as the so-called commercial plant foods, nitrogen, phosphorus, and potassium.

"2. All the plant-food elements should be completely available to the crop and at the same time, as far as possible, resistant to leaching.

"3. The continued use of the fertilizer should not have a harmful effect on the soil, such as making it too acid.

"Fertilizer can be made to meet these specifications and at the same time give you more plant food for your fertilizer dollar."

Spring and the Vegetable Garden

There is more to the pleasure of planning and putting in the vegetable garden than the hopes for saving on the food bill and the satisfaction of the spring urge to get outdoors and work with the soil. An inherent appetite for fresh vegetables, not well understood except by those who have scientifically delved into the matter, is responsible in no small degree. These scientists credit various vegetables with definite medicinal values and give point to their use in supporting the proper functioning of the human system.

Whether or not people are becoming better informed on the value of balancing their diet, since 1920 vegetable production has increased more rapidly than the production of any other type of crop. The acreage of truck crops grown for sale has increased 165 per cent since 1919. To meet this growing public appetite for vegetables, more and more experimental work is being done, not only along lines of large yields of quality produce but of maintaining quality until the produce is in the hands of the consumer. The South has greatly expanded its vegetable industry, stimulated by the possibility of supplying northern markets with many out-of-season vegetables. Mississippi is establishing a new truck crop experiment station at Crystal Springs in the truck area south of Jackson. Many other states have experimental stations where the work is devoted to truck crops, indicating the growing importance of vegetables both in agriculture and the diet of the nation. This increased interest in the South is particularly noteworthy since it falls in line with the program of diversification which has long been advocated for the South.

In numerous experiments already conducted in various parts of the country it has been shown that proper fertilization is necessary to produce crops that will carry well, which is highly essential in the shipment of vegetables. Proper fertilization also improves the appearance and thus the marketability of vegetables. Of greatest importance from the viewpoint of our national well-being is the influence of fertilization on the nutritional qualities of truck produce. Experiments at Ohio and other places indicate that the vitamin content may be markedly influenced by fertilization. More recently the influence of fertilization on the properties of vegetables destined for quick-freezing processes is demanding attention. At a national convention recently held in Toronto, Ontario, research in fertilizing for the growing of canning crops, in methods of improving flavor, color, and general appearance, and in the preservation of mineral and vitamin content was stressed as an important requirement for progress in the canning industry.

It will be interesting to watch the new research occasioned by the expansion of the vegetable industry. Undoubtedly out of it will come information applicable to the production of other types of crops.

REVIEWS

This section contains a short review of some of the msot practical and important bulletins, and lists all recent publications of the United States Department of Agriculture and the State Experiment Stations relating to Fertilizers, Soils, Crops, and Economics. A file of this department of BETTER CROPS WITH PLANT FOOD would provide a complete index covering all publications from these sources on the particular subjects named.

Fertilizers

¶ Dating from 1903 when tobacco investigations were first begun in Ohio at the Germantown Experiment farm in the Miami Valley, pertinent information concerning most phases of successful tobacco growing has been obtained. In Bulletin 590 of the Experiment Station, "Tobacco Cultural and Fertility Tests," by M. A. Bachtell, R. M. Salter, and H. L. Wachter, a very concise summary of these results is given and should certainly prove of much value to Ohio tobacco growers.

While some areas produce a fair percentage of Burley on soils that are suitable for this type, approximately three-fourths of Ohio's tobacco is grown in the Miami Valley where the cigar filler type is best adapted. Tobacco grown in rotation is more profitable than in continuous culture. Higher yields are usually noted after a legume than following corn. To produce healthy, vigorous plants for setting, it is necessary that the plant beds receive special sanitary and fertility treatments, the Bulletin states. Permanent plant beds in the Miami Valley are the rule and are best kept in condition by proper steaming to control disease and by the addition of organic matter to get good tilth. Proper sanitary practices if thoroughly followed after steaming the beds further help to reduce diseases to a minimum. A satisfactory analysis for the plant bed is 4 per cent nitrogen, 8 to 10 per cent potash, and a reasonable percentage of phosphoric acid that is contained in mixtures with the above analyses of nitrogen and potash. About 20 pounds of this fertilizer per 1,000 sq. ft. of plant bed appear adequate. Maximum yields of Ohio Hybrid 224 variety have been obtained from setting plants in the field from June 15 to 25.

The highest average quality is generally secured with the highest yields of an adapted variety. The fertilizers recommended for the light colored silt loams, clay loams, and clay are 2-12-6, 2-14-4, and 4-10-6, at the rate of 500 to 800 pounds per acre, supplemented with a side-dressing of nitrogen. The analyses and rate to use depend on whether the soil was manured or clovered. Larger acre applications of the fertilizers are advised when no manure or legumes are turned under. The fertilizer analyses in this case usually should carry higher percentages of nitrogen and potash. On the lighter colored soils 2-8-10 or 2-12-6 ranging from 300 to 600 pounds per acre should give good results. Here again the fertilization depends on whether or not the soil was manured or a legume turned under. The preferred placement appears to be in lateral bands about 2 inches on either side of the plants and 1 inch below the base of the root crown. On soil with a pH of about 6.0, limestone has caused a small decrease in yields.

The authors also explain other important factors relating to tobacco growing, such as varieties, seed selection, topping, and rotations.

"A Study of the Fertilization of Rice," Agr. Exp. Sta., Baton Rouge, La., Bul. 292, Oct. 1937, J. Fielding Reed and M. B. Sturgis.

"Comparative Value of Cyanamid in Fertilization of Apple Trees, Soil Changes and Tree Response," Agr. Exp. Sta., Columbia, Mo., Bul. 273, Feb. 1938, George E. Smith and A. E. Murneek.

Soils

¶ "Soil Mining or Soil Building?" is the appropriate title of a Wisconsin Special Circular in which C. J. Chapman tells the reader how Wisconsin farmers are losing the fertility of their soils. The author values the plant food lost annually from farm land in this State at 30 million dollars, even where most of the crops grown are fed to livestock and the manure returned to the land. The soils are likewise rapidly losing organic matter and are becoming more and more acid.

The alarming rate of loss of fertility is clearly shown by the inability of the land to produce crops as formerly. Clover seedings have failed in recent years and there is more lodging of grains. Corn does not mature as it did in the early days. Yields of corn and grain have not increased, in spite of improved and higher yielding varieties and better tillage machinery.

Results of fertilizer demonstrations conducted on a wide range of soils for the past 5 years show conclusively that mixtures containing superphosphate and potash pay. Results obtained on 64 farms in southern and central Wisconsin showed a net gain of $1.77 from grain (oats and barley) where 0-20-10 at 200 pounds per acre was compared with the same amount of 0-20-0. That the residual effects of the phosphate and potash mixture are beneficial to the following hay crop was attested by data secured on 25 farms which showed a value of $2.54 was produced in increased yields of hay above that obtained from the superphosphate alone.

The more general use of fertilizers applied at the time of seeding down to alfalfa or hay and pasture mixtures is a recommended practice. Wisconsin farmers already are using considerable fertilizer on cash crops, such as potatoes, sugar beets, etc., and obtain good results from applying fertilizer with an attachment on the corn planter. These practices are also recommended.

Professor Chapman warns that unless something is done in the very near future by shifting the land from soil-depleting to soil-conserving crops and by the use of more fertilizer and lime to maintain a balanced state of fertility, the ultimate prosperity of Wisconsin farmers is in real jeopardy.

¶ Massachusetts agricultural extension officials outline the latest recommendations in connection with the practices established under the Agricultural Conservation Program applicable to that State in Extension Leaflet 175, entitled "Building Massachusetts Soil." The practices recommended by the State officials follow very closely the experience of good farmers and the teachings of agricultural specialists. Included in the comprehensive publication are suggestions for improving hay and pasture crops, building up market garden soils, and orchard soil and woodland improvement. By following the provisions set forth in the Conservation Program, Massachusetts farmers have an excellent opportunity to replace the plant food exhausted from the crop land and to receive assistance in covering part of the expense involved in reseeding hay lands, plowing under growing crops for organic matter, the use of lime where needed, preventing erosion in orchards, and the improvement of forests.

"Conserving Soil by Contour Farming," Agr. Ext. Serv., Columbia, Mo., Cir. 365, May 1937, Marion W. Clark and W. R. Tascher.

"Methods of Growing Plants in Solution and Sand Cultures," Agr. Exp. Sta., New Brunswick, N. J., Bul. 636, Nov. 1937, J. W. Shive and W. R. Robbins.

"Soil Erosion in Ohio," Agr. Exp. Sta.,

Wooster, Ohio, Bul. 589, Dec. 1937, G. W. Conrey, J. S. Cutler, and A. H. Paschall.

"Cultural Experiments With Yellow Bermuda Onions Under Irrigation," Agr. Exp. Sta., College Station, Brazos County, Tex., Bul. 561, Feb. 1938, Leslie R. Hawthorn.

"The Adaptability of Strawberry Clover to Saline Soils," Agr. Exp. Sta., Pullman, Wash., Bul. 353, Jan. 1938, Carl A. Larson.

Crops

¶ The essentials of profitable potato growing in Indiana are detailed and brought up to date in the sixth revised edition of Extension Bulletin 89 entitled "More and Better Potatoes," by W. B. Ward, C. T. Gregory, and C. E. Gould. Observations extending over a period of 10 years have shown the value of planting certified seed, as demonstrated by the average increase of 70 bushels per acre in the State. For early planting the Irish Cobbler leads all other varieties, while Rurals, Chippewa, and Katahdin do well for late planting.

Liberal applications of manure and thorough seed-bed preparation are important prerequisites. To control scab and black scurf, all seed potatoes should receive the corrosive sublimate treatment. From 500 to 1,000 pounds of fertilizer will give profitable increases. Analyses recommended for sandy loams are 3-12-12 and 3-9-18; silt clay loams, 2-12-6, 3-12-12 and 2-16-8; and dark loams and muck, 2-8-16, 3-9-18, 0-8-24, and 0-8-32.

Not less than 20 bushels of seed per acre should be used. Seed pieces weighing 2 ounces each give best results. Four years' experimental work on spraying late potatoes with bordeau mixture resulted in an average increase of 62 bushels per acre. Specifications for most effective spraying and dusting, cultivation, and storage are fully explained by the authors. Finally, the well-graded home-grown potatoes in new clean sacks find a ready market.

"Forty-seventh Annual Report, January 1, to December 31, 1936," Agr. Exp. Sta., Auburn, Ala., M. J. Funchess, Director.

"High-altitude Studies on Dry-land Grasses and Clovers," Agr. Exp. Sta., Fort Collins, Colo., Bul. 439, Nov. 1937, Dwight Koonce.

"Proso or Hog Millet," Agr. Exp. Sta., Fort Collins, Colo., Bul. 438, Nov. 1937, J. J. Curtis, J. F. Brandon, D. W. Robertson.

"Annual Report of the Director for the Fiscal Year Ending June 30, 1937," Agr. Exp. Sta., Newark, Del., Bul. 207, Sept. 1937.

"Austrian Winter Peas and the Vetches for Fertilizer, Feed, and Soil Protection," Agr. Ext. Serv., Athens, Ga., Bul. 453, Revised Jan. 1938, E. D. Alexander.

"Twentieth Annual Report of the Department of Agriculture, July 1, 1936 to June 30, 1937," Dept. of Agr., Illinois, J. H. Lloyd, Director.

"Vegetables" (Second revised edition), Agr. Ext. Serv., Lafayette, Ind., Leaf. 142, Sept. 1937.

"1937 Iowa Corn Yield Test," Agr. Exp. Sta., Ames, Iowa, Bul. 370, Feb. 1938, Joe L. Robinson, R. C. Eckhardt, M. M. Rhoades, and M. S. Zuber.

"Influence of Environmental Factors on the Growth of the Corn Plant Under Field Conditions," Agr. Exp. Sta., Ames, Iowa, Res. Bul. 229, Jan. 1938, Harold F. Eisele.

"Burley-tobacco Project for 4-H Clubs," Agr. Ext. Serv., Lexington, Ky., Cir. 289, Jan. 1938, E. J. Kinney.

"Alfalfa in Minnesota," Agr. Ext. Serv., University Farm, St. Paul, Minn., Sp. Bul. 104, Revised Mar. 1937, A. C. Arny.

"Top and Double Working, and Bridge Grafting of Fruit Tress," Agr. Exp. Sta., Columbia, Mo., Cir. 196, Feb. 1938, T. J. Talbert.

"Growing Potatoes," Agr. Exp. Sta., Columbia, Mo., Cir. 197, Mar. 1938, R. A. Schroeder, J. W. C. Anderson, and T. J. Talbert.

"Evaluation of Varieties of Peaches in the Northeast," Agr. Exp. Sta., Durham, N. H., Sta. Cir. 54, Nov. 1937, M. A. Blake.

"Fifty-sixth Annual Report for the Fiscal Year Ended June 30, 1937," Agr. Exp. Sta., Geneva, N. Y., U. P. Hedrick, Director.

"Fifty-eighth Annual Report of the North Carolina Agricultural Experiment Station, for the Fiscal Year Ending June 30, 1935, Progress Report for Year Ending December 1, 1935," Agr. Exp. Sta., Raleigh, N. C., R. Y. Winters, Director.

"Lawns," Agr. Ext. Serv., Columbus, Ohio, Bul. 129, Revised June 1937, George M. McClure, C. J. Willard, and F. A. Welton.

"A Program for Shade Trees in Oklahoma," Agr. Exp. Sta., Stillwater, Okla., Bul. 234, Jan. 1938, K. Starr Chester, H. J. Harper, R. O. Monosmith, and F. A. Fenton.

"Fiftieth Annual Report of the South Carolina Experiment Station for the Year Ended June 30, 1937," Agr. Exp. Sta., Clemson, S. C., Dec. 1937, H. P. Cooper, Director.

"Studies on Tobacco Downy Mildew in Virginia," Agr. Exp. Sta., Blacksburg, Va., Tech. Bul. 62, Nov. 1937, R. G. Henderson.

"Foreign Agricultural Extension Activities," U. S. D. A., Washington, D. C., Ext. Serv. Cir. 262, May 1937, M. C. Wilson.

"Over a Million 4-H Club Members, a Review of 4-H Club Work in 1936," U. S. D. A., Washington, D. C., Ext. Serv. Cir. 274, Dec. 1937, Charles E. Potter.

"The Tung Tree," U. S. D. A., Washington, D. C., Revised Jan. 4, 1938, H. L. Crane and Robert A. Young.

"A Digest of Some World Pasture Research Literature," (Exclusive of the Continental United States and Canada), U. S. D. A., Washington, D. C., Dec. 1937, A. J. Pieters.

Economics

¶ According to the annual fertilizer sales report compiled by the Department of Agronomy at the Ohio State University, the recovery in the fertilizer business in Ohio continued in 1937, reaching an all-time high of 362,205 tons of all fertilizers sold. This is 11 per cent larger than the 337,146 tons sold in 1936 and 11 per cent larger than the pre-depression peak of 338,662 tons sold in 1929.

Fertilizer sales in Ohio are fairly evenly divided between spring and fall, 180,215 tons being sold in the spring, and 181,990 tons sold in the fall. Of the total 1937 sales, 201,103 tons were represented by the 21 designated standard analyses, all of which contain 20 per cent or more plant food. There were sales of 65,356 tons of materials and 95,707 tons of miscellaneous analyses, most of which contain less than 20 per cent plant food.

The most important single analysis sold in the State is 2-12-6, which constitutes 143,143 tons of the total sales. The next most important mixed fertilizer is 2-12-2 with 41,526 tons, followed by 0-14-6 with 21,421 tons. Particularly significant is the trend toward the standard analyses.

¶ According to the annual report of the Inspection and Regulatory Service, College Park, Maryland (Maryland Fertilizer Facts for 1937), 92 firms represented by 970 different brands and 98 different analyses sold a total of 186,285 tons of fertilizer in 1937 in the State. Of this total, 144,575 tons were complete fertilizers of 73 different grades, and 15,724 tons were superphosphate and potash mixtures. Sales of materials included 700 tons of nitrogen salts, 12,785 tons of superphosphate, and 1,210 tons of potash salts. There were 4,505 tons of nitrogen, 14,508 tons of phosphoric acid, and 10,954 tons of potash contained in mixed fertilizers sold.

The leading single analysis was 2-9-5 with sales of 37,438 tons, which was followed by 6-6-5 with 14,758 tons, 2-12-6 with 12,524 tons, 2-8-10 with 11,377 tons, and 4-8-7 with 10,215 tons. Of the total tonnage sold, 123,007 tons were of the Maryland standard analyses recommended for 1937, none of which contained less than 16 per cent plant food, and the only one containing as little as 16 per cent was 2-9-5.

In 1936, mixed fertilizer sales totaled 139,290 tons, and contained 3,870 tons of nitrogen, 12,605 tons of P_2O_5, and 8,904 tons of K_2O.

¶ The Monthly Bulletin of Agricultural Statistics for Canada, January 1938, included a very nice summary of the fertilizer trade in Canada covering the fertilizer year July 1, 1936, to June 30, 1937. This report is prepared through the cooperation of the Mining, Metallurgical, and Chemical Branch of the Dominion Bureau of Statistics and the Fertilizer Division of the Federal Department of Agriculture.

The total production of fertilizer in 1936-37 reached 579,196 short tons or an increase of 33 per cent over the preceding year. Of this total 229,888 tons were mixed fertilizers; 162,509 tons were calcium cyanamide; 79,556 tons were sulphate of ammonia; 66,-967 tons were superphosphate; and 32,151 tons were ammonia phosphate. During the year, sales for Canadian consumption reached 298,276 tons, representing an increase of 27.6 per cent over the preceding year. The most popular mixture was 2-12-6, with 68 per cent of the tonnage of this analysis consumed in Ontario, and 20 per cent in Quebec. The next most important brand was 4-8-10. Approximately 10,258 tons of nitrogen, 37,027 tons of phosphoric acid, and 19,441 tons of potash were contained in the fertilizers used in Canada during the year 1936-37.

"The Agricultural Outlook for 1938," Agr. Ext. Serv., Storrs, Conn., Vol. 33, No. 3, Nov. 1937.

"Quarterly Bulletin," St. Bd. of Agr., Dover, Del., Vol. 27, No. 4, for Quarter Ending Dec. 31, 1937.

"1938 Agricultural Outlook for Idaho," Agr. Ext. Serv., Boise, Idaho, Ext. Cir. 59, Dec. 1937, Karl Hobson and Ezra T. Benson.

"Illinois Farm Economics," Agr. Ext. Serv., Urbana, Ill., No. 33, Feb. 1938.

"The Importance of the Fruit and Vegetable Industry in Louisiana," Agr. Exp. Sta., Baton Rouge, La., Bul. 294, Jan. 1938, Roy A. Ballinger.

"Crop Report for Michigan, December 1937," Mich. Dept. of Agr., Lansing, Mich., Verne H. Church and Grant D. Clark.

"Family Living on Poorer and Better Soil," Agr. Exp. Sta., State College, Miss., Bul. 320, Sept. 1937, Dorthy Dickins.

"Some Economic and Social Aspects of Irrigation in Montana," Agr. Exp. Sta., Bozeman, Mont., Bul. 354, Jan. 1938, P. L. Slagsvold and J. D. Mathews.

"Inspection of Commercial Fertilizers for 1937," Agr. Exp. Sta., Durham, N. H., Bul. 301, Dec. 1937, T. O. Smith and H. A. Davis.

"Cotton Marketing in the Salisbury Area of North Carolina," Agr. Exp. Sta., Raleigh, N. C., Bul. 317, Dec. 1937, J. W. Wright, G. R. Smith, and J. A. Shanklin.

"The Farm Outlook for South Carolina 1938," Agr. Ext. Serv., Clemson, S. C., Cir. 160, Jan. 1938, D. W. Watkins, Director.

"Department of Agriculture-Immigration of Virginia," Richmond, Va., Bul. 357, Mar. 1938.

"Do Wisconsin Farmers Need a Dairy Program?", Agr. Ext. Serv., Madison, Wis., Sp. Cir., Jan. 1938.

"What Does Northern Wisconsin Farming Need Most?", Agr. Ext. Serv., Madison, Wis., Sp. Cir., Feb. 1938, W. A. Rowlands.

"Report of the Administrator of the Resettlement Administration, 1937," U. S. D. A., Washington, D. C., Will W. Alexander.

"Report of the Chief of the Bureau of Agricultural Economics, 1937," U. S. D. A., Washington, D. C., A. G. Black.

"Some Problems in Marketing Tomatoes Grown in the Lower Rio Grande Valley of Texas," U. S. D. A., AAA, Washington, D. C., GCM-4, Jan. 1938.

"Some Problems Involved in Establishing Milk Prices," U. S. D. A., AAA, Washington, D. C., DM-2, Sept. 1937, E. W. Gaumnitz and O. M. Reed.

"The New Farm Act, A Short Summary of the Provisions of the Agricultural Adjustment Act of 1938," U. S. D. A., AAA, Washington, D. C., G-83, Feb. 1938.

"Marketing Quotas for Cotton?", U. S. D. A., AAA, Washington, D. C., 38-Cotton-2, Feb. 1938.

"Flue-cured Tobacco Facts," U. S. D. A., AAA, Washington, D. C., 38-Tobacco-1, Feb. 1938.

"The Agricultural Adjustment Act of 1938 in Relation to Flue-cured Tobacco," U. S. D. A., AAA, Washington, D. C., 38-Tobacco-2, Feb. 1938.

"Fire-cured and Dark Air-cured Tobacco, The Economic Situation and the New Act," U. S. D. A., AAA, Washington, D. C., 38-Tobacco-3, Feb. 1938.

"A Study of Factors Affecting the Price of Dry Edible Beans in the United States, By Classes, 1922-23 to 1934-35," U. S. D. A., Washington, D. C., Feb. 1938, Janet Murray.

"Land Classification for Land Use Planning in the Great Lakes Cut-over Region as Illustrated by Forest County, Wisconsin," U. S. D. A., Washington, D. C., Land Ec. Rpt. No. 1, 1937, William F. Musbach.

"Statistical Results of Cooperative Extension Work, 1936," U. S. D. A., Washington, D. C., Ext. Cir. 266, June 1937, M. C. Wilson.

Mr. Pender Specializes in Asparagus

(From page 22)

500 pounds or more of some form of potash after cutting season. The most popular potash fertilizer for years was the old 12.4 per cent kainit. Now, manure salts seem to be the most popular.

Since 1915, practically all the asparagus shipped from this section has been green asparagus. Various sized crates were used at first, but they dwindled down to the 12- and 24-bunch size, and now the 12-bunch crate is used altogether.

Many improvements in marketing

asparagus were brought about by the South Carolina Asparagus Growers Association, an organization which came into existence through the efforts of Broadas Knight in 1912 and included growers from the several asparagus-producing counties in the State. They standardized the crate, grades, and the bunch. In 1918 the association employed a grader to visit the different shipping points and instruct producers in preparing asparagus for shipping. By 1927 they had government graders at each shipping point and began using wax paper in the bottom of crates to retain the moisture. In 1932 the bunches were wrapped in cellophane for the first time. They were shipping as high as 205 carloads of asparagus in 1930—quite an increase over the production in 1908 when the first complete carload went out from this section.

About 90 per cent of the asparagus shipped from South Carolina in 1929 was marketed by the association, but shortly thereafter it began to lose ground and had completely disappeared by 1935. There are some small marketing associations now, but a large part of the produce is sold for cash at the local shipping point to speculators and a few commission merchants. The rest is shipped on consignment.

When one realizes that asparagus was not introduced into South Carolina until 1885, when Lewis Thompson, of Barnwell County, planted 2 acres, and that its possibilities as a money crop were not recognized until 1905, the present 3,000 acres of asparagus at producing age are a startling increase. However, a large number of acres now being cut came through the fertilizer depression years of 1932 and 1933, when the total amount of commercial fertilizer used dropped 63 per cent from what it was in 1931. These fields will not produce profitably again. Farmers who have put out young beds since that time and those who have followed sound practices through 1932 and 33 are still producing quantity and quality asparagus.

The most successful farmers are producing around 100 crates per acre, and have found 1,500 pounds of a 5-7-5 or 5-7-7 fertilizer when beds are being prepared for the cutting season, 200 pounds of nitrate of soda at the beginning of the cutting season, and 600 pounds of manure salts after cutting season good fertilizer treatment for asparagus of cutting age.

Profitable Cows Need Productive Pasture

(From page 9)

equivalent to 500 pounds of a 10-20-20 complete fertilizer (assuming only one-half of the nitrogen in farm manure is available to the immediate crop).

It is very important to recognize that these old pastures are as deficient of available potash as they are of available phosphorus. Figures 2 and 3 show the response from phosphorus only, and phosphorus plus potash, on a typical "run-out" permanent pasture soil. These tests were made in the greenhouse under ideal conditions of temperature and moisture, and even under these ideal conditions phosphorus alone proved very ineffective as an initial permanent pasture top-dressing treatment. Further, field experiments have shown that an initial treatment of complete fertilizer is far more effective in bringing about tremendous changes in yield and flora than is manure or any combination of commercial fertilizer that does not include nitrogen, phosphorus, and potash. Later, as the pasture becomes more productive, a soil test will show what fertilizing constituents should be given special consideration.

Pasture crops other than permanent pasture are usually referred to as supplementary pasture crops. This is a misnomer. Crops that will furnish an abundance of green pasture feed at a time when the improved permanent pasture regularly will not take care of the milking herd are equally as important a part of an all-season pasture program as is the improved permanent pasture.

The Maine farmer has found that the grazing of as much of the small grain nurse crop as possible has proved far more valuable than allowing it to ripen off for grain. Oats are at the proper stage for grazing, the fifth leaf stage, when feed on the improved permanent pasture is beginning to get too scarce for cows in full milk. This crop fits into any pasture scheme in the Northeast based on an abundance of green feed for the milking herd.

Sudan grass also has a place in an all-season pasture program in the Northeast. This crop will carry cows in full milk through the month of August better than, possibly, any other crop. Cows like it, and they milk on it.

Regularly a small portion of the hayland should be seeded down to Ladino clover for pasture. This crop, like Sudan grass, is quite drought-resistant and will furnish an abundance of late summer feed as well as early spring pasturage.

Finally, more attention to adequate fertilization of the meadowland and early cutting of the hay crop will result in a more abundant aftermath which can best be used for late summer and early fall pasture.

The procedure to follow in fertilizing these cropland pastures should also be determined from a chemical analysis of the soil. A soil analysis pretty largely speaks for itself. If the soil is low in available phosphorus, the important item is to get superphosphate on the land. A convenient way for the dairy farmer to get superphosphate on the land is in conjunction with the manure-spreading operation. Superphosphate may be used daily on the floors of the stable, or spread directly on the top of each load of manure at the time of hauling. It, of course, can be spread directly on the land.

Low Available Potash

On many dairy farms the soil is low in available potash. This is partly the result of improper handling of farm manure. Manure should be broadcast on top of plowed ground as it is made, allowing the rain to purify it there rather than in a pile, under the eaves, alongside of the barn.

One should bear in mind that lime does not neutralize soil acids quickly and effectively when applied on top of sod ground. Much of the land seeded down may not be plowed for several years. The best, and really only time, to satisfy the lime requirements of a soil is to broadcast lime following plowing and mix it thoroughly with the surface soil prior to seeding down.

Finally, if a soil test or crop management calls for a particular plant-food element, extra increments of this element should be added in the form of commercial fertilizer. Manure applications heavier than 10 tons per acre are not economical and will not correctly satisfy soil plant-food deficiencies. There is sufficient evidence to show that farm manure alone will not maintain soil fertility on the average dairy farm. Dairy farmers, by and large, must make use of commercial plant food to bring their soils to an optimum level of soil fertility. Cows are built for handling large quantities of roughage; it takes a fertile soil to produce abundant, high quality roughage, which our dairy cow of today demands.

Mississippi Soil Types and Their Preferences

(*From page* 12)

to 1,704 pounds per acre, or an increase of 474 pounds as a result of adding 24 pounds potash.

Instead of continuing with these individual farm reports we will pass to the experiment station reports as obtained at the State Experiment Station and in cooperation with the Junior Colleges of the State. Table I is taken from Information Sheet No. 122, issued November 1937 by the Mississippi Experiment Station, State College, Mississippi.

From the above table we see that an application of 600 pounds of 4-8-4 produced a profit over cost of fertilizer of $8.14, but by increasing the analysis to 4-8-8 the profit over cost of fertilizer was raised to $13.78. The table (second line) also shows that when the potash was omitted, using 600 pounds of 4-8-0, the profit was reduced to $1.45 and the yield dropped from 1,116 to 765 pounds per acre. the profit was increased to $26.56. A further increase to $28.59 was made upon increasing the potash to 12 pounds per hundred.

From Information Sheet 96, issued December 1935, the Mississippi Experiment Station at Holly Springs gives the results in Table III.

Upon referring to Table III it is seen that at Holly Springs Experiment Station a 10-year test on Memphis Silt Loam (Hill land) showed that 4-8-8 applied at the rate of 600 pounds per acre produced an average of 507 pounds over no fertilizer, and that 600 pounds of 4-8-4 over a 10-year period produced an average of 519 pounds per acre over no fertilizer. From this it is seen that there was no increase as a result of the additional potash; in fact, the higher analysis has a record of 12 pounds per year less yield. This is infinitesimal, still it shows that there was no response to

TABLE II—ANALYSIS TEST—SOUTHWEST—SUMMIT—CADDO VERY FINE SANDY LOAM

Treatment	Seed cotton per acre	Increase over no fertilizer	* Value of crop	Gain over no fertilizer	Cost of fertilizer	Profit over fertilizer
600# 4-8-4	881	651	$35.24	$26.04	$7.86	$18.18
600# 4-8-0	531	301	21.24	12.04	6.99	5.85
600# 4-8-8	1,112	882	44.48	35.26	8.70	26.56
600# 4-8-12	1,184	954	47.36	38.16	9.57	28.59
600# 0-8-4	770	540	30.80	21.60	5.58	16.02
600# 6-8-4	954	724	38.16	28.96	8.97	19.99
600# 8-8-4	945	715	37.80	28.60	10.11	18.49
600# 4-4-4	725	495	29.00	19.80	6.99	12.81
600# 4-12-4	878	648	35.12	25.92	8.70	17.22
600# 4-0-4	567	337	22.68	13.48	6.12	7.36
No fertilizer	230	...	9.20	....	....	....

* Value at 4c per pound for seed cotton.

By referring to Table II we see that 600 pounds of 4-8-4 produced a profit over cost of fertilizer of $18.18, but when the potash was left out and the same amount of 4-8-0 used, the profit fell to $5.85 per acre. The analysis was then raised to 4-8-8 and the usual amount applied, with the result that an application of additional potash. We do find though, that when the potash was omitted and 4-8-0 applied at the same rate as above, the average yield over no fertilizer was reduced to 382 pounds per acre. Thus it does appear that, while no great amount of potash is necessary on Memphis Silt

TABLE III—COTTON FERTILIZER ANALYSIS TEST ON MEMPHIS SILT LOAM (HILL LAND), HOLLY SPRINGS STATION, HOLLY SPRINGS, MISS.

Analysis	Rate per acre, lbs.	Yield 1935	Increase over no fertilizer, 1935	Increase over no fertilizer, 10-year average
4-8-8	600	884	339	507
4-8-6	600	908	418	453
4-8-4	600	896	401	519
4-8-2	600	856	371	444
4-8-0	600	832	362	382
8-8-0	600	980	525	578
8-8-4	600	932	481	502
6-8-4	600	882	412	422
4-6-4	600	872	383	368
4-4-4	600	904	435	461*
4-10-8	600	898	424	470*
4-12-8	600	876	397	417*
4-8-10	600	888	404	449*
4-8-12	600	...	...	697**
4-8-4	1,200	...	...	780**
4-8-4	1,800	...	...	859**
4-8-4	2,400	...	...	...
Av. check	....	521	...	540

* 3-year average.
** 7-year average.

Loam, there must be a reasonable amount used if best results are to be gotten.

Table IV gives the result of a test run on the same experiment station as the one reported in Table III, but on Lintonia instead of Memphis soil. This soil shows a difference in its response when the analysis was changed to 4-8-4 there was a reduction in the average yield over no fertilizer to 617 pounds, a reduction of 165 pounds. There was a still further reduction to 242 pounds when the analysis was changed to 4-8-0 and the same amount used.

TABLE IV—COTTON FERTILIZER ANALYSIS TEST ON LINTONIA SILT LOAM (VALLEY LAND), HOLLY SPRINGS STATION, HOLLY SPRINGS, MISS.

Analysis	Rate per acre, lbs.	Yield 1935	Increase over no fertilizer, 1935	Increase over no fertilizer, 10-year average
4-8-8	600	1,228	566	782
4-8-6	600	1,328	616	720
4-8-4	600	1,212	504	617
4-8-2	600	1,196	481	459
4-8-0	600	960	234	242
8-8-4	600	1,424	687	606
6-8-4	600	1,352	611	634
4-6-4	600	1,208	474	578
4-4-4	600	1,224	497	532
4-8-4	1,200	...	...	728*
4-8-4	1,800	...	...	799*
4-8-4	2,400	...	...	851*
Av. check	723	...	...	924

* 7-year average.

as indicated by the following results: 600 pounds 4-8-8 over a 10-year period produced an average increased yield of 782 pounds over the no fertilizer plot. But unlike the Memphis Silt Loam on the same farm,

These results seem to indicate that soils differ in their response to fertilizer, and that some soils have more of some plant foods available than other soils do. Thus it is to the interest of the farmer to identify his soils and search experiment station reports and the results from other reliable sources for information before determining his fertilizer practice.

Now I am sure that one peal of thunder does not make a flood, no more than do the results of one test establish a fact. But one peal of thunder does suggest the direction from which rain is likely to come, just as the results of these potato potash tests, while establishing no definite facts, do suggest the direction from which we may get some worth-while information in the future. It is true that tests of this nature must be repeated several years before the results are really conclusive. However, when the response is so decided we are inclined to watch similar work with interest and to inwardly expect the results to continue in the same general direction.

Corn on Alkali Soils Responds to Potash

(*From page* 16)

check rows between each treatment. An 0-12-12 fertilizer was used on the rest of the field at a rate of about 100 pounds per acre. A marked difference between the fertilized and unfertilized plots could be noted as soon as the corn came up. The unfertilized rows were slower in starting and soon showed "firing" of the leaves. The difference between fertilized and unfertilized rows during June is shown in figure 2. The corn on all fertilized plots grew well and showed no potash starvation until late July, when the 0-20-10 plot and the 0-12-12 area began to show marginal firing of the leaves.

The 0-9-27 plot still retained its normal green color, and the 0-20-20 plot showed very slight firing. Both were tasseled out and had strong, well-developed stalks, as shown in figure 3. The following harvest data bear out observations made during the season. The 0-9-27 and 0-20-20 plots out-yielded the 0-20-10 and 0-12-12 plots, an average of 13.8 bushels per acre, and out-yielded the check plots 29.2 bushels. A very profitable return over fertilizer costs was obtained on these plots as indicated by the following data. The slight increase of 0-20-20 over 0-9-27 is probably due to the fact that the field is low in general fertility. Corn values were figured at 50c per bushel for marketable and 25c for unmarketable corn.

CLARK CLEMENT PLOT DATA, GARNER, IOWA

Soil treatment lb. per acre	Yield per acre, bu.	% Marketable corn	Value per acre 50c & 25c bu.	Fertilizer costs per acre,	Net value above fert. costs	Net increase due to fert.
100 lb. 0-12-12....	34.5	79.9	$15.52	$1.50	$14.02	$8.70
120 lb. 0-9-27.....	44.2	91.8	21.20	2.57	18.63	11.55
Check	14.2	50.0	5.32	....	5.32	....
120 lb. 0-20-20....	48.8	94.0	23.68	3.04	20.64	13.56
Check	20.3	74.2	8.85	....	8.85	....
120 lb. 0-20-10....	32.0	87.4	15.00	2.14	12.86	5.78

Fertilizer costs: 100 lb. 0-12-20 = $1.50 120 lb. 0-20-20 = $3.04.
120 lb. 0- 9-27 = $2.57 120 lb. 0-20-10 = $2.14.

As shown by the summary of results the 0-20-20 and 0-9-27 gave the best results. (See Table I.)

In 1937, as in the 2 previous years, a series of plots were run on the alkali

TABLE I.—SUMMARY OF RESULTS OF PLANTER ATTACHMENT FERTILIZER DEMONSTRATIONS CONDUCTED ON "ALKALI" SOILS IN NINE NORTHERN IOWA COUNTIES, 1937

Series I.—On areas of low alkalinity—Average yields for 8 farms

Fertilizer *	Bu. Corn per Acre	Per cent † Marketable Corn	Increase Due to Fertilizer Yield per A.	% Marketable Corn
0-20-0	60.6	93.2	3.2 Bu.	14.4%
Check	57.4	78.8		
0-20-10	69.3	93.6	12.3	15.2
Check	57.0	78.4		
0-20-20	63.4	91.3	5.8	27.5
Check	57.6	63.8		

Series II.—Conducted on areas of high alkalinity—Average yields for 10 farms

Fertilizer *	Bu. Corn per Acre	Per cent † Marketable Corn	Increase Due to Fertilizer Yield per A.	% Marketable Corn
0-20-10	51.7	89.8	11.5	16.0
Check	40.2	73.8		
0-20-20	54.9	92.7	17.8	22.1
Check	37.1	70.6		
0-9-27	55.6	92.0	19.1	20.1
Check	36.5	71.9		

* Rates varied from 125 to 140 lbs. per acre on different farms. Rate same, however, on each farm.

† Closely associated with moisture content. Corn from check plots was usually higher in moisture at harvest time.

soils after the symptoms of potash starvation had appeared. The applications were made with a cultivator having a fertilizer attachment with discs substituted for the inside front shovels. The fertilizer was applied as near the corn plant as possible and at a depth of about 2½ to 3 inches. Fertilizer should be applied as close to the plant as possible to cultivate in moist soil, so that it can become available quickly.

Potash Effects Recovery

One series of plots was treated about the first of June, at the normal time for the first plowing. Potash starvation or firing was beginning to show at this time. Within a month the potash caused the corn to turn back to a normal green.

A second series of plots was treated about a month after the first, and at that time many corn plants on these plots were suffering severely from potash starvation. Many of the plants had died and those remaining were severely stunted. However, applications of 100 and 200 pounds per acre as side-dressings at that time proved profitable, as can be seen from the summary of these plots in Table II.

About a month later observations on the second series of plots showed that the plants were recovering.

Typical of the side-dressing demonstrations on "hot" alkali were those conducted on the Ray Frye farm near Dows in Wright County, Iowa. This field had several areas which were extremely "hot" and other areas not alkaline which would grow a normal crop of corn. Soil samples from the area on which the tests were run showed an acid-neutralizing value of 37 per cent.

Part of the area was treated early in June at 3 different rates—100, 200, and 500 pounds of muriate of potash per acre. Corn plants at this time were showing distinct signs of potash starvation. The stand was poor on

Fig. 5—Showing size of roots and stalks from Paul Rule plot, Waterloo, Iowa, Oct. 1937. Left: roots and stalks from hill side-dressed in June with muriate of potash. Right: hill from unfertilized row next to it.

this area, and the plants looked withered and showed considerable firing.

The balance of the area was treated the last week of June, at which time the early treatment plots had turned normal green in color and were approximately the same size as the corn on normal soils in the field. Only two rates were used for this application—100 and 200 pounds of muriate of potash.

By August 1 these plots were showing normal color and were tasseled out. Extreme difference could be noted between "no treatment" plots and "early June applications" as shown in figure 4. Harvest data following show the advantage in yield of the plots side-dressed with potash early. A difference of 47 bushels per acre over the check was obtained on the plot treated with 200 pounds of muriate of potash early in June.

Applications after July 1 proved profitable on other plots conducted on "hot" alkali. Corn treated with potash fertilizer improved particularly in size and strength of stalk and roots as well as in yield of grain. Figure 5 shows a comparison of stalks and roots from a hill treated with potash and one next to it with no treatment on the Paul Rule farm in Black Hawk County.

RAY FRYE PLOT DATA, DOWS, IOWA

Soil treatment	Yield per acre, bu.	% market-able corn	Value per acre* 50c & 25c bu.	Fert. costs per acre	Net value above fert. costs	Net increase due to potash
500 lb. 0-0-50 S. Dr. June 8	60.5	96.8	$29.78	$11.35	$18.43	$7.55
Check	24.9	74.5	10.88	....	10.88	....
200 lb. 0-0-50 S. Dr. June 29	50.8	95.5	24.83	4.54	20.29	9.41
200 lb. 0-0-50 S. Dr. June 8	67.1	97.2	33.08	4.54	28.54	19.52
Check	20.3	78.0	9.02	....	9.02	....
100 lb. 0-0-50 S. Dr. June 8	67.1	95.9	32.85	2.27	30.58	21.85
Check	19.8	76.2	8.73	....	8.73	....
100 lb. 0-0-50 S. Dr. June 29	53.3	91.3	25.50	2.27	23.23	14.50

* Value of marketable corn figured at 50c per bu. and unmarketable at 25c. Muriate of potash is figured at cost of $2.27 per 100 lb.

Following is a summary of cultivator attachment side-dressing plots conducted on alkali soils in northern Iowa counties during 1937. (See Table II.)

Fertilizer Recommendations

Results obtained over a period of years have shown that potash applied to "hot alkali" soils gives consistently good results. In general, corn plants on these soils need from about 30 to 50 pounds of actual potash (K_2O) per acre if applied in the hill and considerably more if applied broadcast. This would be added by applying 60 to 100 pounds of muriate of potash or other fertilizers applied on a potash equivalent basis.

Previous work has indicated that heavy applications of 200 to 1,000 pounds per acre as a broadcast treatment are not satisfactory over a period of time, because the potash seems to "lock up" again in an insoluble combination that is unavailable to the plant. Since this is true the practical thing to do is to apply the fertilizer in the hill at planting time. Where over 50 per cent of the entire area of the field is alkaline, 0-9-27 or 0-0-50 in the hill at planting time is recommended. The rate of application should be varied according to the degree of alkalinity.

However, where less than 50 per cent of the field is alkaline, but where many small areas are present, it is recommended to apply 0-14-14 or 0-12-12 in the hill and side-dress the alkali spots with 60 to 100 pounds of 0-0-50 per acre at the time of the first or second cultivation. Where no fertilizer is applied at planting time, 100 to 200 pounds of muriate of potash at time of the first or second cultivation are recommended. Cultivator attachments for applying this fertilizer can be secured from the larger machinery companies. The cost of such attachments is not high as compared with the value of increase

TABLE II.—SUMMARY OF RESULTS OF CULTIVATOR ATTACHMENTS—POTASH SIDE-DRESSING DEMONSTRATIONS CONDUCTED IN NINE NORTHERN IOWA COUNTIES IN 1937. MURIATE OF POTASH APPLIED AFTER POTASH STARVATION SYMPTOMS APPEARED

Series I.—Early and late applications in same fields—Average yields on 11 farms

Fertilizer	Bu. Corn per Acre Early	Bu. Corn per Acre Late	Per cent * Marketable Corn Early	Per cent * Marketable Corn Late	Increase Due to Fertilizer: Yield Bu. per A. Early	Yield Bu. per A. Late	% Marketable Corn Early	% Marketable Corn Late
100 lb. 0-0-50	54.7	52.8	93.7	96.4	14.2	11.0	9.6	11.9
Check	40.5	41.8	84.1	84.5				
200 lb. 0-0-50	60.5	55.2	95.5	92.2	20.4	10.6	11.3	5.6
Check	40.1	44.6	84.2	86.6				

Series II.—Late applications only—6 farms

Fertilizer	Bu. Corn per Acre Early	Bu. Corn per Acre Late	Per cent * Marketable Corn Early	Per cent * Marketable Corn Late	Increase Due to Fertilizer: Yield Bu. per A. Early	Yield Bu. per A. Late	% Marketable Corn Early	% Marketable Corn Late
100 lb. 0-0-50	...	65.3	...	93.0	...	8.9	...	6.9
Check	...	56.5	...	86.1				
200 lb. 0-0-50	...	66.8	...	92.7	...	12.9	...	7.9
Check	...	53.9	...	84.8				

* Closely associated with moisture content. Corn from check plots was usually higher in moisture content at harvest time.

Early applications made in early June or approximately at time of first cultivation.

Late applications made in late June and early July or at approximate time of last cultivation.

in the corn yields that can be obtained by applying potash fertilizer on these areas.

For more information on these recommendations, farmers may consult their county agent and extension service representative of Iowa State College. Soil samples from these areas may be sent to the Soils Subsection of the Agricultural Experiment Station for analysis. Fertilizer recommendations will be based on results from these tests and the field work carried on to date on these areas. Without potash fertilizer these alkali spots are very unprofitable, but with fertilizer they can be made as productive as the best land on the farm.

New Approaches to Potash Fertilization

(*From page* 19)

vorable climatic conditions were eliminated and soil drainage were adequate, the Bladen soil considered in this test would have a crop-producing power of about two-thirds and the Norfolk one-third of that of the Portsmouth soil for beets. The picture changes slightly for other crops considered, but the relation of one soil to another remains about the same.

The crop-producing power of the soil is determined to adequately answer the question of how much potash a grower must use on his soil. The grower must first consider just how much of a given crop he expects to produce. Obviously, if the soil is extremely acid and lime or calcium and magnesium are the limiting factors, excessive fertilization with other nutrients is not going to eliminate this deficiency but perhaps enhance it. Once he has evaluated this question, then what must be the measuring stick for these constituents? The soil tests or analyses are rapidly establishing this unit of measurement.

When the calcium and magnesium content of the soil has been determined and corrected to compare with a fertile soil, other limiting factors must be investigated. What is the organic matter content, available phosphorus and nitrogen requirement? Finally, it is estimated how the soil compares with one of a certain, maximum, crop-producing power. The available potash must then be estimated, leaching and fixation accounted for, and the crop fertilized for maximum yield.

The influence of 400 lbs. per acre of 0-8-8 upon the yield of early corn on a soil showing a low supply of available phosphorus and potash.

Certain chemical properties of the soil influence the fixation of potash in a difficultly available state. That is, the lower the pH value of a mineral soil low in bases, the higher is the fixation of potash. For example, the Bladen, Elkton, and Keyport soils have a higher potash-fixing power than the Norfolk, Sassafras, and Craven soils. Therefore, soils of the first group will require higher potash fertilization than soils of the latter group. Since these facts have been established a grower located on the first group of soils must fertilize more heavily with potash for maximum crop production than a grower on the second group.

Nutrient Balance

Likewise, there is the question of nutrient balance in the soil. For example, a soil with a high calcium content will require more potash for adequate potash fertilization than a soil with a low calcium content, but the ultimate yield may be greater. Then there is a point at which it is not profitable to increase one nutrient in the soil over another, lest the plant is unable to get an adequate supply of the nutrient in the lesser amount.

This was well illustrated by a sweet potato experiment reported last year. A small application of potash was not adequate to increase the yield over the no-potash plats whereas large applications greatly increased the yield. Since this study, the influence of magnesium and sodium upon the absorption of potash by plants has been investigated. Large applications of these bases prevented the absorption of potash by the plant, whereas a large application of potash overcame this condition. Since the condition of high sodium and magnesium content in the soil exists only in exceptional cases, it will not be discussed further at this time. However, the nutrient balance in the soil has been shown to be important and deserves consideration in a fertilization program when one hopes to get the most out of his soil.

The author has tried to point out in the above discussion that to adequately investigate a soil fertility program in respect to a particular nutrient, some system of measurement must be set up not only for the nutrient under consideration but for the other factors as well. A system of tests for Coastal Plain soils has been described elsewhere * and need not be mentioned here. The rest of the discussion will relate some of the instances of crop yields under investigation with the growers. It must be admitted that the investigations were not conducted under conditions to produce maximum yields.

First, field experiments conducted in a given section should be designed to ascertain pertinent information for the grower. Second, they should be conducted under conditions as nearly similar to his methods of farming as possible, and yet they should point to a type of fertilization that tends to overcome his shortcomings in fertilization practices. The experiments herein reported were laid out in the grower's field and fertilizer applied in plats of two or three rows each according to randomized blocks so the data could be subjected to statistical analysis.

Instead of considering an ideal situation for investigating the needs of the soil for information regarding potash fertilization, conditions in the average grower's field will be shown.

With the assistance of J. M. Blume a series of fields of different soil types which possessed varying degrees of fertility was located. These differences in the widely varying chemical factors of soil fertility are shown in Table 2. The soils were then fertilized with different fertilizer mixtures, which are given in Table 3. Potato yields on these soils present an interesting picture of certain relations to soil phenomena and potash fertilization.

The soils of the Bayboro, Bladen,

* See Bulletin 95, Virginia Truck Experiment Station.

TABLE 2—CHARACTERISTICS OF VARIOUS SOIL TYPES

Soil Type	pH	Per Cent Organic Matter	Per Cent Total P_2O_5	Per Cent Total Nitrogen	Replaceable Parts per 2,000,000 CaO	Replaceable Parts per 2,000,000 MgO	Replaceable Parts per 2,000,000 K_2O	Fertility Index Short Test P	Fertility Index Short Test K
Bayboro	5.2	6.67	0.13	0.18	2,020	520	67	Poor	Poor
Bladen	5.0	3.84	0.13	0.10	2,130	592	170	Poor	Fair—
Elkton	5.2	3.48	0.16	0.13	2,520	616	160	Poor	Fair—
Keyport	5.05	1.64	0.12	0.06	1,790	592	207	Fair	Fair
Moyock	5.9	2.71	0.23	0.08	3,140	712	179	Fair	Fair—
Sassafras ...	5.5	1.40	0.08	0.07	2,900	1,150	281	Good	Good
Norfolk	5.0	2.63	0.25	0.09	2,460	560	179	Good	Fair—
Norfolk * ...	4.85	1.60	0.16	0.07	740	396	123	V.Poor	Poor

* Limed with 1,000 pounds of hydrated lime.

and Elkton series, while they may not have the lowest replaceable potash content, tend to show the largest response to potash fertilization. It must be realized that while the total replaceable potash content of a soil indicates its available supply of potash, it does not show how much will be absorbed by the plant. Therefore, a correlation of replaceable potash and yields can be expected only on a uniform type, because certain factors regarding physico-chemical relations govern the absorption of potash by plants.

These same factors seem to influence the short chemical tests. For example, as the replaceable potash of a given soil is diminished, the more difficultly available it becomes to the plant. This same relation has been shown with the short chemical test. That is, a Bladen soil with 200 pounds per acre of replaceable potash will give a larger proportion of its potash to the plant, and in the short chemical test, than the same soil with 100 pounds to the acre. Further, it has been shown that a soil with a strong potential acidity (Bladen, Bayboro, Elkton) will retain a larger portion of the replaceable potash against plant absorption and extraction by the short chemical test reagent than a soil with less potential acidity (Norfolk, Sassafras, Craven). The following experiment illustrates this last phenomenon.

A Bayboro silt loam, Elkton silt loam, and a Sassafras sandy loam were placed in a series of tiles. The nutrients, other than potash, were supplied the soil in a constant ratio, and the potash varied from 0 to 800 pounds of K_2O to the acre. The yield of potatoes (Table 4) varied with each increment of potash on the Bayboro and Elkton soils, whereas little difference in yield was noted on the Sassafras soil. The Sassafras soil as well as the Elkton showed a good supply of replaceable potash. Yet there was a

TABLE 3—THE INFLUENCE OF VARIOUS FERTILIZER RATIOS UPON THE YIELD OF POTATOES

Soil Type	Yield in Bushels Per Acre 6–6–0	Yield in Bushels Per Acre 6–6–5	Yield in Bushels Per Acre 6–6–10	Yield in Bushels Per Acre 6–12–10	Bushels Required for Significant Difference
Bayboro	126	188	210	232	12
Bladen	67	130	128	136	18
Elkton	228	268	275	299	41
Keyport	140	190	200	222	50
Moyock	112	147	145	152	20
Sassafras	275	282	300	295	61
Norfolk	140	220	185	213	42
Norfolk	85	141	133	155	29

TABLE 4—THE RELATION BETWEEN POTASH APPLICATION AND THE YIELD OF POTATOES ON THREE SOIL TYPES IN TILE STUDIES

Type of Soil and Replaceable K_2O per Acre	0	Pounds K_2O Applied per Acre 100	200	400	800
		(Yield—Bushels per Acre)			
Bayboro silt loam 67 lbs.	181	237	250	316	349
Elkton silt loam 175 lbs.	189	309	396	410	471
Sassafras fine sandy loam 163 lbs.	370	352	357	411	403

difference in response to potash on these two soils. In other words, it requires a higher replaceable potash content in the Elkton soil to produce a crop than it does in the Sassafras. The Elkton soil has a greater potential acidity and thus offers a greater resistance to plant absorption. In this respect the two soils are opposite in phosphate fixation.

Two Potash Problems

In another greenhouse experiment, using the Bladen sandy loam (1.8 per cent organic matter) and the Norfolk fine sand (1.0 per cent organic matter), and growing four crops and leaching four times with rain water, the following relations were shown. The Bladen soil retained 78 per cent of the replaceable and added potash against leaching and 64 per cent against plant absorption. That is, only 22 per cent of the replaceable and added potash was leached by four severe leachings and only 36 per cent was available to four successive crops. Whereas, on the Norfolk soil only 40 per cent of the replaceable and added potash was retained by the soil after leaching and 15 per cent retained against absorption by the four crops. Stating it another way, 60 per cent of the potash was leached and 85 per cent was available to the plants. Consequently, the fertilization of the two soils, in respect to potash, presents two separate and entirely different problems if the most is to be gotten out of the soil.

In order to further point out the relation of potash fertilization and maximum crop yield one more experiment will be cited. In an experiment with spinach on a Sassafras sandy loam of average fertility Mr. Blume compared a 6-6-0 and 6-6-5 fertilizer mixture. With 1,000 pounds per acre of a 6-6-0 mixture the yield was 447 bushels per acre, and with a 6-6-5 mixture it was 540, a difference of 93 bushels per acre. The difference of 50 pounds of K_2O per acre resulted in the increase. Thus, to attain the maximum yield of a crop one must anticipate the maximum yield for the particular soil and fertilize for that yield. It would be needless to fertilize a soil with enough potash to produce 600 bushels of spinach if factors other than potash prevented the growth of 600 bushels.

No discussion of the availability of potash in a soil is complete without a discussion of the different requirements of different plants for potash. For example, certain vegetable crops (potatoes, sweet potatoes, beets, carrots, etc.) have a high potash requirement. These crops not only utilize a large quantity of potash but also remove a large quantity from the soil. Further, it should be mentioned that certain plants have a greater power for getting potash from the soil than other plants. Two different plants may remove an equal amount of potash from a soil yet one would require a higher potash content in the soil. Not much is yet known about these different powers of the various plants.

It is hoped, as time permits, these factors will be investigated.

A series of plats was planned on a Sassafras sandy loam testing low in available potash. Cabbage were planted on this soil and fertilized with 0, 100, and 200 pounds of potash per acre. The no-potash plats produced no marketable crop, and a very large response was noted from 200 pounds of potash over the 100-pound application. Following this crop of cabbage, sorghum was planted and adequately fertilized with nitrogen. The sorghum grew luxuriantly over the whole area. In fact, the potash plats could hardly be found; therefore, the sorghum had a much greater power for extracting potash from this soil. In this manner potash unavailable to cabbage could be made available by the use of a cover crop. In potash fertilization some point between fixation, leaching, and absorption should be selected for a given soil type and used as a guide.

In this discussion the author has tried to point out that the present approach to the fertilization of Coastal Plain soils has given certain definite leads which look extremely interesting. The many gaps yet to be filled in should prove a fruitful field for research and maintain the interest of an inquiring mind.

Vernal Visions

(From page 5)

could live again the hours of boyhood with the perspective of maturity, how much more we might do to add a touch of glory to the lives of those we cherish!

And the bumper oats and gigantic corn envisioned by Father in the inglenook of winter fantasy likewise failed somehow to meet his expectations or live up to the pictures issued by the seedsmen. To be sure, he "bit" too often on species ill adapted to the short seasons and weak soils of our paternal acreage. He repeatedly invested in teosinte, lespedeza, kudzu, and such like fancy fragments of forage so that he might "show off" to the neighbors. No doubt he had it coming for unwise selections, but viewing it fairly and after years of seeing efforts wasted by men of greater education and capacity than he, I somehow wish it had been different and that some of his dreams might have been fulfilled just as they looked in the catalogs.

In retrospect I see his naive and ever-youthful zeal of springtime as a sort of sign-manual of the everyday hopes of agriculture all around us. I do not know of any calling followed by mankind wherein the workers come forth again after defeat with renewed and vivified ambitions, wrestling anew in the same old furrows for their share of gladness and light. Wrapped up in its message of confidence is the Easter time, typical of man's faith in himself and the works of nature.

Folks these days who shut themselves in apartment houses with only a few rods of cement before the doorway surely cannot whiff the springtime with the ardor and the fond memories, put into life again, as do others fortunate enough to have a yard to rake and other odd jobs to perform. As I wield the rake amid the litter of winter accumulation, my heart seems as young as it was when our whole family spent April evenings bunching up the late-falling oak leaves and touching them off with matches, if the wind was right. We youngsters danced around the ripping blaze and bashed out the embers with shovels as bedtime drew night. If the breeze grew gusty we sometimes worked like blackened demons slapping back the flames to keep them from searing the fence posts or creeping through the dry, bottom grass toward the house or barn.

IF SOMEBODY had told me in those days that I would learn to enjoy the chores incident to a spring revival, I would never have believed it. Not that they were hard or difficult in general, but they really took so much time away from the very important things a "feller" had to arrange before the baseball and fishing season began. To some extent I remain that way yet, indifferent to the necessity of cellar cleaning and renovating, patching screen doors, painting screens and removing pesky storm sashes, washing windows, and varnishing the stairs. However, they are not quite so painful to me as they were in my youth, and I have often learned to relish them with the pride of home ownership. I steel myself with the thought that if my wife is able to manage all the spring sewing undaunted, the least I can do is to save on janitor work.

Human doings of spring have somewhat changed since I was assigned sundry stunts in my teens during April vacations. For along with the ancient faith in Doc Jaynes and other almanac soothsayers, certain jobs kindred to the joyful season are on the way to abandonment forever. I refer to parlor stove removal, carpet whacking on the clothes-line, the carting away of foundation packing at the outer walls, and the placement of rain barrels under downspouts at the corners.

I presume here and there we still find folks who spend their winter evenings hugging the cast-iron ornamental heater, with its nickel trim and silver dome—but many farm houses have discarded them for furnaces and stokers.

We had a series of those weighty, awkward, metal monoliths, each one seemingly uglier and heavier than the other. Arising from the rear ran a length of piping that vanished through a register hole in the ceiling and connected there with sundry hot-air reservoirs or drums, and beyond that to lengths of shaky, wire-hung stove pipes in chilly bedrooms above. One had to be careful when tossing a big oak chunk into the heater, lest the vibration loosen some link in the sooty chain and give rise to smoke and fire hazard. The dirt and sawdust fell from those chunks all over the ingrain carpet, and the zinc standard was full of burnt spots. But my folks were raised in the fire-place era, and to them these inconveniences spelt luxury in comparison, although I often argued that one never had to *move* a fireplace in springtime.

THE semi-annual stove tussle was put off as long as possible for two cogent reasons. First, chilly days often sneaked back upon us after we had agreed that spring had "came"; and second, none of us relished the damnable ordeal ahead. We finally said our prayers some pleasant morning and grabbed the crow-bar, the pliers, and our padded cotton gloves. Mother moved all the precious heirlooms aside, so that our pathway to the storage room would leave no chance of serious wreckage.

All the tangled, rusty wires must first be untwisted and the pipe lengths taken outside and beaten free of soot. As a rule most of the soot landed in my hair and Father's whiskers, and on the stairs and floors, so that the pipe-whacking job became a mere formality. When that was over, the lifting and grunting period began, followed rapidly by vehement language unfit for Christians in a peaceful community. My shins and disposition still bear scars of battle endured while quick-stepping backwards with my cheeks pressed against the iron monster and my fingers aching with the horrid pressure of a bottom rim. Invariably one or both of us became lodged in the narrow doorway, our bellies crushed against some demoniacal protuberance and our eyes bulging with terrifying glares. Father stood it better than I, but he had been through the Civil War and thus had some advantage.

I once proposed after an unusually blasting experience of this kind that the household set up its heater permanently on the lawn and move out there in winter. It would indeed have been almost as effective in warming the house, and the smoke nuisance would have been largely abated. Thank heavens, the kitchen cookstove never migrated!

BEATING rugs gently or giving them an indoor massage a la vacuum cleaners constitutes the bulk of our house-cleaning tasks today. But we followed a sterner system. It was my turn always to "untack" the heavy carpet and roll it up from its dusty bed of year-old newspapers, thence to hoist and stumble with it to the back yard and fling it heavily across the hempen line. Mother gave us a broom and a wire beater, as well as plenty of advice.

When that was done the heaps of strawy manure banked, boarded, and staked around the foundations, as insulation, had to be dug out and spread on the lawn or mixed into the flower beds. When such recreation was insufficient to quash my animal spirits, there were ladders to fetch out and eaves spouts to clean.

Ah, but 'twas not always these rigors of life that met us in the spring. Compensations came early and often, though we did not always recognize them at the time.

There were long walks in marshy dells and damp hollows, the bringing home of the first harbingers of budding life—the pussy-willow catkins, soon followed by white hepaticas and purple pasque flowers. There were visits to Uncle Byron's famous sugarbush, the lugging in of sap buckets and the fragrance of the sap pans gleaming in the firelight, the dunking of corn bread in luscious syrup, the sweetness and the freshness of old forests in new adornment. There was the gorgeous coloration of the opening white oak buds, equalled only by the pigment of its leaves in the fall. There were the tender greens of the river willows (waiting there for me yet, as I live) down by the old swimming hole not far from the best perch fishing spot in creation. There was the coming home with a stubby stick and a string of crappies, to find that mother had dug up some rhubarb and stewed it down for us into the slickest sauce I have ever sluiced into my gizzard. Or else she was prodding me awake some bright and vernal morning, smiling and telling me that the bluebirds and martins had returned to be our summer neighbors. There was father shyly introducing me to the trick of making a willow whistle, or offering to show me some timber cruising lore he had picked up in the roaring river days of the lumber drives.

Yes, I always liked the spring and I like it still; although the ones who made it happiest for me have ceased to know or care about the seasons or the crops, and have themselves become as resplendent, as joyful and immortal as the springtime world they admired so fondly. But in the faces of my children I see their souls still shining. It makes one cheery to think there are so many things which never die, no matter how hard the winter or how fleeting time can be.

The old man was sitting on the wood pile whittling when his wife came out to hang up the clothes.

"Paw," said the Mrs., "there's a bug crawlin' on you."

The old man went right on with his whittling, without looking up. Presently, he said, "No, Maw . . . it's crawlin' off me!"

A Few Whinnies

FOREIGN ACCENT

A Frenchman, invited to attend a "silver wedding," made inquiry as to what the term meant.

"Oh," answered his host, "that means the couple have lived together for 25 years."

"Ah," exclaimed the Frenchman, enthusiastically, "how charming! And now they are going to get married!"

The professor rapped on his desk and yelled, "Gentlemen, order!"

The entire class shouted: "Beer!"

"Mamma, Pop just ran over Zeb with the drill."

"Heavens! Is he hurt badly?"

"Naw. Zeb told Pop to do it again, 'cause there was a place on his back that still itched."

Oldtime Mosquito (to young mosquito): "And to think that when I was your age I could bite girls only on the face and hands."

WOULDN'T YOU?

School Teacher: "Mickey, which had you rather be, Napoleon or Jack Dempsey?"

Mickey: "Jack Dempsey."

School Teacher: "And why?"

Mickey: " 'Cause he ain't dead yet."

"And what," she asked, "should a little boy say to the lady who has given him a penny for carrying her bundles?"

"I'd hate to tell you," he replied.

Pat: "Moike, why is kissin' your gurril loike a bottle of olives?"

Moike: "Giv it up."

Pat: "Cause ef yez can git one the rest come aisy."

ADJUSTMENT

Mrs. Cohen awoke in the middle of the night to discover her husband pacing wearily up and down the bedroom in his slippers.

"Vo't der matter, Cohen?" she asked him.

"Vell, Rebecca, I owe Isaacs vun hundred pounds, and I haven't a penny to meet it vith. It falls due in der morning."

Mrs. Cohen slipped out of bed, went to the window, threw it open and called, "Mrs. Isaacs! Mrs. Isaacs!"

Over the road a window went up, and a tousled head in curls appeared.

"Mrs. Cohen, vot is der matter? Is dere a fire?"

"No. Cohen owes your husband a hundred pounds, and can't meet it in der morning!"

She shut the window and turned to her husband.

"Come back to bed, Cohen, and let Isaacs pace der floor!"

Better Crops with PLANT FOOD

May 1938

10 Cents

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Better Crops with PLANT FOOD

The Whole Truth—Not Selected Truth

R. H. Stinchfield, *Editor*

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An Explanation of what makes people—

Too Goofy to Grumble!

Jeff McDermid

NOW that summer is upon us in all its warmth and fervency, we can put aside the dreary evening paper and the stuffy economic and financial digests which we endured for want of livelier company beside the winter hearth.

Perhaps you share my cheerful resignation in the pleasant thought that although depleted in cents and none too rich in sense, we happily possess our normal *senses*. That is wealth indeed, but too often carelessly despised—and nowhere in the season's round of wakefulness do we have the chance to use them more than in the too brief summer interval which now enthralls us.

Not long ago I heard a noted cooperative spokesman tell his loyal fellow crafters that what we need most of all is a greater awareness of and a sturdier belief in our blessedness as native-born Americans.

He then removed his coat and vest to give free play to histrionic exercise and unbuckled his belt to give full belly tone to his deeper verbosity—and proceeded to make us all ashamed of Wall street and the jittery stock jobbers who seem to do all our economic barometric reading for us. He reminded us of the present and future wealth and resources of our broad land and the numerous advantages we have compared to millions in the murk of old world misery.

But somehow he overlooked the simplest and most comforting things which healthy folks enjoy in summer time—the period of general rejuvenation, of resurrection, of deep outdoor breathing and wide visions beyond the hills, of all things most treasured by ordinary Americans whose supply of political economy and economic lore is worn pretty thin after imbibing a whole winter's pharmacopœia of contradictory doctrines and frustrated theories.

Before the advent of those lengthy stock quotations in every small-town newspaper and prior to the blatant radio financial dopester, most of us came through the indoor confinement spell with nothing worse than boils and bilious indigestion. Mother had her stock of natural and artificial remedies and condiments with which to assuage our alimentary ailments. We had plenty of pie plant growing tall and tender under an old nail-keg, with which to activate our bowels and enliven our livers. There was an overabundance of sprouting asparagus tips ready to be nipped off and stewed up in butter for the welfare of our sluggish bladders. And sundry potent patent solutions and tablets peddled over the countryside by the same wagon man who also sold Father his horse liniment and louse powder were toted out of the kitchen cupboard to be taken "infernally" in deference to the summer moon.

"MORE than like as not," as Uncle Jarvis used to say, it was the salubrious breath of summertime and not the dope we swallowed so unwillingly which had us playing leap-frog so soon after a winter of inertia. My only point in dragging in the old medicine chest is not to advocate its present use to cure the "recession mania," but to emphasize the fact that nearly all our fancied disturbances in those days were physical reactions and not mental ones caused by morbid concentration on the "state of the nation."

Aside from a little red fire and blatherskite in the campaign of 1896 when a lot of us thought the free silverites and populists would capture the capital, I do not recall our pondering over much on the condition of the country at large. My Father thought, and pounded the table in defense of his hunch, that if we kept the dear old protective tariff and outvoted the A. P. A. outfit we were on the road to salvation. We imagined we did fairly well to elect decent town selectmen and keep our bills paid up, to say nothing about taking in any of the nation's worries.

NOW I am fully cognizant that you are going to say we were all so dumb and indifferent to what was going on in those times of "innocuous desuetude" that we let this fair land of ours drift into the bow-wows, while we drank Botchkin's Elixir with one hand and turned the ice-cream freezer with the other. It's bad to be put on the defensive so soon.

I know without asking—I can see it in your superior "seminar" smile—that you intend to charge us youngsters with being such introverts that we let the extroverts get a mean holt on us for a tough fall. I am sure you have it ready to spring on me that we let the communists in through the open door and shut out Secretary Hull's world trade; and that our ignorant, blissful, daisy-plucking dream (like that of Ferdinand the Bull) has turned into a graphic nightmare, with rip-snorting "repercussions" and may be just a few plain kicks in the pants!

You would have us keep that world almanac and the chart of ups and downs right before us while we sow and reap and play horseshoes and dive off the spring-board. But, no thanks! I prefer to take a mental vacation from that, for this is what summer's made for!

One of my rollicking friends observes drolly that if all the economists were placed end to end they would reach to no conclusions! At any rate, that's about as far as most of us can reach when we abandon ourselves to a spree of worrying why the world doesn't run like it "used to could." As a matter of fact, folks who keep close partners with nature don't notice much change.

MY MOTHER got a picture of Helen Keller a long time ago, and she framed it to hang in the hallway. She always thought Helen Keller was the greatest person who ever lived, and I doubt if she would change her mind today even for the sake of paying homage to Mrs. Dionne of Callander, Dorothy Thompson, or Snow White! Mother was always idolizing folks who

rose above tough breaks, maybe because she didn't always have the strength to overcome the jokes that fate slipped to her—like myself perhaps! Blind Tom, the untaught plantation pianist, whom she heard in a concert back in the seventies, was another scrapbook hero of hers. Anyhow, her instructions to us family folks were that every time we came home with a heavy heart or a bad grouch, or when we heard some bad news—like a case of measles in the neighborhood or a Democrat landslide—that we must pause after hanging up our wraps and take a good, long look at Helen Keller there in the walnut frame.

If that didn't fetch us around, she would take more drastic remedies, such as sulphur and molasses! It appears to me that herein I have given the world about as good an anchor to windward as many economists can furnish in case of a storm. Seems to me as though we might even start a campaign to place a Keller chromo in every home, with sulphur and molasses kept in reserve for the ones who listen too long to bewailers and bewarers.

Is the world getting sophisticated to a point where we find fewer and fewer folks of the good old kind we used to neighbor with, who were too happy to holler for help and too goofy to grumble about their lack of luxury?

Has our higher average level of learning put us in closer touch with the mysteries of nature only to reduce our thinking to skepticism and morbid fear? Were the old-timers better equipped mentally and spiritually to stand a siege despite their haphazard methods and groping guess work? Is it not also true that most jobless folks on relief fare better today than did two-thirds of the upper crust of our country less than fifty years ago?

Even such a realistic business booster as Roger Babson thinks that what we need most now is mutual confidence in each other, less class selfishness, and a genuine spiritual regeneration. I interpret that sentiment to mean that we should fret and fume less about what we hope to have tomorrow and just lean back and light our last cheroot like a busted sport, in contemplation of the fine possessions we enjoy already. This would include the three godsends which noble Helen Keller never had—sight, speech, and hearing.

YET far be it from me to league myself or attach my philosophic kite to the dubious doctrine of the w. k. brass monkeys—for it is a negative virtue just to abstain from seeing, speaking, or hearing evil or foreboding. Because a fellow who closes his senses to unworthy things or refuses to admit that everything is not ideal, may not be able to impart the better things his senses tell him in such a way as to render the most good to the most unfortunate.

In my way of looking at it the most unfortunate are the ones who must live in huddled cities. It has always seemed

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A Balanced Fertilizer
For Bright Tobacco

By E. M. Matthews

Superintendent, Agricultural Experiment Station, Chatham, Virginia

TOBACCO growers are unanimous today in their recognition of the important part which fertilizers play in producing profitable yields. They are not, however, unanimous in their knowledge of the functions performed by the different ingredients making up their mixed fertilizer; or what is necessary to provide a balanced plant-food ration for bright tobacco on new and on old soils, in wet and in dry seasons; or what part fertilizers may play in influencing yield and quality of tobacco and in increasing or decreasing the chances of damage from many common disease and malnutrition troubles.

It is with a view in mind of answering some of these questions, and so far as possible (based on results measured by actual tests conducted on the Agricultural Experiment Station in Virginia) showing to what extent varying the fertilizer analysis, source of materials, and rate of application influences the money returns per acre for this important crop, that this discussion is given.*

Few crops respond so readily and depend so completely on the plant food supplied by fertilizer applications as does bright flue-cured tobacco when grown on typical bright tobacco soils. During the early years of tobacco growing in Virginia, most planters depended largely upon the natural fertility of the virgin soils. Later animal manure was used to add extra plant food and boost yields. When the old fields would no longer produce crops of quality tobacco, these early planters sought the new lands of Piedmont Virginia. These virgin fields when first cleared of trees were rich in many of the plant-food elements so essential for healthy tobacco growth; such plant foods as magnesium, potash, organic nitrogen, and probably many others in minor quantities. Early in the history of bright-tobacco production it was discovered that most of these new soils just cleared for tobacco growing were too deficient in phosphoric acid for proper growth and early ripening. Consequently the use of phosphoric acid in fairly liberal applications was soon considered essential and was recommended.

Quality—an Early Factor

Before commercial fertilizer mixtures were generally used, tobacco growers acquired the practice of using stable manure for tobacco. This manure supplied ample nitrogen, small quantities of phosphoric acid, and considerable potash to supplement the diminishing supply of natural plant foods removed from the soil by successive tobacco crops. Peruvian Guano, a complete organic fertilizer, was widely used in early days.

* AUTHOR'S NOTE: The present article dealing with fertilizing bright tobacco is intended to supplement the information given by the writer in a previous article entitled "Virginia Tobacco Needs Potash," which was published in *Better Crops* in February 1936. It is, therefore, suggested that all interested readers obtain a copy of the former discussion to read as an introduction to the present discussion and recommendations.

General view of tobacco plots at Chatham, showing seed plants in the far right covered with bags to prevent crossing of the several varieties. Potash and nitrogen variation plots are on the right in the foreground.

As early as 1880 a bulletin on growing and "Curing Fancy Yellow Tobacco" by E. L. and F. P. Love of Pittsylvania County, Virginia, said in part: "This plant is like the butter-weed crop, in that it flourishes best in topsoil. To grow it fine and house it early, don't stir up the clay which is hostile to the growth of fine tobacco. A lump of clay large as a hen's egg at the root of a plant of tobacco will cause it to grow coarse and mature late. It matters not how fine you break the top-soil, the finer the better, but do not plow deep enough to reach the clay. . . . Guano should be used in the hill to the extent of a handful to every three hills on thin land. If the land is strong use a spoonful to the hill."

The Guano referred to was no doubt Peruvian Guano which was extensively used in Virginia about that time. In 1879 Virginia spent $2,000,000 for fertilizer, while the United States spent only $28,000,000, compared with expenditures 40 years later of $17,000,000 by Virginia and $326,000,000 by the United States.

The need for extra phosphate, as well as nitrogen and potash, became so universally apparent with tobacco growers that by 1875 or 1880 commercial fertilizer mixtures containing nitrogen and phosphoric acid, and in some cases small percentages of potash from wood ashes or kainit, were prepared and sold to tobacco growers.

Potash Need Appears

In the early days of fertilizers for bright, flue-cured tobacco, when small yields were expected from wide-spaced planting, low topping, and the whole-stalk method of harvest, a mixture containing 2 per cent nitrogen and about four times as much, or 8 per cent, phosphoric acid was found to produce the best quality of yellow, easily-ripening, cigarette tobacco. Since chemical analysis showed that most of the better tobacco soils contained large quantities of total potash (often 15,000 to 40,000 pounds of K_2O per acre for the top 8 inches of soil), very little thought was given to the actual potash needs of the tobacco plant, hence a 2-8-2 fertilizer was thought ample and complete for bright tobacco. Not until closer spacing, higher topping, and harvesting by the priming method, with resultant large yields, have the severe potash-hunger symptoms awakened research workers, as well as farmers and fertilizer manufacturers, to a realization of the importance of providing more potash in the fertilizers for bright tobacco.

Severe symptoms of deficiencies in other elements, such as magnesium and in some cases calcium, boron, and others have also developed, and consequently the agricultural experiment stations throughout the tobacco belt have been and are continuing to run hundreds of field and laboratory tests to help find answers to many of these old and new nutrition problems which confront tobacco farmers. As a result of these investigations and based on the findings throughout the several States, a committee of agronomists and other research workers from the various stations meets annually to make recommendations for fertilizing bright tobacco. It is with a view to explaining these recommendations, as well as to offer a few experimental results in support of the same, that the writer makes this discussion.

First, let us review the principal functions of the five or six major plant-food elements for tobacco:

Nitrogen: Without nitrogen in our fertilizers we get very little growth. This element is probably the most important element for boosting fast growth and supplying the dark green color. However, it was early found important that soils which were fairly deficient in natural organic nitrogen be used, and that care be exercised not to make available to the tobacco plants an over supply of nitrogen, particularly during the ripening stages of the crop.

Phosphoric Acid: Although the tobacco plant uses only a small quantity of phosphoric acid, yet a fairly large supply of this element is necessary for the proper growth and ripening of tobacco. Phosphoric acid hastens maturity and ripening of the leaf. Without it tobacco grown on most soils remains small, with dark green and narrow leaves which never ripen.

Potash: Potassium is an essential plant food for tobacco. This element aids in the development of starch and sugar. Without it the plant would be weakened and make very little growth. Potash adds much to the yield of tobacco, improves the leaf quality by increasing the oil, sweetness, elasticity, and general smoothness, and makes it more healthy and vigorous to withstand certain leaf diseases.

Magnesium, Calcium, Iron, Boron, and others: Magnesium, although required in fairly small quantities, is an essential plant food for tobacco. Without this element the leaf bleaches out and wastes away before maturity. The pale, almost white, and thin undeveloped leaves (known as Sand-drown) near the bottom and middle portions of the plant are typical magnesium deficiency symptoms.

Calcium deficiency produces small, dwarfed plants, light in weight, with poor root development. The effect of a deficiency in boron is similar to that of calcium, except that the plant appears more drawn near the top, with the terminal bud finally dying in extreme cases. Where sulphur or iron is deficient, the plant is also stunted in growth.

Of all the above-mentioned elements essential for growth of the tobacco plant, probably potash has been most neglected in being supplied in sufficient quantities by Virginia bright-tobacco producers. For this reason the writer in this article endeavors to give slightly more emphasis to study and discussion of the potash requirements for tobacco than is given to the others.

Different authorities give rather widely varying figures on the amount of plant food removed from the soil by an average crop of tobacco. Such figures from literature reviewed vary from 38 pounds of nitrogen, 5 pounds of phosphoric acid, and 57 pounds of potash, to 127 pounds of N, 32 pounds of P_2O_5, and 148 pounds of K_2O. However, based on actual analysis of the tobacco plant under average conditions, we find that a 1,000-pound crop of tobacco leaves removes from the soil approximately 40 pounds of N, 5 pounds of P_2O_5, and 60 pounds of K_2O; and if the stalks are also removed from the field, the total plant food then removed would be approximately 47 pounds of N, 7 pounds of P_2O_5, and 77 pounds of K_2O.

1,000 pounds leaf (alone) remove 40 lb. N, 5 lb. P_2O_5, 60 lb. K_2O.

1,000 pounds of 3-8-3 supply 30 lb. N, 80 lb. P_2O_5, 30 lb. K_2O.

Difference: 10 lb. N, + 75 lb. P_2O_5, — 30 lb. K_2O.

The above shows that 1,000 pounds of 3-8-3 fertilizer contain ample phosphate but lack 10 pounds of nitrogen and 30 pounds of potash in supplying as much of the three major plant foods as a 1,000-pound crop of tobacco removes, provided all stalks and roots are left on the field. This slight deficiency of nitrogen can usually be supplied by organic nitrogen received from weed growth or other organic material plowed under; however, this is not always possible, especially on sandy soils where there is little organic matter and leaching is bad. Lack of nitrogen may often limit the yield on tobacco fields where only 30 pounds of nitrogen are applied per acre.

In nearly all cases, where only 30 pounds of potash are supplied by 1,000 pounds of a 3-8-3 mixture (particularly on typical tobacco soils where tobacco is grown year after year), the 30-pound shortage will greatly limit the yields and quality of the crops grown. With some growers who produce on good deep sandy soils as much as 1,200 to 1,600 pounds of smoking leaf per acre, the potash requirement would be from 70 to 96 pounds per acre for the leaf alone.

On new soil rich in potash reserve, or on farms when a 2- or 3-year rotation is practiced with heavy weed and fallow crops turned under before each tobacco crop, this potash supply of 30 pounds may prove sufficient, and particularly is this true where low topping and wide spacing are practiced and small yields of cutting-type tobacco are expected.

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Note the rough, crinkled leaves and dead areas of the plant on the right which received no potash. These are typical potash starvation symptoms.

Looking down over the small flower garden showing the roses in bloom and the winding driveway as it starts from the top of the hill to reach the valley below.

Advantages of Living On Your Own Farm

By E. B. Ferris

Superintendent, Holly Springs Branch Experiment Station, Holly Springs, Mississippi

BEFORE the Civil War, the average Southern land-owner and planter lived on his farm and had that intimate knowledge of its every detail that the present merchant or manufacturer has of his store or factory. It is true that the larger ones among these planters had their overseers or managers. But as one who was reared on the plantation of his grandparents so soon after this war as to have made the relationship between former master and slave seem all but a reality, such overseer only represented the master in minor details, had no authority to punish the slaves or to decide matters of policy. All of this was left to the owner of the farm who knew the peculiar needs of every field and even the strength or weakness of every slave or work animal. The mistress, too, on such a plantation, largely supervised the making of the clothes, looked after the health of the family, including the slaves, and saw to the beautification and upkeep of the home in the broadest sense that the word implies.

Under such a system of careful planning and overseeing, there is no wonder that many of these homes which still stand are now monuments to the high rural civilization of the Old South. Pilgrimages to such places as the country around Natchez, Mississippi, where invading armies did not destroy the old homes, are attracting annually thousands of visitors who come to see the beauty of the old gardens, the majesty of the old houses, and the exquisite taste employed in the selection of the furnishings. In the opinion of the writer, no rural civilization, past or present, ever surpassed that of the Old South immediately preceding this Civil War, and it was largely due to the fact that our forefathers lived on their farms and that every member of the family did his or her part toward the upkeep of the land from which their wealth was derived.

The Trek from the Land

Following this war, these old families, as a matter of protection to themselves, largely moved to nearby towns and cities or to distant States. They left their farms to the tender mercies of the former slaves, for whom we entertain none but the kindliest of feelings, realizing that they were themselves the victims of circumstances beyond their control as were also their masters. But the 70 odd years that have intervened now find the North and South entirely reconciled, with the farms of the South the main sufferers by reason of the fact that far too large a part of their owners live away from the land and cannot possibly give that intimate supervision necessary to the best farm husbandry. It is true that many of our Southern people, in the generation rapidly passing, grew up with a false interpretation of what constituted a real gentleman or lady and feeling that any sort of manual labor was beneath the dignity of their class, but this has long since become a thing of the past and is no longer a handicap.

As a representative of a generation that possibly had been imbued with the most of this false pride, we wish to pay tribute to the example and teaching of one who was the personification of the Old South and, following the Civil War, devoted his energies to the training of Southern youth. We refer to General Stephen D. Lee, the first president of the Mississippi Agricultural and Mechanical College, who did more than any other man of his generation, especially in the lower South, to teach the dignity of honest toil and to train the youth of the land how to work with their hands as well as their heads. As old age approaches, we come more and more to appreciate the privilege of having been one among the thousands of Southern youth who received training under him and especially to remember the encouragement he gave to the poorer boys, among whom we were numbered, in teaching us to hold up our heads and forget the troubles of the past.

But even General Lee was not able in a generation to restore the modes of living in the Old South and especially to send the farm youth back to the land, for it is a task that will require the efforts of many generations. One can destroy in a decade what it will require centuries to restore, if, indeed, it can ever be wholly accomplished. As a matter of fact, 1938 finds the South with far too large a part of its land-owners living off the farm, and the object in preparing this article is to give the public our personal experience as to the many advantages of living on our land.

A Move Back to the Land

Long the owner of Southern farm land, we trusted its upkeep to the mercies of ordinary negro tenants, feeling that we owed too much to the family to move them miles away from the nearest town and on to this farm. Only circumstances beyond our control forced this move back to the land during the height of the recent depression and under conditions far worse than the average. The most agreeable surprise came in the satisfaction of the family and the way each and every member took hold and helped to make it a success. On a plantation where, even before the Civil War, a white family had never lived, 16 miles from the market town, with no building of any kind except the worst type of negro cabins, we took this family after building the cheapest kind of residence, so placed as to take full advantage of the natural landscape, and otherwise a place where it required a vivid imagination to foresee happiness and contentment.

Under the old regime this place had never produced anything of money value but cotton, and barely enough to support the tenants and pay the taxes. There was no livestock except the mules required to make the cotton and never enough corn grown to feed these mules, making it necessary every year to purchase fully half of the feed. Simply as a result of closer supervision of the tenants by being always present and by a more intimate knowledge of the lands best suited to cotton, corn, and pastures, the family has been able to practically double the production of cotton on 35% less land than had previously been devoted to it; to increase the production of corn almost tenfold; and to set aside all the very poor acres for summer legumes and all the land inclined to erode or to be too wet for cultivation, for pasturage. On this land are kept 75 to 100 breeding cows, 50 to 60 head of sheep, 12 to 15 brood mares, about a dozen brood sows, and enough goats to keep down shrubbery when once the pastures are cleared of timber and old fields consolidated from the neglect of previous inattention. Winter feed for all has been grown largely on land taken out of cotton.

Thus, instead of cotton alone as a money crop, they have introduced the sale of appreciable numbers of hogs, possibly $1,000 worth a year; many baby beeves; some lambs and wool; and at least enough mule colts to do away with the necessity for buying older ones every year. Large acreages of bur clover have been planted both for pasture and for soil building, the hope being that this crop may be substituted entirely for other winter legumes and do away with the necessity of buying vetch or winter pea seed annually. As a matter of fact, the use of winter legumes, except bur clover on fenced pastures, was introduced less than 2 years ago, because it was feared that on unfenced fields livestock running at large in winter would make the practice impossible. However, to our surprise, the neighbors cooperated in keeping their livestock off the land, and we kept our own in pastures.

During the spring we turned under some 200 acres of about as fine vetch

(*Turn to page* 33)

Looking down from the top of the water tank on the small and simply constructed residence. Note the porch built around the hickory tree, the flowers and shrubbery in the yard.

Tomatoes & Cucumbers Reveal Diet Needs

By I. C. Hoffman

Ohio Agricultural Experiment Station, Wooster, Ohio

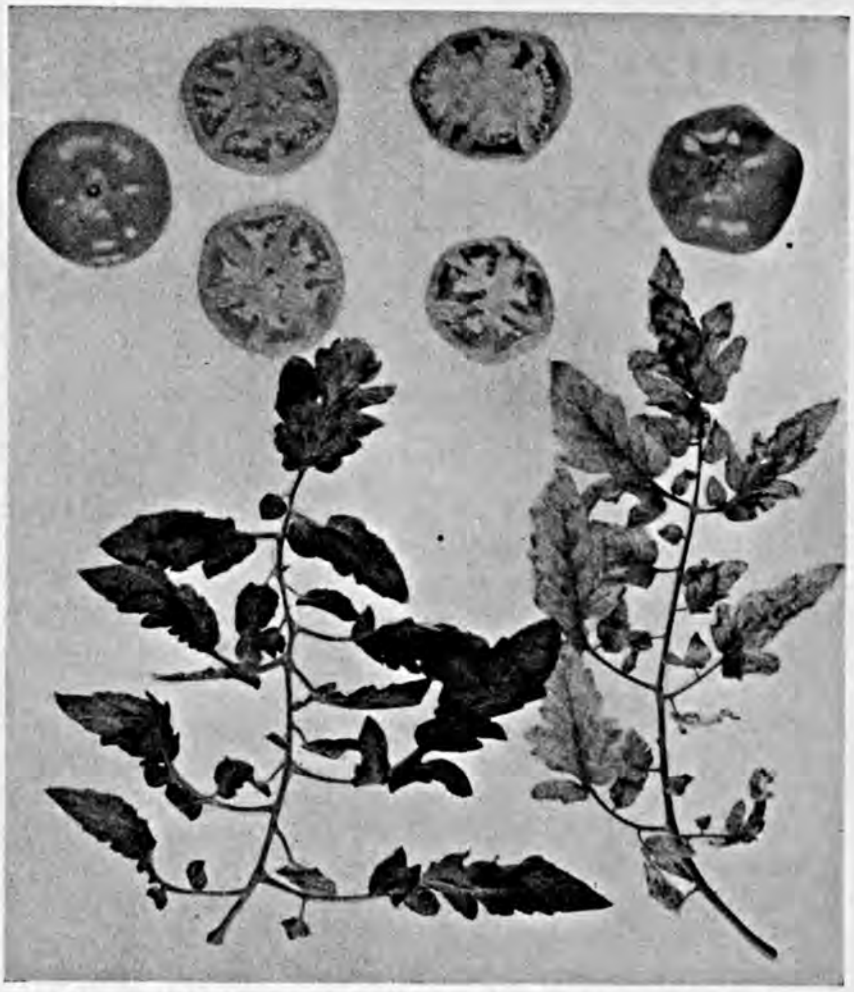
IN GREENHOUSES where the environmental conditions are maintained at such favorable levels for rapid plant growth, large quantities of commercial fertilizers need to be always available. Tomatoes and cucumbers are luxury consumers of mineral nutrients. They absorb considerably more of them than they can use immediately for growth, and the uncombined portions may be found within the plant. Certain portions of these unused mineral nutrients are removed from the plant when undesired parts are pruned off and when fruits are removed during the harvesting period. These are lost to the plant and speed the time when supplementary applications must be applied as growth and fruiting continue.

Certain mineral nutrients are fixed in plant tissue and then cannot be removed easily to other growth centers. Some other nutrients are held very loosely in combination and may be translocated to growing parts and be reused again and again. Under greenhouse conditions soils that are not kept well supplied with readily available minerals of all kinds very soon lose their capacity to supply them fast enough to support such rapid growth. In fact, greenhouse soils that appear to have a generous supply when the plants are transplanted may lose their reserves of certain nutrients long before the crop is completely grown. From either soil condition the first nutrients to produce external starvation symptoms are those which are fixed by the plant tissue and become practically immobile. A typical example is the case of nitrogen.

Nitrogen is fixed by the plants and very little of it is reused. In fact, it is released so slowly that the growing portions show the characteristic starvation symptoms long before they occur in the older tissues. When nitrogen salts, as nitrate of soda, nitrate of calcium, sulfate of ammonia, etc., are applied to the soil around the starving plants, the symptoms of the deficiency quickly disappear and the plants resume rapid growth. Such plants will continue to grow rapidly until they are limited by some other element which, in the meantime, has become nearly exhausted. In most cases the next mineral nutrient of importance to limit the growth of greenhouse tomatoes and cucumbers is potash. Potash is one of those elements which is loosely combined in plant tissue and may readily be transported from older to younger tissues where it may be reused.

Need for Adequate Potash

Presumably, this may be one of the reasons for the delay in the appearance of potash deficiency symptoms until after the nitrogen deficit has been relieved. In the case of tomatoes, however, apparent potash starvation symptoms do not always show first at the bases of the plants, as commonly reported, but they may occur in the upper one-half to two-thirds of the plants if there is a heavy load of rapidly growing fruits on the bottom clusters. The effect of the fruits seems to be to absorb so large a proportion of the potash supply taken up by the plants that not enough of it gets to the top portions in time to prevent the development of several potash starvation symptoms. If, however, the supplementary nitrogen fertilizer also contained potash in adequate amounts, the starvation symptoms would not have appeared. Furthermore, when potash starvation symptoms have so far advanced in tomatoes that they are easily visible in the young fruits, they cannot be entirely corrected by the use of supplementary potash salts.



Healthy tomato leaf and fruit (left); potash-starved leaf and fruit (right). Note the hollow, irregularly ripened fruit from the potash-starved plant. The leaves are yellowed, with greenish-tinted veins.

When the symptoms are observed in very early stages most of the damage can be corrected in the younger growing tissues in the tops. Even the leaves and stems in the middle portions may be returned to approximately normal appearance. The fruits, however, which have begun to develop flattened sides and hollow locules usually fail to recover their quality and are not as heavy as they otherwise would be. It is necessary then to maintain the potash supply at a high level during the entire harvesting period so that quality, weight, and appearance of the fruits, especially tomatoes, may be maintained.

When nitrogen and potash salts have been applied liberally to greenhouse soils, inadequate supplies of phosphates sometimes limit growth, and the characters of the plants are modified accordingly. The first effects of the deficiency of any of the principal nutrients is to cause a decrease in the growth rates. Later the various organs are modified in a way which is characteristic for the deficient material. Chlorosis may assume rather definite patterns in the leaves and fruits. Normal colors are frequently modified or kept from being formed. Stem thickening and lengthening are also affected. Fruit development may be prevented or modified in size, shape, color, and certain internal characters. The roots are also affected, and the usual branching and lengthening habits may be greatly modified depending upon the nature of the nutrient and its use within the plant. For the purpose of this article the discussion will be confined to the starvation symptoms produced by insufficient nitrogen, phosphate, and potash.

Nitrogen Starvation

The plant as a whole.—Nitrogen deficiency may become acute at any stage of development. If the soil is deficient the symptoms may appear early in the seedling stage. If it is moderately well supplied with available nitrogen for early growth, the deficiency symptoms may appear later. When tomato and cucumber plants are in full production the symptoms may appear very suddenly, and if the condition is not remedied quickly much loss will result. The first symptom to attract attention is a stunting in growth which is followed by a change in color of the plant. The normal green color fades through various shades of green and yellow-green to a pale lemon yellow. The tops are affected first, and as the symptoms develop, older leaves become yellowish in turn towards the base of the plant. Plants, like the tomato, in which purple anthocyan pigments develop are often colored by them in the tops. This is particularly the case when the temperature is low and the soil cold and wet.

Leaves.—As nitrogen deficiency makes its appearance the leaves in the tops fail to grow to normal size for greenhouse conditions. They remain small and usually are smooth, thin, and flat. The color turns to a yellowish green with the destruction of the chlorophyll, and purple color develops in the veins on the under sides of the tomato leaves. Since the forcing cucumber varieties do not form anthocyans, the color which finally develops in them is a pale greenish yellow. In very extreme cases practically all of the chlorophyll is broken down, and the final color is nearly a clear yellow. In the greenhouse nitrogen starvation symptoms may be produced by surface applications of straw and strawy manures. The condition is made very acute by the decomposition of the straw. Since straw does not contain enough nitrogen to rot itself, the organisms must draw on the supply within the soil. In a short time the soil nitrogen may be locked up temporarily by the soil organisms, and the plants may suffer if the total supply of nitrogen is not sufficient to meet all needs. As the leaves collapse, the dying begins at the mid-ribs and proceeds towards the margins without forming any definite pattern.

Stems.—The stems of nitrogen deficient tomatoes and cucumbers are hard and fibrous. They are slender, whiplike, and in tomatoes considerable anthocyan develops, which produces a distinct purplish color. In severe cases the green color fades much the same as in the leaves.

Roots.—With low nitrogen supply the roots of tomato and cucumber plants are often more fully developed than the tops. With a very low supply they become stunted, and in time they will turn brown and die.

Fruits and seeds.—Fruit formation is greatly restricted when nitrogen is not available in sufficient quantities. When the temperature is high during the long days of summer and nitrogen is deficient, tomato flower buds may turn yellow and drop without opening. This latter phenomenon seems to be the result of a chain of circumstances. It appears that when nitrogen is deficient less carbohydrates are formed, since the leaf area is small and the chlorophyll greatly reduced in quantity. At that time of year the night temperatures are also high. This will tend to reduce the carbohydrate supply by maintaining a high respiration rate all of the time. Respiration quickly destroys the reserve carbohydrates, and the blossom buds absciss and drop. By the addition of supplementary nitrogen, the chain of reactions is reversed. The normal green color is built up and the leaf area increased in size. Carbohydrates are again synthesized in quantity, the new buds develop to full anthesis, and fruiting is resumed. The condition may be further improved by liberally syringing the plants and ground with water to aid in lowering the temperature. Water alone will not have this effect, but when water and nitrogen are used together, improvement can be seen in 3 or 4 days, and recovery follows in a short time. Similar effects have been observed with cucumbers.

When nitrogen deficient conditions are not corrected, the number and size of the fruits are greatly reduced. Tomato fruits are often pale green in color while young but frequently are highly colored when ripe. They are very firm and well shaped, but small.

Cucumber fruits on nitrogen deficient plants are frequently so light in color that they must be sold with the off-grade fruits. As the effects become more pronounced, the cucumbers become pointed at the blossom end as well as light in color. Nitrogen deficiency is one of the main causes of low greenhouse yields, and under extreme conditions the mature seeds are light in weight.

Phosphorus Starvation

The plant as a whole.—The plants tend to grow slowly and mature late. Tomato and cucumber plants in phosphate deficient soil have become as tall in the greenhouse as those in well-fertilized soil, but the yields have not been as great, and ripening has usually been delayed. In the early stages the plants may be very dark green for a time, and then tomato plants may develop much dark purple color. This may be in part a seasonal effect, for it is usually confined to early spring. Later, as the daily temperatures increase and as the plants become older, the anythocyans largely disappear. Sometimes the color of the plant appears dull green when it reaches maturity.

Leaves and stems.—In the early stages of growth the color may become much darker green for a time than in well-fertilized plants. Tomato leaves develop much purple pigment during the short days when the temperature is low and soil moisture relatively high. The stems of phosphate deficient plants are frequently more slender and fibrous than well-fertilized ones. Tomato stems are often colored while young the same as the leaves.

Roots.—Phosphorus deficiency inhibits

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Potash-starved leaves and fruits of cucumber (left) compared with healthy ones (right). Note chlorotic leaves and fruits with constricted necks due to lack of potash.

A simple and inexpensive manure shed with a concrete wall and floor prevents leaching and, if the manure is superphosphated, will preserve its value until it is spread.

Our Responsibility With Manure

By Ford S. Prince
Agronomist, Agricultural Experiment Station, Durham, New Hampshire

THUS far in the Agricultural Conservation Program, the huge losses that occur to manure on the farms of the country have not been specifically recognized to the extent that practices have been formulated to prevent the tremendous draft on fertility that these losses entail.

It is probably fair to state that over half the fertilizing value of manure is lost during the period that elapses between its production and its incorporation with the soil. Under ideal conditions some loss of nitrogen is bound to occur through the escape of ammonia in gaseous form. Unless sufficient bedding is used to absorb the urine this portion may escape, with a consequent loss of both nitrogen and potash. Exposure to rain causes manure to suffer much loss by leaching, and this loss affects the more soluble plant food and hence the most valuable portion. Drying permits nitrogen to escape; freezing withdraws water from the mass and results in serious nitrogen losses; and even after spreading, if the manure is not immediately incorporated with the soil, nitrogen is dissipated by being volatilized and carried off as a gas in the atmosphere. Fermentation, lack of compaction, and exposure of the surface of manure heaps to the air or weather are aggravating and contribut-

Manure loses half its value in a few months exposed, as it is here, to the weather. Additional water from the eaves of the barn hastens the leaching.

ing factors promoting losses. From the time manure is voided until it is intimately incorporated with the soil, it is subject to loss. Much of this loss is preventable by proper conservation methods.

It is not advisable to close our eyes or become too complacent about this very real opportunity to save fertility elements. The nitrogen that escapes into the air from manure is just as valuable as that which we purchase in the fertilizer bag. Potash, the greater portion of which is contained in the urine, is in solution and is as available to plants as potassic fertilizers. Phosphoric acid in organic form is probably more valuable than its equivalent in superphosphates, although this element is not subject to such major losses as nitrogen and potash. Besides these three important elements, manure carries all the minor ones that have entered into the nutrition of the feed stuffs eaten by the livestock. While there is little data available on these elements as manure components, it is quite possible that the more soluble of these are adversely affected by faulty handling of the manure.

Waste Is Poor Business

It appears to be poor business to allow this waste to occur, especially that which can be easily prevented, and then later take funds to buy the equivalent of the losses in commercial fertilizers.

No method of procedure has yet been devised to save all the fertility elements voided by livestock. To do so would involve catching all the excrement and harrowing it into the soil at once. This would keep several men busy day and night in the average dairy barn, and with team or tractor in the field. The reason for such haste lies in the fact that urea nitrogen changes to ammonium carbonate rather quickly in the presence of air, and in this unstable compound the ammonia readily escapes into the air as a gas. The warmer the temperature the more quickly this transformation occurs. Under conditions such as are found in the average dairy barn this occurs probably in from 24 to 48 hours. Losses therefore are simultaneous with the change, and the losses are commensurate with its rapidity in unprotected manure.

The Function of Bedding

Any substance that will absorb and hold gases, or a chemical material which will react with the ammonia and change it into a stable compound, renders manure less vulnerable to immediate loss. Adequate bedding to absorb the liquid will also catch some of the ammonia because of its porous nature. Of all the chemical substances that have been experimented with up to the moment to react with ammonia, superphosphate of a 16% or 20% composition has proved most satisfactory and effective. The net result of the use of this substance is to change volatile ammonium carbonate into non-volatile ammonium sulphate, a substance which is still subject to leaching but which will not escape in a gaseous condition.

True and effective conservation of manure involves the use of both these substances in amounts sufficient to ade-

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Uncle Henry McDaniel Beats Tomato Record

A 5-year rivalry between Henry McDaniel, 78, and Charles Neeves, 76, both retired Boone County farmers and neighbors, as to who was the best tomato grower, reached a climax at the closing banquet of the eleventh annual conference of Indiana canners, fieldmen and medal winners, held recently at Purdue University. Roscoe Fraser, Purdue Extension Horticulturist, announced McDaniel as State champion and Neeves as reserve State champion of the "Indiana U. S. 'Won' Club" and extension project contest on growing quality tomatoes sponsored by Purdue, county agricultural agents, Indiana Canners' Association, local canning companies, and growers.

Champion McDaniel, who enjoys rivalry and believes a man never gets too old to learn new ideas, produced the all-time record yield of 26.02 tons of tomatoes per acre; while the runner-up, Neighbor Neeves, grew tomatoes at the rate of 21.9 tons per acre. The previous high record in the project was 15.18 tons per acre in 1935. The champion's tomatoes graded 87.9 per cent No. 1's and 12.1 per cent No. 2's, there being no culls.

Not liking the idea of sitting down when he is capable of doing a constructive and interesting piece of work, Champ. McDaniel, who wants to be known as Uncle Henry, decided that "no young whippersnapper like 76-year-old Neeves" could beat him growing quality tomatoes. He selected a piece of ground that had been a permanent pasture and a commercial sheep feeding lot for many years. It was in corn during the 1936 season. The lot was plowed on May 10, double-disced two times, harrowed once, and planted with certified Baltimore tomato plants on May 18. The fertilizer, which was applied at the rate of 250 pounds per

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Henry McDaniel (right), State champion of the Indiana U. S. "Won" Club, talks over the recent contest with his rival and runner-up, Charles Neeves.

Red Raspberries Need Complete Fertilizers

By W. J. Strong
Horticultural Experiment Station, Vineland Station, Ontario, Canada

EXPERIMENTAL results with fertilizers on the red raspberry have been rather variable, and fertilizer practices amongst growers have been anything but uniform. The value of comparatively large amounts of organic matter is usually stressed, due, no doubt, as much to experience and observation amongst growers as to experimental evidence.

The role of organic matter in soils cannot be discussed here in detail, but it is advisable perhaps to remind the reader that in addition to the various chemical and biological changes which it brings about in the soil, it also produces marked physical effects. It acts as a binding medium in the lighter soils and makes them more retentive of moisture, so that larger quantities may be held in reserve. Also, it helps to open up heavier soils, which improves their water-holding capacity and makes possible better air circulation, so that roots may penetrate to a greater depth. These functions are of particular value for the red raspberry which is apt to suffer severely from drought during the growing and ripening season.

It has been demonstrated by various experiments that large, vigorous canes yield more and larger fruit than small, weak ones. Growth is usually increased by nitrogen, hence the crop also may be increased by its use. Under some conditions however, growth may be retarded or actual injury occur, if large amounts of nitrogen are applied in a readily available form, such as nitrate of soda.

While the need for organic matter and nitrogen appears to be well established, there is very little information as to the basic mineral requirements of this fruit. It is not definitely known whether the red raspberry requires relatively small or large amounts of any or all of the principal minerals for its best development. Work in England[1] with various fruits, including the red raspberry, indicates that if one or more of the principal minerals, phosphorus, potassium, calcium, magnesium, etc., are left out of sand culture experiments, certain foliage symptoms may appear. Some of these symptoms may show up under field conditions and can be corrected by applying the appropriate minerals in sufficient quantities. Reduced yields, however, may result before definite deficiency symptoms appear.

Most of the earlier field experiments with mineral fertilizers on the red raspberry have given indefinite results, so that the value of extra minerals has often been questioned. Lack of response to applications of minerals may be due to two causes. First, where the soil is naturally well supplied with minerals and the organic matter is kept up, the minerals become available to the plants in sufficient quantities for their best development. Second, the soil may have the capacity to act chemically on the mineral fertilizer applied, changing much of it into a form unavailable to the plant. This is par-

[1] Wallace, T. Experiments in Manuring Fruit Trees, Journal of Pomology and Hort. Science, Vol. V, 1927.

ticularly true with phosphorus and potassium, especially if they are left at or near the surface for a time. There is less danger of this change taking place if the minerals are plowed under immediately after sowing.

Some Clear-cut Results

Several more recent field experiments carried on in England,[2] the United States,[3 and 4] and Canada[5] have given rather clear-cut results.

[2] Hoblyn, T. N. The Layout and Conduct of Two Manurial Trials on Raspberries. Jour. of Pom. & Hort. Sci., Vol. IX, 1931, p. 328.

[3] Stene, A. E. The Fertilization of Red Raspberries, Rhode Island Exp. Station, Bulletin 229, 1931.

[4] ———— Preliminary Studies in the Fertilization of Red Raspberries, Proc. Amer. Soc. for Hort. Sci., Vol. 30, 1933.

[5] Strong, W. J. Results with Fertilizers on the Red Raspberry, Sci. Agric. 16:8, April 1936.

The experiment in England, under the supervision of Mr. T. N. Hoblyn at East Malling, was conducted in a very thorough manner. Two English varieties, Pyne's Royal and Lloyd George, with 4 acres and 3½ acres respectively were used. The former was divided into 96 plots, which allowed for 12 fertilizer treatments with 8 replications of each. The latter was divided into 80 plots with 10 fertilizer treatments of 8 replications. The plots were arranged in randomized blocks, so that the results could be analyzed statistically by methods originally devised by R. A. Fisher of The Rothamsted Experiment Station. The fertilizers used included sulphate of ammonia, sulphate of potash, kainit (a potassium chloride fertilizer), and shoddy (an organic fertilizer supplying 16% ammonia).

Normal raspberry foliage on the left. Foliage showing potassium deficiency on the right. Note particularly the upward and inward curling of the leaf margins, which assume a distinct gray color.

The details of this experiment are not included here, but the outstanding results are summed up in a quotation from the original report of the experiment.[2]

"The most important manurial information, which has been obtained from these experiments with very different varieties, is the necessity on this soil for a proper balance between nitrogen and potash. Applications of nitrogen, up to a point, may produce more cane, but if this is overdone, the cane growth may be reduced. For crop, however, nitrogen alone has been not only ineffective but inadvisable except in the presence of potash, which, where applied as the sulphate, has always proved beneficial in the quantities applied;" also, "it appears that kainit is, on the whole, less suitable than sulphate of potash, for though in a single season it may prove beneficial, in others it may do harm."

The work in the U. S. A.[3 and 4] was carried on at the Rhode Island Experiment Station as two separate experiments, on two types of soil. The first consisted of one plot of each of the following treatments: Phosphorus plus potassium, nitrogen plus potassium, nitrogen plus phosphorus, and nitrogen plus phosphorus plus potassium, but no check plot. These were given for 3 years in succession at the rate of 500 pounds per acre for the complete fertilizer, a 4-10-6 mixture made up of nitrate of soda, sulphate of ammonia, superphosphate, and muriate of potash. Each plot was 24 by 69.57 feet; there were no buffer or guard rows to separate treatments.

The results of this experiment are best stated by the following paragraph from the summary in Rhode Island Bulletin 229. "The best yield of red raspberries has been secured from a fertilizer containing all three elements, nitrogen, phosphoric acid, and potash. Leaving potash out of the fertilizer reduced the total yield for three seasons to less than one-half of that harvested from the plot receiving a 'complete' fertilizer. Leaving out nitrogen reduced the yield about 30 per cent and omitting phosphoric acid about 20 per cent, from the yield obtained with a complete fertilizer."

The second experiment consisted of the same treatments but in three quantities, i. e., 500, 1,000, and 1,500 pounds of the 4-10-6 mixture per acre on the complete fertilizer plots. Check plots were provided, but no buffer rows. There were four replications of each treatment arranged somewhat at random. Yields follow very closely those obtained in the first experiment. The larger applications, however, gave slightly decreased yields rather than further increases.

Comparative results from both these experiments are summarized in table I and are shown as percentages, 100 representing the yield from complete fertilizer.

TABLE I.—RESULTS OF FERTILIZER EXPERIMENTS WITH RED RASPBERRIES AT THE RHODE ISLAND EXPERIMENT STATION

Fertilizer Treatment		First Experiment	Second Experiment
Complete Fertilizer	(NPK)	100	100
Check Plots	(O)	...	37
No Potash	(NP)	47	53
No Nitrogen	(PK)	70	69
No Phosphorus	(NK)	82	84

The Canadian Experiment[5] was conducted by the writer at the Horticultural Experiment Station, Vineland, in the tender fruit section of the Niagara Peninsula.

The soil is Vineland fine sandy loam from 4 to 10 inches deep with a pH value of about 6.5 and is fairly well supplied with organic matter. The subsoil (underlaid with clay at varying depth from 3 ft. 6 ins. to 7 ft. 6 ins.) is a very fine sand interspersed with lenses, of varying size and thickness, of a clay and sand mixture. Soil of this type is used extensively for growing peaches, small fruits, and vegetable crops.

Chemical tests showed that the soil was fairly well supplied with readily available phosphorus, 70 to 75 parts

[3] Stene, A. E. The Fertilization of Red Raspberries, Rhode Island Exp. Station, Bulletin 229, 1931.

[4] ——— Preliminary Studies in the Fertilization of Red Raspberries, Proc. Amer. Soc. for Hort. Sci., Vol. 30, 1933.

[5] Strong, W. J. Results with Fertilizers on the Red Raspberry, Sci. Agric. 16:8, April 1936.

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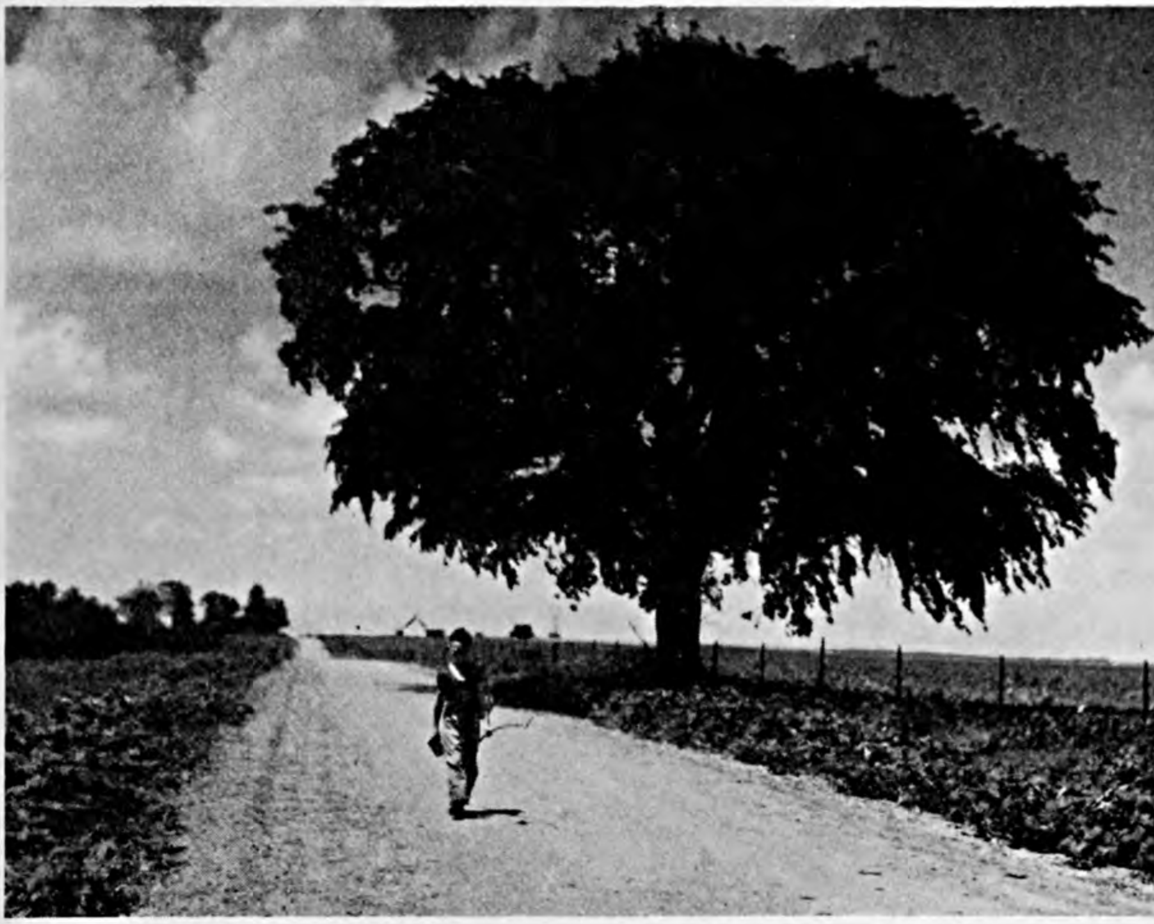
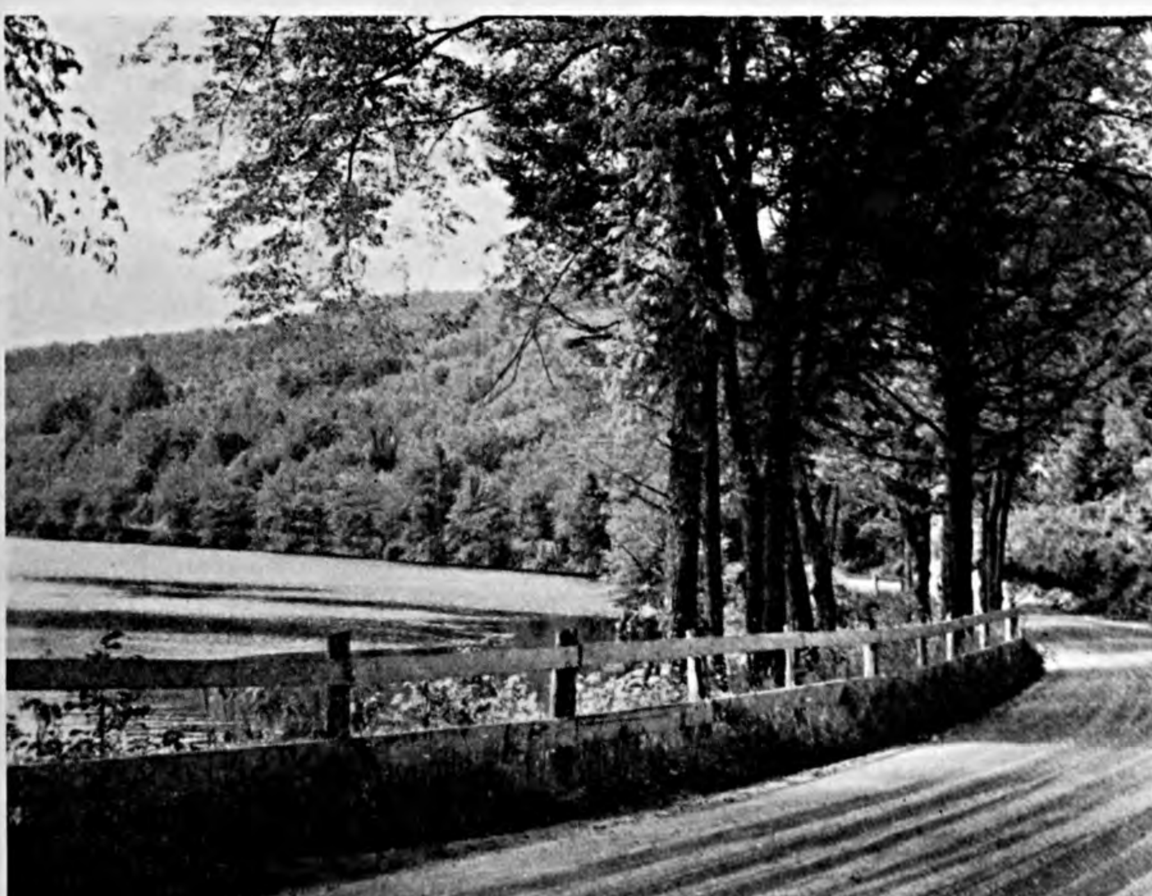
PICTORIAL

GETTING PREPARED FOR SUMMER.

Above: **Spring comes to the backroads.**
Below: **Fancies often delay spring work.**



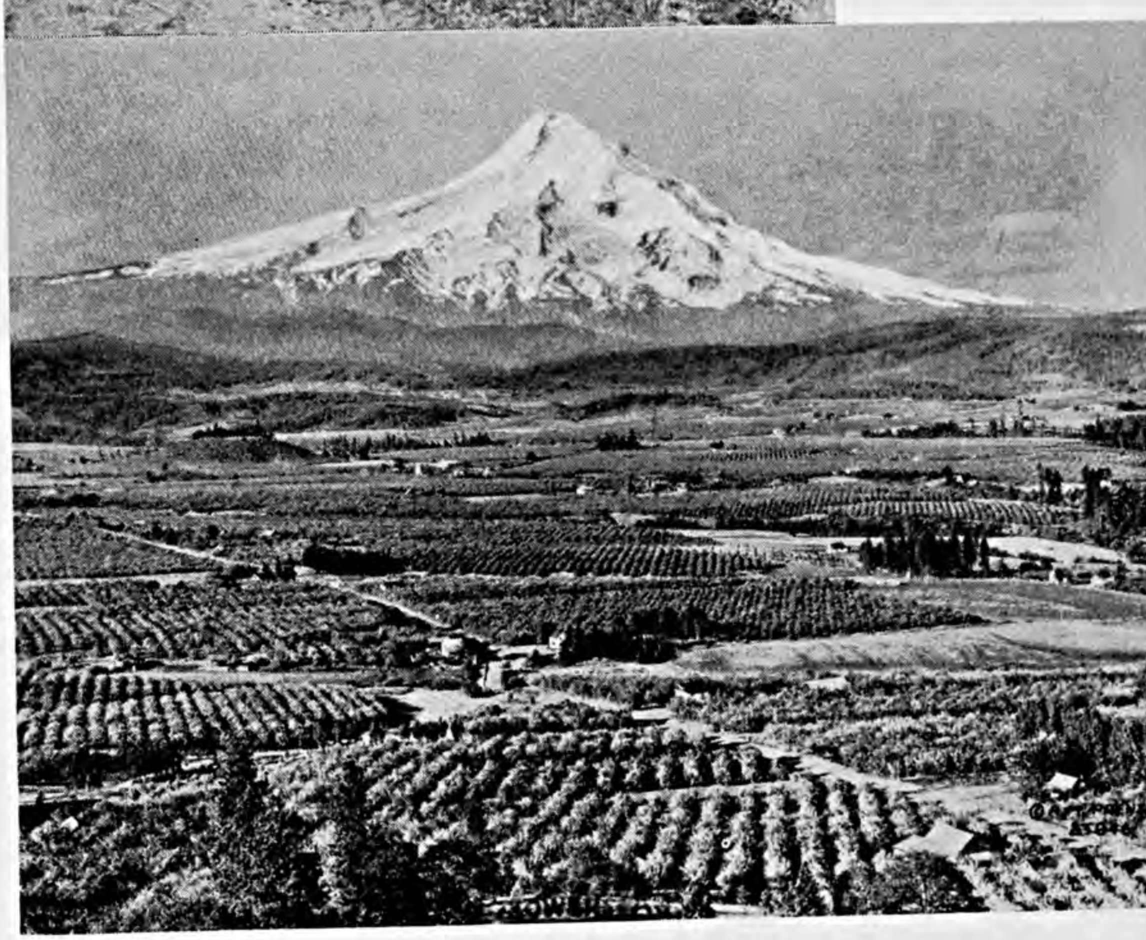
Above: **Distance doesn't count when they're biting.**
Below: **One reason for that tired "May feeling."**



Left: **May adds beauty to commonplace landscapes.**

Below: **The Hood River Valley is always beautiful.**

© Oregon State Highway Department.



The Editors Talk

From Fibre to Feeds

Southern agriculture is changing from fibre to feeds; less cotton and more wheat, hay, legumes, peanuts, and other crops. In 14 Southern States the acreage of cotton has been reduced from 39,706,000 acres in 1933 to 28,000,000 under the Cotton Act of 1938 or a reduction in acreage of 11,706,000 acres in 5 years. In sharp contrast, according to figures of the U. S. Department of Agriculture, the planted acreage of wheat increased by 4,505,000 acres from 1933 to 1937. Hay increased by 3,061,000 acres, and cowpeas by 2,029,000 acres during the same period. The acreage of tobacco was reduced by 53,200 acres, and the acreage of corn has remained approximately the same from 1933 to 1937.

One of the important problems facing the farmers and farm advisers in the South today is what to do with the acreage formerly in cotton. Current changes mean agricultural reorganization on a major scale. A greater crop diversification is inevitable. These changes have an important bearing on fertilizer use and consumption. The day when most of the fertilizer was applied to cotton, tobacco, and a little to corn is gone, and the use of fertilizers must now be studied from a broader viewpoint. The Southern Agricultural Workers are only too well aware of these problems and are working faithfully to keep abreast of the times and to advise the farmer in his best interest what to do and how to do it.

Under these changing conditions, what are some of the fertilizer problems? Even though reduced in acreage, cotton is still, of course, the most important cash and fertilizer crop. The problem is to produce the most profitable yields at the lowest cost of production on the acres allotted to cotton. Thus finding the most profitable amount of fertilizer per acre and making it possible for the farmer to use this amount of fertilizer are of first importance. In close conjunction is the analysis used and the elimination of expensive, low analysis goods. The trend is decidedly toward higher and more profitable fertilizer analyses.

In reducing the cost of production and the determination of the most profitable fertilizer analysis, more attention is being paid to short chemical methods of testing soils. The necessity for calibrating such methods to meet the needs of Southern soils and cropping conditions is fully recognized.

The best fertilizer treatment for the crops taking the place of cotton, such as hay, pastures, and legumes, is a problem of recognized importance. With an increase of approximately 5,000,000 acres of hay and cowpeas in 4 years, the need for knowing the best fertilizer treatment and methods of maintaining soil fertility is apparent. Peanuts is another crop receiving increasing attention from the point of view of its fertilizer requirement. Soil deficiencies of the so-called secondary elements, such as magnesium, boron, and manganese, affect the returns obtained from the older fertilizer elements, nitrogen, phosphorus, and potash. The availability of these secondary elements under Southern soil conditions, the amounts to be applied, and when they are to be applied are all important questions receiving consideration, especially in certain more eastern territories where deficiencies in these elements occur.

The effect of certain crops on the crop that follows is another practical question facing many farmers. It has been noted, for instance, that when cotton follows a crop of legumes turned under the cotton then exhibits nutrient deficiency symptoms. What is the cause and what is the remedy? As the acreage in peanuts increases, the effect of peanuts on the crop that follows is another consideration of some importance.

These changes in Southern agriculture affect the fertilizer man as well as the farmer and farm adviser. There is a greater need today for closer cooperation between the fertilizer industry and agronomists in solving the practical fertilizer problems facing the farmer and making the best fertilizer programs known. In spite of the reduction in acreage of the chief fertilizer crop, cotton, with such cooperation and the proper use of fertilizers the outlook for their increased use in Southern agriculture is brighter than it ever was.

Behind the Figures

It is customary for us to accept facts and figures with little questioning or thought of the amount of work involved in obtaining the results. An example—how much is generally known of the well-organized Government Crop Reporting Service which provides the statistical information upon which agricultural programs and the programs of many allied industries are formulated?

The point was brought to mind by a press release of the U. S. Department of Agriculture to the effect that the Crop Board was celebrating its 75th anniversary during the week of May 9-14. For the occasion, a group of veteran reporters had been invited to Washington by Secretary Wallace.

According to the release, the first crop report—issued in May 1863 by Isaac Newton, first Commissioner of Agriculture, appointed by President Lincoln in 1862—was compiled on the basis of returns from less than 2,000 farmers in 21 States. Today there are more than 200,000 voluntary reporters submitting crop and livestock schedules regularly to the Department of Agriculture. More than 2,000 women reporters—some in the service for more than 15 years—are on the rolls.

Many changes have been made in crop reporting and statistical methods since the early days when the telegraph was not yet in universal use, the telephone was unknown, and the mails to many rural places were carried by stage-coach and pony express. In those days, little was known of the acreage and condition of growing crops. Prices gyrated on false rumors of crop damage.

Now the statisticians speed the State totals and estimates to Washington where once or twice a month the Crop Reporting Board meets in locked chambers with sealed blinds, shadowproof windows, and disconnected telephone and telegraph instruments. Guards stand at the doors. Newspaper and commodity exchange reporters wait nearby to flash all over the world by radio, telegraph, telephone, and news bulletins the reports of the Board.

It would be difficult to estimate the importance of the service headed in the Crop Reporting Board. To the more than 200,000 volunteer reporters, our apologies for thoughtlessness of your great contribution to the betterment of our agriculture. The Service deserves heartiest congratulations on its 75th anniversary.

This section contains a short review of some of the most practical and important bulletins, and lists all recent publications of the United States Department of Agriculture and the State Experiment Stations relating to Fertilizers, Soils, Crops, and Economics. A file of this department of BETTER CROPS WITH PLANT FOOD would provide a complete index covering all publications from these sources on the particular subjects named.

Fertilizers

¶ Before any marked advancement in obtaining the greatest efficiency from fertilizers can be accomplished from crops grown in the Southeast, a revolutionary improvement in method of applying the fertilizer is necessary. By way of attaining this goal, fertilizer placement projects have been under study for some time at locations where full cooperation of the National Joint Committee on Fertilizer Application and agricultural specialists of the U. S. Department of Agriculture has been given the State experiment stations.

Two new publications from North and South Carolina report essential facts on this phase of fertilizer application, based on the extensive placement investigations conducted on cotton and tobacco in the respective States. These are: North Carolina Agricultural Experiment Station Bulletin 318, "Placement of Fertilizer for Cotton," by E. R. Collins and H. B. Mann of the Agronomy Department, and G. A. Cummings, Bureau of Agricultural Engineering, U. S. Department of Agriculture; and Clemson College (South Carolina) Agricultural Educational Bulletin 14, numbers 5 and 6, "Fertilizer Placement Studies with Cotton and Tobacco," by W. G. Crandall, et al.

The data obtained from these investigations clearly emphasize the advantage of side placement of the fertilizer so it does not come in direct contact with the seed or root zone. Applying the fertilizer in narrow bands 2.5 inches to each side of the row and 2 or 3 inches below the seed or root crown level generally gave the best results. Under some conditions, however, equally good results were observed when the fertilizer was placed on only one side of the row, especially on the heavier soils typical of the Piedmont area.

The usual method of placing the fertilizer under the seed or mixing it with the soil before planting often caused delayed germination and reduced stands, while the side placement not only resulted in earlier germination and better stands, but earlier maturity and higher yields, particularly under less favorable moisture conditions. Yield differences were more pronounced when higher rates of standard or double-strength fertilizers were employed.

The above contributions add greatly to the limited literature available on this important subject, and doubtless will be a material aid in solving a major problem for cotton and tobacco growers.

"Summary of Outlying Fertilizer Experiments, 1936-37," Agr. Exp. Sta., Fayetteville, Ark., Dan T. Gray, Director.

"Commercial Fertilizers for General Field Crops," Agr. Ext. Serv., Columbia, Mo., Cir. 315, Nov. 1934, M. F. Miller.

"Sources of Fertilizer Materials," Agr. Exp. Sta., Raleigh, N. C., Cir. 109, Jan. 1938, J. F. Lutz.

"Liming and Fertilizer Recommendations for Bright Flue-cured Tobacco Land, 1938," Agr. Ext. Serv., Clemson, S. C.

"Fertilizer Formulas for Tobacco 1938," Agr. Ext. Serv., Clemson, S. C.

"Effect of Fertilizers on Composition of Soybean Hay and Seed and of Crop Management on Carbon, Nitrogen, and Reaction of Norfolk Sand," U. S. D. A., Washington, D. C., Tech. Bul. 586, Dec. 1937, J. E. Adams, H. M. Boggs, and E. M. Roller.

Soils

¶ Kentucky Extension Circular 304 entitled "Soil Erosion and Its Control," by George Roberts, E. G. Welch, and J. B. Kelley, details the important farming practices which help to control erosion. According to the authors, the usefulness of land for future generations is being unduly impaired by erosion and by the filling of stream channels, causing them to overflow and injure bottom lands and other farm property. Water erosion is the greatest single cause of fertility loss from Kentucky soils, and since practically the entire area of the State is more or less rolling, few farmers are exempt from the ravishing effects of erosion. All farmers in this great agricultural State should take it upon themselves to adopt the control measures exemplified in this circular. A definite warning is manifested by the authors in declaring that "if erosion continues at its present rate, soon only a part of it (Kentucky) will satisfy rural life, and that part will have a severe drain placed upon it in the form of taxes to maintain government, institutions, and roads for the State."

"Conserving Soil with Natural Grass Waterways," Agr. Ext. Serv., Columbia, Mo., Cir. 362, April 1937, W. R. Tascher and Marion W. Clark.

"Irrigation Development in Montana, Part 1. Water Supply," Agr. Exp. Sta., Bozeman, Mont., Bul. 353, Jan. 1938, O. W. Monson, Clyde McKee, and P. L. Slagsvold.

"Farming With and Without Lime," Agr. Ext. Serv., Columbus, Ohio, D. R. Dodd.

"What Is Soil Erosion," U. S. D. A., Washington, D. C., Misc. Pub. 286, Feb. 1938, C. F. Stewart Sharpe.

"The Border Method of Irrigation," U. S. D. A., Washington, D. C., Farmers' Bul. 1243, Revised Oct. 1937, Samuel Fortier.

"Chemical and Physical Studies of Certain Hawaiian Soil Profiles," U. S. D. A., Washington, D. C., Tech. Bul. 584, Dec. 1937, George J. Hough and Horace G. Byers.

Crops

¶ "Asparagus Culture," U. S. Department of Agriculture Farmers' Bulletin 1646, by Ross C. Thompson, is a revised edition of Farmers' Bulletin 829. Like the earlier publication, the new bulletin devotes considerable attention to the soil and fertility requirements of the crop, suitable varieties, growing and handling the crowns, cultivation and care, and preparation for market. Asparagus can be grown under a wide range of soil and climatic conditions, but is not particularly adapted to some sections in the South where the warmer winter climate does not check the growth and give the plant a dormant period. Vigorous 1-year-old crowns produce the heaviest yielding plantations, and crowns more than 2 years old should not be used for planting, the author advises. In localities where asparagus rust is prevalent, only varieties resistant to the disease should be used for starting a new set.

The best types of soil for permanent plants are deep, loose, and light sandy loams. It is essential that the soil be one that affords good drainage. Muck and light sandy loams well supplied with organic matter are ideal for asparagus. Soils ranging from slightly acid to slightly alkaline are best. The matter of fertilizer practice is a local problem and must be determined by local conditions. In the eastern part of the country an application of 1,000 to 1,500 pounds of a complete fertilizer containing 4 to 5% nitrogen, 8 to 10% phosphoric acid, and 6 to 10% potash usually proves profitable, in addition to manure. The author suggests that the fertilizer either be broadcast and thoroughly mixed into the soil if applied before the plants are set, or be delayed until after setting the plants and applied along the rows and worked into the soil by cultivation. Since the crop usually lasts for 8 to 20 years, if well cared for, fertility maintenance is an important factor to successful production. Cultivation should begin soon after the crowns are planted and continue throughout the season to keep down weeds.

The Palmetto, Reading, Giant, Argenteuil, Mary Washington, and Martha Washington are among the desirable varieties. The Washington strains are of high commercial quality, in addition to being rust-resistant.

"Chemical Investigations of the Tobacco Plant. VII. Chemical Changes That Occur in Stalks During Culture in Light and in Darkness," Agr. Exp. Sta., New Haven, Conn., Bul. 407, Feb. 1938, Hubert Bradford Vickery, George W. Pucher, Alfred J. Wakeman, and Charles S. Leavenworth.

"Agricultural Extension Work in Indiana, Report of the Director July 1, 1936 to June 30, 1937," Agr. Ext. Serv., Lafayette, Ind., J. H. Skinner, Director.

"A Preliminary Report of Certain Variety, Fertilizer, and Other Tests Conducted by the Crops and Soils Department of the Louisiana Experiment Station—1937," Agr. Exp. Sta., University, La., C. T. Dowell, Director.

"Report of Progress for Year Ending June 30, 1937," Agr. Exp. Sta., Orono, Maine, Bul. 387, June 1937.

"Better Home Grounds," Agr. Ext. Serv., Orono, Maine, Bul. 219, April 1936, Albert D. Nutting.

"Annual Report of the Maine Extension Service for the Year Ending June 30, 1937," Agr. Ext. Serv., Orono, Maine, Bul. 244, Dec. 1937, A. L. Deering, Director.

"Twenty-five Years of Service Told With Pictures," Agr. Ext. Serv., Orono, Maine, Bul. 243, Dec. 1937, Clarence A. Day.

"Maryland Program for Agriculture and Rural Homes 1937-1942," Agr. Ext. Serv., College Park, Md., Bul. 79, April 1937.

"Establishment and Management of the Vineyard," Agr. Ext. Serv., Columbia, Mo., Cir. 372, Dec. 1937, H. G. Swartwout.

"Grain Sorghums for Grain Production," Agr. Ext. Serv., Columbia, Mo., Cir. 379, Mar. 1938, J. Ross Fleetwood.

"Sweet Sorghum (Cane, Sorgo) for Silage and Forage," Agr. Ext. Serv., Columbia, Mo., Cir. 380, Mar. 1938, C. A. Helm.

"Root Development of Young Delicious Apple Trees as Affected by Soils and by Cultural Treatments," Agr. Exp. Sta., Lincoln, Nebr., Res. Bul. 95, Dec. 1937, W. W. Yocum.

"Forty-eighth Annual Report Agricultural Experiment Station of the New Mexico College of Agriculture and Mechanic Arts, 1936-1937," Agr. Exp. Sta., State College, N. Mex., Fabian Garcia, Director.

"Potato Culture in New Mexico," Agr. Ext. Serv., State College, N. Mex., Ext. Cir. 148, May 1937, A. B. Fite.

"New York State College of Agriculture at Cornell University, Cornell University Agricultural Experiment Station, Fiftieth Annual Report 1937," Cornell Univ., Agr. Exp. Sta., Ithaca, N. Y., Carl E. Ladd.

"Growing Tomatoes for Market," Cornell Univ. Agr. Ext. Serv., Ithaca, N. Y., Bul. 377, Oct. 1937, G. J. Raleigh.

"Vegetable-crop Production in Orleans County, New York," Cornell Univ. Agr. Exp. Sta., Ithaca, N. Y., Bul. 682, Nov. 1937, W. C. Barnes.

"Inoculation for Legumes," Agr. Exp. Sta., Geneva, N. Y., Cir. 179, Mar. 1, 1938, A. W. Hofer and J. K. Wilson.

"Establishing a Commercial Peach Orchard," Agr. Ext. Serv., Raleigh, N. C., Cir. 220, Mar. 1938, H. R. Niswonger and L. P. Watson.

"Ohio Trees," Agr. Ext. Serv., Columbus, Ohio, Bul. 185, F. W. Dean.

"The Bimonthly Bulletin," Agr. Exp. Sta., Wooster, Ohio, Vol. XXIII No. 191, March-April 1938, G. H. Stringfield.

"Fertilizing Farm Crops," Agr. Ext. Serv., State College, Pa., Leaf. 26 Revised, Nov. 1937, J. B. R. Dickey.

"Cover Crops for Farm, Orchard, and Garden," Agr. Ext. Serv., State College, Pa., Leaf. 53 Revised, Nov. 1937, J. B. R. Dickey.

"Alfalfa," Agr. Ext. Serv., State College, Pa., Leaf. 54, Mar. 1937, J. B. R. Dickey.

"Studies on the Fermentation of Tobacco, 1. Microflora of Cured and Fermenting Cigar-leaf Tobacco," Agr. Exp. Sta., State College, Pa., Bul. 356, Mar. 1938, J. J. Reid, D. W. McKinstry, and D. E. Haley.

"Progress Report for Twelve Years of the Agricultural and Mechanical College of Texas, 1925-1937," College Station, Tex.

"Twenty-second Annual Report of Cooperative Extension Work in Agriculture and Home Economics, State of Vermont for Year 1936," Agr. Ext. Serv., Burlington, Vt., Ext. Bul. 22, May 1937, J. E. Carrigan, Director.

"Forty-seventh Annual Report of the University of Wyoming Agricultural Experiment Station, 1936-1937," Agr. Exp. Sta., Laramie, Wyo., J. A. Hill, Director.

"Two New Varieties of Sugarcane for Sirup Production," U. S. D. A., Washington, D. C., Cir. 461, Nov. 1937, B. A. Belcher and S. F. Sherwood.

"Certain Chemical and Physical Changes Produced in Kieffer Pears During Ripening and Storage," U. S. D. A., Washington, D. C., Tech. Bul. 590, Nov. 1937, J. M. Lutz and C. W. Culpepper.

"Factors Affecting the Rate of Drying of Kieffer Pears," U. S. D. A., Washington, D. C., Tech. Bul. 592, Dec. 1937, C. W. Culpepper and H. H. Moon.

Economics

¶ A good illustration of the growth of the fertilizer industry on the western edge of the fertilizer belt may be found in Wisconsin Fertilizer Statistics 1937 published as Bulletin No. 190 of the Wisconsin Department of Agriculture and Markets, under the direction of W. B. Griem. Fertilizer consumption, which was only 1,500 tons in 1909, reached a peak of 51,222 tons in 1930; receded to 16,311 tons in 1933; and advanced again to 42,872 tons in 1937. The 1937 tonnage is greater by 33%

than 1936 and is larger than in any year previous to 1930. The most important single analysis from the tonnage standpoint was 2-12-6 with 9,650 tons, followed by 3-12-12 with 5,289 tons. The total plant-food content of all fertilizers, which was 20.11% in 1928, increased to 23.8% in 1937. This is the largest average plant-food content for Wisconsin fertilizers with the exception of 1930, when it was estimated to be 24.45%. The increase which has taken place in plant-food content is largely attributed to the higher nitrogen and potash content of all fertilizers. In 1928 the average analysis was about 1.92% nitrogen, 12.71% phosphoric acid, and 5.48% potash. In 1937 the average analysis was 2.54% nitrogen, 12.41% phosphoric acid, and 8.85% potash. In other words, there has been approximately a 32% increase in nitrogen, and a 61% increase in potash with practically no change in phosphoric acid since 1928.

A noticeable change has occurred in the relative importance of the various fertilizers since 1928. The most important single complete fertilizer in 1928 was 2-12-2 which represented 29% of the total, 2-12-6 was second in that year with 13%, and 3-12-12 was third with 5%. In 1937 2-12-2 had dropped to 9% of the total, 2-12-6 had increased to 36%, and 3-12-12 had increased to 20%. The 3-9-18 which was only 1% in 1928 had increased to 11% in 1937. The five leading analyses represented 51% of the total in 1928 and in 1937 they represented 83%.

"Commercial Fertilizers as Reported to Date for Quarter Ended December 31, 1937," Dept. of Agr., Sacramento, Calif., Mimeo., Mar. 15, 1938.

"Connecticut Vegetable Acreages, 1935-1936-1937," St. Dept. of Agr., Hartford, Conn., Bul. 51, Nov. 1937, B. T. Peck.

"Historical Trend in Massachusetts Industries 1837-1933," Agr. Exp. Sta., Amherst, Mass., Bul. 340, Jan. 1938, David Rozman and Ruth E. Sherburne.

"Massachusetts 1937 Practice Tabulation," Agr. Ext. Serv., Amherst, Mass.

"Farm Economic Facts," Agr. Ext. Serv., Amherst, Mass., Vol. XI, No. 3, March 1938.

"Crop Report for Michigan, Annual Crop Summary 1937 and Crop Statistics 1927-1937," Mich. Dept. of Agr., Lansing, Mich., Jan. 1938, Verne H. Church, Grant D. Clark, and Manfred L. Lowe.

"Crop Report for Michigan, Annual Livestock Summary, 1937, and Livestock Statistics, 1927-1937," Mich. Dept. of Agr., Lansing, Mich., Feb. 1938, Verne H. Church and Grant D. Clark.

"Crop Report for Michigan March 1938," Mich Dept. of Agr., Lansing, Mich., Verne H. Church, Grant D. Clark, and Manfred L. Lowe.

"Crop Report for Michigan April 1938," Mich. Dept. of Agr., Lansing, Mich., V. H. Church and Grant D. Clark.

"Seasonal Variations of Prices and Marketings of Minnesota Agricultural Products, 1921-1935," Agr. Exp. Sta., Univ. Farm, St. Paul, Minn., Tech. Bul. 127, March 1938, Warren C. Waite and Rex W. Cox.

"Minnesota Farm Business Notes, Agricultural Adjustment Act of 1938," Agr. Ext. Serv., Univ. Farm, St. Paul, Minn., No. 183, Mar. 20, 1938, O. B. Jesness.

"Minnesota Farm Business Notes, Variability of Crop Yields in Minnesota," Agr. Ext. Serv., Univ. Farm, St. Paul, Minn., No. 184, April 20, 1938, S. A. Engene.

"Re-planning Missouri Farms," Agr. Ext. Serv., Columbia, Mo., Cir. 375, Jan. 1938, Donald B. Ibach.

"Eighth Annual Report of the New Mexico Feed and Fertilizer Control Office, Year Ending December 13, 1937, Commercial Fertilizer," N. Mex. Feed and Fer. Control Office, State College, N. Mex. Feb. 15, 1938, R. W. Ludwick and Lewis T. Elliott.

"Farm Economics," Cornell Univ. Agr. Ext. Serv., Ithaca, N. Y., No. 106, April 1938.

"An Economic Study of Land Utilization in Monroe County, New York," Cornell Univ. Agr. Exp. Sta., Ithaca, N. Y., Bul. 683, Nov. 1937, W. T. Wilson and J. N. Efferson.

"An Economic Study of Land Utilization in Cortland County, New York," Cornell Univ. Agr. Exp. Sta., Ithaca, N. Y., Bul. 685, Feb. 1938, E. H. Matzen.

"Spring and Fall 1937, Analyses of Commercial Fertilizers (Made since July 1)," N. C. Dept. of Agr., Dec. 1937, B. W. Kilgore.

"Current Farm Economics Oklahoma," Agr. Exp. Sta., Stillwater, Okla., Series 49, Vol. II, No. 1, Feb. 1938.

"Department of Agriculture of Oregon Bulletin," Salem, Oreg., No. 75, Mar. 1938.

"Department of Agriculture of Oregon Bulletin," Salem, Oreg., No. 76, Apr. 1938.

"A Suggested Plan for Texas Agriculture," Agr. Ext. Serv., College Station, Tex., C-120, 1938, H. H. Williamson, Director.

"Department of Agriculture—Immigration of Virginia," Richmond, Va., Bul. 358, April 1938.

"Annual Report on Tobacco Statistics, 1937," U. S. D. A., Washington, D. C., Stat. Bul. 63, Feb. 1938.

"A Graphic Summary of Farm Labor and Population (Based Largely on the Census of 1930 and 1935)," U. S. D. A., Washington, D. C., Misc. Pub. 265, Nov. 1937, J. C. Folsom and O. E. Baker.

"Bibliography on Land Utilization, 1918-36," U. S. D. A., Washington, D. C., Misc. Pub. 284, Jan. 1938.

"Price Spreads Between the Farmer and the Consumer (Second statistical supplement bringing up to date the tables contained in the mimeographed report of July 1936)," U. S. D. A., Washington, D. C., Feb. 1938, Richard O. Been and Frederick V. Waugh.

"Financing Crop Production on the Eastern Shore of Virginia," U. S. D. A., Washington, D. C., Feb. 1938, Burton D. Seeley.

"Burley Tobacco Facts and the New Act," U. S. D. A., AAA, Washington, D. C., 38-Tobacco-5, Mar. 1938.

"The A. A. A. Farm Program for Cigar-Tobacco Growers," U. S. D. A., AAA, Washington, D. C., 38-Tobacco-4, Mar. 1938.

Advantages of Living on Your Own Farm

(*From page* 12)

as ever grew and will allow almost as many acres planted last fall to bur clover to reseed and give a more perfect stand another year. The seed necessary for planting this bur clover was saved 200 miles away from this farm, for the trouble of sweeping from other land in which the family is interested, and at a cost of 3¢ per bushel for labor and less than 10 cents per bushel for sacking and delivery these many miles. Since the land on this farm was once very fertile and has deteriorated largely as a result of the waste of organic matter and nitrogen, following the continuous growing of cotton for almost a century, our hope is that the turning of these winter legumes will largely restore its original fertility, perhaps to a bale of cotton per acre rather than the one-third bale it was producing when the family moved to the place. Already, without legumes and without fertilizers, the production has been increased to more than one-half bale per acre, with that of other crops and pastures proportionately increased.

But the best part of this move to the land is in the fact that life has seemed as much worth while away from the bright lights of the town or city, and that the family, young and old, are just as well satisfied. This is best illustrated by the eagerness with which children and grandchildren living in cities from New York to Cincinnati come every year to visit on the farm where they are privileged to fish and hunt, ride horses, or to delight in watching the cows and calves, sheep and lambs, mares and colts, sows and pigs and even a few Shetland ponies provided for their pleasure.

Knowing from hearsay, which all but approaches actual experience, the joys of the Old South, one is encouraged to hope from this present experience that a return of our Southern people to the farm may largely restore a rural civilization which once was ours and was all but wiped out by a single stroke in the unwisdom of the Civil War, on whatever side may rest the responsibility. Certainly it will promote increased soil fertility and a greater diversity of crops, and with the introduction of better roads, automobiles, consolidated schools, individual lighting systems, and running water, the joys and comforts of the country home should equal or excel those of our towns and cities.

Let us at least hope that the necessity for reducing our cotton production and consequently increasing our farm income from other sources may result in a back-to-the-farm movement, because, certainly, such necessary farm diversification can never be accomplished without a more intimate contact on the part of the owner with his land.

Red Raspberries Need Complete Fertilizers

(*From page* 22)

per million, while the replaceable potassium was decidedly low, 10 or 11 parts per million. After three annual applications of fertilizers, the available phosphorus was rather more than doubled, and the replaceable potassium was almost doubled in the surface soil—first 8 inches—but there was no appreciable increase in the subsoil. Undoubtedly this soil was too low in replaceable potassium for the red raspberry, as deficiency symptoms were quite marked on the non-potash plots (figure 1).

probably potassium deficiency. From 1919 to 1923 manure was applied at the rate of 15 tons per acre, and several green manure crops were plowed under from 1924 to 1930. Just previous to planting, the ground was plowed and subsoiled to a depth of 12 to 14 inches.

The experiment was planned so that the effects of applications of nitrogen, phosphorus, and potassium both singly and in combination could be compared. There were 8 treatments with 8 replications of each, 64 plots in all, about 1/60 acre each, with buffer rows on all sides.

TABLE II—RATES PER ACRE AND DATES OF APPLYING FERTILIZERS

Fertilizers used	1932 (A)		1933 (A)		1934 (B)	
	Date	Rate lb.	Date	Rate lb.	Date	Rate lb.
Nitrate of soda (15.5%)*	May 19	300	May 3	600	May 15	600
Superphosphate (16%)	May 19	750	May 4	1,200	May 2	1,200
Sulphate of potash (48.7%)	May 20	480	May 3	480	May 2	480

(A) Fertilizers worked into ground with cultivator several days after sowing.
(B) Superphosphate and potash plowed under immediately after sowing.
* Nitrate worked in by cultivator.

Surface drainage was very fair to good. The natural underdrainage was fair but was supplemented by lines of 4-inch tile laid at 24-foot intervals. Test wells showed that the water table did not rise higher than 20 inches below the surface.

A brief history of the soil from 1918 will be of interest. In that year ground limestone was applied at the rate of 2 tons per acre. In 1920 it was in vegetable crops. From 1921 to 1927 it was used for peach trees which did not thrive on account of a "hard pan" layer and

They were arranged in eight randomized blocks, so that the results could be analyzed statistically by the Fisher method.

Fertilizers were applied in 1932, 1933, and 1934 at the rates shown in table II.

Results from the above treatments varied considerably from year to year, growth and yield in all plots being highest in 1932. Total growth and yields for 1932, 1933, and 1934 are given in table III.

TABLE III—GROWTH AND FRUIT YIELDS IN POUNDS FOR 1932, 1933, AND 1934 FOR THE 64 PLOTS. GROWTH MEASURED AS WEIGHT OF WOOD

1932		1933		1934	
Wood	Fruit	Wood	Fruit	Wood	Fruit
4,893.8	5,883.9	2,202.7	1,821.6	1,532.2	1,003.2

These yearly differences were due probably to differences in season. There

TABLE IV—RESULTS OF FERTILIZER TREATMENTS (A)

Treatments	1932		1933		1934	
	Wood	Fruit	Wood	Fruit	Wood	Fruit
Nitrate	Highly significant increase	Highly significant increase	Significant increase	No effect	Small decrease	Highly significant decrease
Phosphate	No effect	Small increase	No effect	Small increase	Almost significant increase	Almost significant increase
Potash	Slight decrease	Almost significant increase	Highly significant increase	Highly significant increase	Highly significant increase	Highly significant increase
Combinations	No apparent interaction	No apparent interaction	No apparent interaction	No apparent interaction	No apparent interaction	No apparent interaction

(A) From tables in original article (5).

also were marked differences each year in wood and yields of fruit between plots treated differently and these are briefly stated in table IV.

The results of this experiment are given also in the following summary:

1. Seasonal differences were of marked importance in these tests.
2. Nitrate of soda, 300 lb. per acre, increased yields significantly in a comparatively cool, moist season (1932), but 600 lb. per acre decreased yields in dry seasons (1933 and 1934).
3. Superphosphate, 750 lb. per acre in 1932, 1,200 lb. per acre in 1933 and 1934, gave no significant results. This particular soil was already well supplied with readily available phosphorus.
4. Sulphate of potash, 480 lb. per acre in 1932-33-34, gave significant increases in yield in 1933 and 1934. The soil was rather low in replaceable potassium.
5. In the several combinations of fertilizers the results seemed to indicate independent action rather than interaction between them.

These experiments indicate rather conclusively that under suitable conditions, applications of minerals, more particularly potassium, in some cases alone and in others with nitrogen, will result in increased growth and yield in the red raspberry.

Our Responsibility With Manure

(*From page* 18)

quately do the job for which they are designed. The function of bedding, primarily, is to absorb the liquid portion of the manure. Urine carries about one-half the nitrogen and four-fifths of the potash of the total excrement from cows. These materials are already in solution and are readily available if saved and preserved until they reach the soil. It takes 8 or 9 pounds of sawdust or straw to absorb the urine produced by an average dairy cow during a 24-hour period.

If sufficient bedding is not used, free urine escapes either before or after the manure is stored or spread. Under ordinary conditions this may occur in the barn cellar, where it runs out through openings in walls or doors unless there is a tight floor. Or it may occur outside where the manure is piled until the farmer chooses to spread it, in which case it trickles or is squeezed out of the manure heap, resulting in a very serious loss. How serious depends entirely upon how much is lost. Since potash is so abundant in the urine, this element is lost to a greater degree than any other because of faulty methods of saving urine.

While it is commonly practiced in Europe, only a few farmers in this region have dug or constructed wells into which the urine may collect for later spreading. A short while ago I visited the farm of George Bell in Lunenburg, Vermont, who is cutting hay from stands of timothy over 50 years old. These fields are yielding 2½ tons of hay per acre. Mr. Bell has been able to achieve this by saving the liquid portion of his manure in a well and using this along with the solid portion as an annual top-dressing. He has a heavy soil, a thick stand of grass, and the top of the soil feels like a sponge when stepped on, so thoroughly is it covered with organic matter.

Phosphate Is Preservative

The use of superphosphate as a manure preservative has long been advocated by scientists and is practiced by large numbers of dairymen, although it is far from being a general practice. To be most effective, superphosphate should be spread in the gutter behind the cows after the stable is cleaned but before fresh bedding is put in. There it is, ready to perform its useful function, for it acts not only as an absorbent of the liquid itself but also reacts chemically with the nitrogen that changes into the ammonia form. The gutters should of course be tight, so that the liquid containing the superphosphate will not be lost.

The reaction that ensues when superphosphate is mixed with urine is a complex one, but it is relatively easy to understand the results that occur. Superphosphate itself is more than a phosphorous compound, for it carries gypsum as well as monocalcium phosphate. The gypsum or calcium sulphate apparently is more effective in actually holding ammonia than other compounds that may be present. Ammonium carbonate is changed by this material to ammonium sulphate, while in the process the monocalcium phosphate is reverted to the tricalcium form. At first thought this latter process might seem undesirable, but in a region of acid soils it is just the reverse, for the finely divided state of the tricalcium phosphate that is produced makes it readily available to plants, but in this form it is not water soluble and is not so easily fixed as the monocalcium form by excess aluminum and iron in acid soils that prevail in the northeast region.

Time of Spreading Important

What chance does the farmer who does not superphosphate his manure have of saving this urea nitrogen? If he spreads his manure daily and harrows it immediately, his chances are good. If he spreads daily and does not work the manure into the soil he will lose the volatile ammonia due to drying winds or freezing weather, or both, unless rain falls before this occurs. This fact has been definitely established recently by Midgley and Weiser in Vermont.

On the other hand, if this farmer chooses to store his manure instead of spreading it daily, it is still subject to loss of escaping ammonia, although the loss may be less than if it is spread at a time when it cannot be worked into the soil. Spreading manure on frozen land or in the snow, especially on a field which is subject to washing, is always questionable practice because of loss by surface washing.

As a matter of fact, there are only a comparatively few days during the year when manure can be spread without some loss by drying or due to freezing. To prevent as much loss as possible, the land should be harrowed after spreading each day if possible.

These findings by the Vermont workers mentioned limit to no small degree the use of manure for top-dressing, especially if no superphosphate has been used. They also cause us to wonder what untreated manure carries in the way of plant food as spread bv the average farmer. While manure as voided carries in the neighborhood of 10 pounds of nitrogen per ton in the liquid and solid portions, it is doubtful whether more than half of this amount ever reaches the field. Losses of potash are probably just as serious, although this element would vary more than nitrogen with the effectiveness of the methods of bedding and saving the liquid portion, since the potash is not subject to volatilization.

The Value of Manure

A ton of manure has usually been considered to be equal in plant-food value to a 100-pound bag of 10-5-10 fertilizer. With these losses in mind it is doubtful if the average ton of manure carries more than a 5-5-5 equivalent in fertilizer elements. Likewise manure has been thought low in phosphorus, but it appears that even if it has not been superphosphated, the phosphorus content is at least as high as the other two elements.

If a farmer superphosphates his manure and uses bedding enough to absorb the urine and then spreads immediately on the fields or stores where the manure is not subject to leaching, he will reduce his nitrogen losses to the point where at least 8 pounds of this element will remain in each ton of manure, in which case he would be applying the equivalent of 100 pounds of an 8-5-10 fertilizer, not counting the phosphoric acid in the superphosphate which has been used. If this has been used at the rate of 30 pounds per ton of manure (1 pound per cow per day), then his manure would carry approximately an 8-10-10 equivalent.

In view of what is now known as to the perishability of manure, it appears likely that half of its value is dissipated before it is actually worked into the soil where losses cannot further occur. If we assume that manure is worth $2 per ton and that half its value is gone before spreading, then the loss in our small State of New Hampshire reaches the enormous total of $800,000 annually. Saving one-half of this loss, or $400,000, which is easily possible, would mean rescuing the equivalent in plant-food value of the total fertilizer we purchase annually in this State! The same is true in certain measure in most of our northeastern States.

Recommended Practices

None of us who has given intensive study to the principles of the Agricultural Conservation Program believes that a farmer should get any pay for the manure that is produced on his own farm. We do believe, however, that practices designed to curb the tremendous loss that occurs to it should be developed.

The use of bedding, while vital to the preservation of manure, would be very difficult to design and administer as a practice. In many cases, however, bedding presents a very real item of cost in the dairy set-up and if under the program an orchard man can get paid for mulch carted into the orchard some provision might be made so that the dairyman could secure adequate bedding for his dairy herd.

Superphosphating cow manure is a practice that should be adopted by every dairyman. Many boards of health are requiring that lime be used in stables to keep down odors, to make them brighter, etc. Superphosphate will do everything that lime will do and in addition will preserve the nitrogen content of manure, something that lime will not do.

Since the use of superphosphate in stables preserves nitrogen and even keeps the phosphorus available to plants in the soil over a longer period, it appears that its application in this manner is more of a conservation measure than when it is applied to the soil alone or as a component of mixed fertilizers.

To adequately recognize this in the program, superphosphate used with manure should either command a higher rate of payment or so used that it would be recognized and paid for no matter to what crop it is applied.

In the Northeast daily spreading is inadvisable, if not impossible. This means that manure must usually be stored somewhere until spread. If stored, a roof over it is a protection from severe leaching. A tight concrete floor is a protection against loss from seepage. Either one or both of these items should be recognized as important conservation measures by adequate practices in the program.

It seems logical to conclude that conservation in the broad sense should mean saving as well as adding to the fertility of our soils. The losses that occur to farm manure constitute the greatest single draft on the productiveness of the soils of the nation. While many farmers already recognize this fact and do something about it, it is doubtless true that the rank and file of dairymen will be slow to change their methods unless they are presented with a greater urge than they have received up to the present time.

Tomatoes & Cucumbers Reveal Diet Needs

(*From page* 16)

the development of the root system more than any other organ of the plant. The roots are greatly stunted, which seems to be an important factor responsible for the slow plant growth and delayed fruit development.

Fruits and seeds.—The fruits are dull in color and sometimes slight bronzing occurs before they mature. There is considerable variation in size and total weight of plant from season to season. They are, however, slow to ripen. Tomatoes on phosphate deficient plants have a "leathery" rind. The mature seeds are light in weight and germinate poorly.

Potash Starvation

The plant as a whole.—Potassium starvation may modify the growth of every organ in the plant, and the characteristic symptoms may appear at any stage of the plant's development. In soils that are extremely low in available potash, the deficiency symptoms appear in the seedling stage as soon as the supply which was in the seed has been exhausted. This is shortly after the secondary plant characters begin to form. In soils with somewhat more potash, the plants may reach the fruiting stage before the starvation symptoms begin to appear. In recent tests at the Ohio Station when muriate of potash was applied at the rate of 500 pounds an acre to a spring tomato crop, the starvation symptoms began to appear about the time the fruits began to ripen on the first cluster. On soils that are very deficient in available potash, it is the usual experience for the symptoms to appear first on the older leaves at the base of the plants. Since potash is only loosely combined in plant tissues, it is easily translocated from place to place. It is, therefore, removed from the older tissues and reused in building up the new under ordinary conditions. For this reason the young and growing parts in the tops look better than the older tissues at the base.

In the case just mentioned the starvation symptoms appeared first at the middle of the plant and affected the upper half. At that time 4 clusters had been set, and the 5th, 6th, and 7th clusters were in bloom. The blossoms were setting easily, and the fruits and plants had been growing very rapidly. The tomatoes on the first cluster were nearly all full size, and some were ripening.

Left: **A well-fertilized cucumber crop. Note the dark color and vigorous growth of the foliage and the large number of well-shaped cucumbers.** ***Right:*** **a nitrogen-starved cucumber crop. Note the light yellow foliage and scarcity of fruits. Also note the pointed cucumber at the upper left which is typical of nitrogen starvation.**

Those on the second and third were nearing maturity or growing rapidly, and the blossoms practically all set on the fourth cluster. With such a large number of fruits at the base of the plants, it seems that the demand for potash was greater than the supply, so the tops had to suffer. The condition had apparently been aggravated by two or three applications of calcium nitrate as side-dressings, which had stimulated the plants to greater growth. It is common experience that when additional nitrogen is applied to a crop where potash is limited, the increased growth hastens the appearance of potash deficiency symptoms.

Ordinarily, potash-starved plants grow slowly and may soon assume an ashen gray-green color. They are usually stunted and produce very low yields. They are also more susceptible to insect and disease attacks than normally fertilized plants.

Leaves.—Young leaves on tomato and cucumber plants starving for potassium often become finely crinkled as in crepe tissue paper, especially if much nitrogen is available. Older leaves become an ashen grayish green at first and then yellowish green along the margins, which gives the plants a dull color. The light margin finally dies and turns brown—a condition sometimes called "brown edge scorch." The injury progresses towards the center of the leaf, causing a bronzing or browning of the leaf tissue. This is followed by large, light-colored spots between the larger veins, which often become a bright orange under cool spring conditions. The development of this color proceeds rapidly from this point on, and the leaves collapse in time and die. In tomatoes and cucumbers the leaves do not drop but dry and remain attached to the plant. The petioles and veins of potash-starved leaves become very brittle and break off with light upward pressure.

Stems.—Stems of potash deficient tomato and cucumber plants become hard and woody. The cambium tissue becomes inactive and the stems fail to increase much in diameter, so they remain slender and whip-like. There is a slow increase in length, and for a time the tops look fairly normal. But by the time a few fruits ripen and are removed, growth stops in extreme cases of starvation and the top collapses and dies. Just before this stage is reached, brown streaks appear on the stems, petioles, and larger veins of the leaves of tomato plants. These spots may easily be confused with the tomato (virus) streak disease, if the other symptoms are not carefully noted.

Roots.—Since the cambium is inactive in roots as well as in the stems of potash deficient plants, they are slender, not well developed, and often brownish in color. The roots will continue to increase in length for a time but will not increase much in diameter, since secondary thickening does not occur.

Fruits.—Potash deficiency has a decided effect on the shape, solidity, and quality of tomato and cucumber fruits. Tomato fruits on potash deficient plants become flat sided, hollow, thin walled, light in weight, and sometimes ripen unevenly. The pectic compounds do not develop around the seeds in tomato fruits. Fruits often become quite acid to the taste, color poorly, and are sometimes considerably reduced in vitamin C potency. Cucumber fruits fail to develop at the stem ends, but they do in the middles and blossom ends. This often results in gourd-shaped fruits. The flesh in the "neck" is tough and corklike and is often nearly tasteless. It is of interest to know that muskmelons on potash-starved plants are pointed at the stem end. The shape is similar to the common chestnut. White heart of watermelons is also caused by potash starvation.

Seeds.—Seeds from potash deficient plants often fail to reach maturity. They are small in size and light in weight. They are chaffy, often brown, and usually germinate poorly when they do mature.

Uncle Henry McDaniel Beats Tomato Record

(*From page* 19)

acre, was of the 2-16-8 analysis and was placed about each plant as it was set in the soil. The first picking of tomatoes was delivered to the local canning plant when it opened for the season on August 1.

McDaniel and Neeves provided the Lebanon community with plenty of interesting scenes as each would try to beat the other delivering loads of tomatoes grading 100 per cent U. S. No. 1's. It was only the inspiration given by his rival Neeves that gave him the desire to win and produce high quality tomatoes, says Champ. McDaniel.

A Balanced Fertilizer for Bright Tobacco

(*From page* 9)

The tests, results of which are given in the following three tables, were conducted at Chatham, Virginia, on typical bright-tobacco soils of the Granville type (a sandy loam surface soil with yellow sandy clay subsoil). Previous to 1936 an old field which had grown probably 20 or more tobacco crops was used, but in 1936 the experiments were all shifted to a new field. This new field had not been used for crops during a 16- or 18-year period. It was recleared of trees, and consequently the large supply of leaf mold and weeds plowed under increased the natural potash reserve above that on fields used for tobacco crops every year. The results obtained during 1936 (as table I shows), where potash was omitted or used in small quantities in the fertilizer mixture, were therefore not as low as such results usually are when old tobacco fields are used for the tests. Even the second year's results in 1937 help to support this conclusion.

TABLE 1.—VARYING NITROGEN, PHOSPHORIC ACID, AND POTASH—TOBACCO TESTS—CHATHAM 1936–1937

Plot	Fertilizer Treatment 1,000 Lbs. per Acre	1936 Pounds per Acre	1936 Value per Acre	1937 Pounds per Acre	1937 Value per Acre
1	3–8–0 (no potash)	887	$281.25	821	$176.03
2	3–8–3	914	324.55	977	236.72
3	3–8–6	1,026	306.00	1,229	333.74
4	3–8–9	950	312.85	1,155	350.64
5	3–8–16	1,106	319.80	1,248	324.88
6	3–8–20	1,040	305.65	1,194	282.86
7	3–8–30	982	255.85	1,038	205.05
8	no fertilizer	216	24.07	367	59.74
9	0–8–6 (no nitrogen)	485	124.40	864	229.89
10	2–8–6	965	301.60	1,060	274.75
11	3–8–6	1,026	306.00	1,229	333.76
12	5–8–6	900	219.70	1,132	182.93
13	3–0–6 (no phosphate)	754	146.70	599	93.31
14	3–4–6	1,000	309.60	861	210.81
15	3–8–6	1,026	306.00	1,229	333.76
16	3–12–6	1,040	329.30	1,134	313.48
17	3–16–6	1,126	340.30	1,073	310.80

NOTE: Results given above for plots 1 to 7 inclusive and plots 11 and 15 are averages of duplicate plots each year.

Formula for above fertilizer mixtures:
- Nitrogen = 1/3 Cotton Seed Meal, 1/3 Nitrate of Soda, and 1/3 Sulphate Ammonia.
- Phosphoric Acid = 16% Superphosphate.
- Potash = 2% K_2O from Muriate. 2% K_2O from Sul. Pot. Mag. balance from Sulphate. All mixtures supplied 200 lb. per acre of Magnesium Limestone.

All potash above 6 per cent applied as a side-dressing ahead of cultivator about 20 days after transplanting.

The results shown in table I will serve to prove quite conclusively that fertilizer applications are responsible for at least 75 per cent of the yield and money value of tobacco when grown on typical bright-tobacco soil. When no fertilizer was used, the value per acre was only $24.07 for the fairly dry season of 1936 and $59.74 for the wet year, 1937, when growth was naturally boosted.

When nitrogen was omitted in the dry year, 1936, the yield and value were very low, while for the wet season, 1937, a fair crop value was obtained without added nitrogen ($229.89 per acre). All of these plots received 200 pounds of magnesium limestone per acre, which helped to boost yields where fertilizer applications were incomplete.

This field was very deficient in phosphoric acid, as can be seen from the first year's results, 1936, when the no-phosphate plot produced a value of only $146.70 per acre, which value was still lower the second year of consecutive cropping, $93.31 per acre.

In this series of 17 plots, during the first year after reclearing, the maximum money value per acre was obtained from the greatest quantity of phosphoric acid used, as a 3-16-6 (the value was $340 per acre), while during the second year of phosphate applications 8 per cent phosphoric acid, in a 3-8-6 mixture, produced the greatest money value per acre ($333.76) of any in the phosphate variation series.

On the new land it can be seen that during the first year of cropping 3 per cent potash seems sufficient, and a fair crop can be produced without adding potash to the fertilizer mixture. However, by studying the results for 1937, just the second year of cropping in tobacco after clearing, some very interesting changes are most apparent. The no potash fertilizer application dropped from $281.25 per acre to $176.03 per acre, and the maximum acre value has changed from the 3-8-3 in 1936 to the 3-8-9 in 1937, showing that even the second crop of tobacco on new land requires double the quantity of potash which the first crop does.

During the first year of cropping this newly cleared land, the maximum increase from potash applications over no potash was $43.30 per acre and from only 30 pounds of K_2O per acre; while for the second year of cropping, 1937, potash applications alone showed an increased value of $174.61 per acre over no potash and was obtained from an application of 90 pounds of K_2O per acre, or 1,000 pounds per acre of 3-8-9 fertilizer. In 1937 this 3-8-9 fertilization produced $113.92 per acre greater value than the 3-8-3 did.

These results help to show why farmers have often obtained their most profitable tobacco crops when a fertilizer relatively high in phosphoric acid and fairly low in potash and nitrogen was used on new fields just cleared of trees for tobacco, while after a few years of continuous cropping the maximum values are obtained from moderate phosphoric acid applications (around 80 pounds of P_2O_5 per acre) and higher potash applications (60 to 100 pounds K_2O per acre). Many tobacco farmers complain that even with exactly the same analysis fertilizer which they used to grow crops of good quality tobacco when they first cleared their tobacco land, they now seem to grow only inferior crops on the same fields. This can better be understood when we realize that the fertilizer needs of new virgin soils and old fields are not the same.

The Disappointment Visualized

The disappointing results which a farmer might expect from using no fertilizer or from using a mixture without the necessary balance of nitrogen, phosphoric acid, and potash may be visualized by observing the growth made by six individual tobacco plants grown by the writer in greenhouse pots and illustrated in the accompanying photograph and data.

Pot No.	Fertilizer Treatment	Final Height Plants, Inches	Total Dry Matter Pounds Per Acre
1	No fertilizer	7½	106
2	0–10–6	21	169
3	3– 0–6	21	477
4	3–10–0	51	1,155
5 & 6	3–10–6	57	2,142

Above plants were transplanted March 31st and leaves were harvested July 12th and 21st.

The total dry weight was based on total weight of plants, leaf, stalk, and seed for 5,000 plants per acre (although the soil area per pot was only about $\frac{1}{10}$ of average field area of 8 sq. ft. per plant). The soil used was the same as that in field tests for 1936, table I, and fertilized at the rate of 1,000 lb. per acre of 5,000 plants.

Table II gives the results from a few of the test plots at Chatham where various sources of materials are used to supply the necessary plant foods which make up a tobacco fertilizer. These results show why the tobacco fertilizer recommendations printed in part in this article require that one-third of the nitrogen be derived from organic materials, such as cottonseed meal, blood,

Table II.—Sources of Materials Supplying Nitrogen, Phosphoric Acid, and Potash for Tobacco Fertilizers, 1932–1937

Plot	800 lb. 3–10–6 Per Acre	1936 Per Acre		1937 Per Acre		5-Year Average Excluding 1936 Per Acre	
		Lb.	Value	Lb.	Value	Lb.	Value
	Supplying Nitrogen						
1	Nitrate of Soda	910	$283.00	1,120	$280.00	1,145	$224.75
2	1/2 N. = Nit. Soda 1/2 N. = Sul. Ammonia	1,006	317.75	1,145	258.36	1,145	231.35
3	Urea	790	239.35	1,140	295.40	1,141	234.66
4	1/2 N. = C. S. M. 1/2 N. as Plot 2	840	274.75	1,088	304.44	1,172	254.18
5	1/4 N. genuine organics 3/4 N. as Plot 2					1,123	243.06
6	3/4 N. Ammoniated Superphosphate	805	227.46	1,036	227.68	1,064	197.35
7	0–10–6 No Nitrogen	520	111.38	566	148.38	813	150.64
	Supplying Phosphoric Acid						
8	16% Superphosphate					1,138	249.00
9	Bonemeal					1,062	216.38
10	Basic Slag					1,116	221.36
	Supplying Potash						
	Potash for above 10 Plots—1/2 Muriate, 1/2 Sul. Potash Magnesia.						
11	3–10–0 (no potash)			930	187.53		
12	Nitrate of Potash			1,073	229.99		
13	1/2 Nit. of Potash 1/2 Muriate of Potash			1,183	278.39		
14	All Muriate of Potash			903	210.01		
15	All Sulphate of Potash			969	247.10		
16	1/2 Muriate of Potash 1/2 Sulphate of Potash			1,025	251.04		
17	1/2 Muriate of Potash 1/2 Sulphate of Potash			1,179	287.96		

Nitrogen for plots 11–17 incl.—1/3 Nit. Soda 2/3 Urea.
Phosphoric acid for plots 11–16 incl.—Mono-calcium-phosphate.
Phosphoric acid for plot 17—16% Superphosphate.
All 17 plots received 200 lb. per acre Magnesium Limestone.

fish, or tankage. Such materials over a 5-year average period (when supplying from one-fourth to one-half of the total nitrogen) give values of around $250 per acre, or $20 to $25 per acre more value than the all-mineral nitrogen mixtures, such as nitrate of soda and sulphate of ammonia.

The sources which supply the necessary potash are equally as important as those supplying nitrogen. In table II (plots 12 and 13) it can be seen that while all nitrate of potash gave a value of $229.93 per acre, one-half nitrate and one-half muriate gave a value of $278.39 per acre, or an increase of nearly $50 per acre. The muriate supplied the necessary chlorine. Plots 16 and 17 show that a mixture of muriate and sulphate give greater values than either of the two sources when used alone. an extra 100 pounds of sulphate of potash per acre (50 pounds of K_2O) increased the acre-value of tobacco from $271 to $307.80, or nearly $37 over that obtained from the 3-8-5, or 50 pounds K_2O, and an increase of $23 per acre for the 6-year average period. This same total quantity of potash, 100 pounds K_2O per acre, when applied all before transplanting in the furrow (the usual form practiced in the past) in both the 3-8-10 and the 4-8-10 mixtures gave very little increases in value over the single application of 3-8-5.

The addition of nitrogen when the original application contained 3 per cent (ammonia basis) showed increases of around $7 per acre over the 6-year average period. This 10 pounds of ammonia per acre was side-dressed just as the potash was.

TABLE III.—EXTRA SIDE-DRESSING APPLICATIONS OF NITROGEN AND POTASH

Plot	1,000 Lb. Per Acre	1937 Per Acre		6-Year Average Per Acre	
		Lb.	Value	Lb.	Value
1	3–8–5 in furrow before transplanting	1,110	$271.00	1,107	$208.35
2	2–8–10 in furrow before transplanting	1,148	278.20	1,217	211.86
3	3–8–5 in furrow before transplanting 0–0–5 (side-dressed 20 days after planting)	1,144	307.80	1,289	231.00
4	3–8–5 before planting 1–0–0 20 days after planting	1,212	301.60	1,232	215.58
5	4–8–10 in furrow	1,178	272.60	1,278	211.54
6	3–8–5 in furrow (N. as nit. soda) 1–0–5 20 days	1,228	269.60	1,317	229.75

NOTE: Above results are averages yearly of duplicate plots.
Ammonia basis used (not nitrogen).
Extra nitrogen applied was nitrate of soda and potash was sulphate.
Formula for Basal Mixture:
- N = 1/4 each of cottonseed meal, fish, urea, and nit. soda.
- P_2O_5 = 16 per cent superphosphate.
- K_2O = 2 per cent muriate, balance sul. pot. magnesia.
- Also 200 pounds per acre of dolomitic limestone used.

The muriate-sulphate combination when used with superphosphate gave greater value than when used with mono-calcium-phosphate.

Table III is given here to show some of the results obtained at Chatham during the past 6 years from applying extra potash and/or extra nitrogen as a side-dressing approximately 20 days after transplanting. These results show that for 1937 (a wet year) the addition of

Based on these results and on the results of experimental tests conducted by the writer and research workers in other States, together with the experience of successful tobacco growers, agronomists and research workers who compose the tobacco research committee representing all of the bright-tobacco-producing States have made the following recommendations for the year 1938, with reference to the fertilization of flue-cured tobacco grown on average soils:

"I. Fertilizers for Bright Flue-cured Tobacco

I. *Analyses of Mixtures and Rates of Application:*

(1) *For Heavy or More Productive Soils*—Use 3 per cent total nitrogen, 10 per cent available phosphoric acid, and 6 per cent potash. To be applied at the rates of 800 to 1,000 pounds to the acre.

(2) *For Light or Less Productive Soils*—Use 3 per cent total nitrogen, 8 per cent available phosphoric acid, and 6 per cent potash. To be applied at the rates of 800 to 1,200 pounds to the acre.

(3) *Additional Potash* — Experiments indicate that the acre value of tobacco may be materially increased by additional potash. It is therefore suggested that potash to the extent of 60 to 120 pounds of K_2O to the acre be applied in most cases as an additional side-dressing within 20 days after transplanting.

(4) *Method of Application*—Experiments indicate that fertilizers applied so as to come in direct contact with the plant roots cause loss of plants and retard early growth. It is, therefore, suggested that fertilizers be placed in bands 3 to 4 inches to the sides of the row at the approximate level of the roots, and the plants be set between these bands, or thoroughly mixed with the soil in the rows before planting.

Note 1—The above analyses may be modified, provided the given ratios are maintained and the recommended sources of plant food are used.

II. *Sources of Plant Food:*

(1) *Nitrogen*—One-third of the nitrogen should be derived from high-grade organic materials of plant or animal origin; one-third from materials supplying nitrogen in the nitrate form; and one-third from urea and/or standard inorganic sources of nitrogen. (Fertilizers that are claimed to be made according to the recommended formulas should contain not less than one-third of the total nitrogen in organic form and not less than one-fourth of the nitrogen should be water insoluble.)

(2) *Phosphoric Acid*—To be derived from any source of available phosphoric acid, provided that the available calcium in the mixture shall conform to the requirements of Subsection 7 of Section II.

(3) *Potash*—To be derived from any source of available potash, provided the chlorine content of the mixed fertilizers so compounded does not exceed 2 per cent, except that in case of soils where the pH is above 5.6 the maximum may be 3 per cent. If tobacco by-products are used as a source of potash, these must be sterilized to kill such organisms that might be present that cause diseases.

(4) *Magnesia*—It is recommended that fertilizers carry 2 per cent magnesia (MgO), at least one-half of which shall be derived from water-soluble materials, or shall be water soluble in the mixed fertilizer.

(5) *Chlorine* — Available experimental data from bright tobacco sections of Virginia, North Carolina, South Carolina, and Georgia show that a small quantity of chlorine in the tobacco fertilizer increases the acre value of the crop. Experiments have shown,

however, that an excessive amount of chlorine in fertilizers used for tobacco injures its growth and reduces quality, producing a thick, brittle leaf, which when cured becomes thin, soggy, and dull in color. It also has an unfavorable effect upon the burning quality of the cured leaf. It is recommended, therefore, that fertilizers should be compounded in such proportions that the fertilizer mixtures shall contain 2 per cent chlorine. Where the pH of the soil is above 5.6, the maximum may be 3 per cent.

(6) *Sulphur*—It is suggested that fertilizers for bright tobacco be formulated in such a manner as to reduce the more soluble sulphur compounds used in the fertilizer. However, where it is desired to apply additional side-dressings of potash as suggested in paragraph (3) of Section I, the sulphate is perhaps the most suitable form of potash available for this purpose.

(7) *Calcium*—Since fertilizers compounded with high-analysis materials are often low in calcium, it is recommended that tobacco fertilizers carry in an available form a minimum of 6 per cent of calcium oxide (CaO) equivalent.

III. *Neutral Fertilizers:*

If non-acid fertilizers are to be produced, it is suggested that the neutralizing agent be dolomitic limestone, as this material not only neutralizes but carries magnesia (MgO) and calcium (CaO), which are important plant nutrients.

II. *Fertilizers for Dark Tobacco (Sun-cured and Shipping)*

I. *Analyses of Mixtures:*

Use 10 per cent available phosphoric acid, 3 per cent nitrogen, and 4 to 6 per cent potash, 600 to 1,000 pounds per acre. Where manure is used in the rotation, 4 per cent potash in a 600-pound application of a 3-10-4 is usually sufficient.

Note 2—The above analysis may be modified, provided the given ratios are maintained and the recommended sources of plant-food materials are used.

For the first bright-tobacco crop on new land just cleared of trees in the Piedmont section, the writer would like to add one additional fertilizer recommendation. Under such conditions a 3-10-4 mixture might give the most profitable results.

In conclusion the writer would like to emphasize a few points which a summary of results from tobacco tests conducted at Chatham during the last 16 years would show. They are as follows:

I. At least 25 per cent organic nitrogen of plant or animal origin seems safe and profitable for bright-tobacco fertilizers, particularly on leachable soils.

II. No one source of potash should be recommended as a sole source where more than 40 pounds are used per acre. The potash mixture should not generally contain more than 2 per cent chlorine.

III. Under most conditions, the general application of 30 pounds of K_2O or less per acre is not sufficient. The fertilizer mixture should supply 48 to 60 pounds of potash per acre, and in addition to this, extra potash is usually desired, particularly where the potash content is low and leaching is bad. The extra potash should be applied as a side-dressing about 3 weeks after transplanting.

IV. On sandy soils the application of from ½ to ⅔ of the nitrogen and potash before transplanting, and the remainder as a side-dressing about 3 weeks later, has given increased values of around $25 per acre over a 6-year period.

V. Much larger yields and money values per acre on the average have been obtained from close spacing, high topping, and the priming method of harvest, than from wide spacing, low topping, and harvesting by cutting the whole plant."

Too Goofy to Grumble!

(*From page* 5)

to me that most of our troubles of this era are city-made troubles. Of course we have our occasional rural slums and sore spots, but originally this was not the case, for the great outdoor country is not ordinarily a festering place for injustice and discontent. Only when we get some economic disorders springing up in great consuming centers do we get the backwash of their muddy whirlpool back on the land.

Yet when we of the fresh air zones join hands to right our wrongs or grievances, the first thing we do is to copy some city-hatched scheme and hope to profit thereby, just as we imitate the city slickers in other fads and fashions of the hour.

We planters demand business men's credit terms, mercantile selling methods, high pressure radio campaigns, restrictive output to raise the ante, beauty queen contests to boost our butter and eggs, and every other urban gimcrack except labor unions for the hired man and cigarettes for the old lady!

Sometimes I wish the city dudes would turn around and copy us rubes as we were originally—if they can find any of us situated that way. Things might slide up a peg in the national morale and morals, too. I admit they try to sometimes, because the newspapers say the operators on Wall street dock and shear the spring lambs quite early and often, and a few firms plow under their profits. Beyond this, however, the mob is all looking and rushing in one direction—to pattern after the pavement instead of looking for a solvent in the soil.

I can't figure out the reason why we ruralites should be copying after a passell of humans we often sort of feel sorry for—sorry for the many things their senses are deprived of, largely because they're so used to peering out dead against smoky walls and sickly foliage.

Come to think of it, the folks born and confined forever to the city outnumber the city folks who sometimes come chasing out our way looking for fish worms, mosquito bites, or cheap eggs, seeking the fresh-air cure dressed in plus fours and riding twin sixes. Come to ponder it, there is little wonder that the tenement dwellers think the job and the dollar are the greatest powers in the world and are ready to fight hard for both. Maybe if we country folks had to hand over cash money every time we had a bite to eat or took a little recreation, our minds would get warped about the income problem more than they do.

"THAT ain't livin' " my Father said that time we took a look at the shacks in the ash-alleys back of the stockyards. " 'Taint fittin' for humans," he kept saying all the way back to the loop. He didn't have much money left after selling his hogs and paying for the yardage, feed, and commissions, but Father was so much like that queer old generation of his that I never questioned his attitude or reactions. For instead of losing time and patience grumbling and fussing about low livestock prices, he usually found somebody somehow somewhere who deserved to be pitied and comforted, if possible—at least somebody more than himself.

Now I am aware that the man nowdays who devotes his time to hunting for grief and despair greater than his own brand is apt to be privately designated as a sucker. The women would call him a busybody. Probably he ought to roll up his sleeves and get into the ruthless game with the rest of the snipers. But I feel sure the countryside has more such freaks than we imagine in this age of competition. Maybe a few of them are a wee bit happier than many of the exploiters.

Another member of my queer country clan evinced a quirk in his make-up that holds the key to one of the secrets of our satisfaction in rural life's compensations beyond the dollar mark. This uncle was known widely for his early rising habits and his incessant activity. Be it known that he didn't force this trait on his kinsfolk because he always got his own breakfast and sallied forth with the lark into the fields, alone and indomitable. Neighbors thought he was mercenary and grubbing, but in later years he still retained the custom of beating the sun up o' mornings.

ONE day I asked him why he kept this going when he might take it easy. With a wave of his pipe and a smile at the sunrise, he replied, "For years they called me a durned old toiler and said I was after the almighty dollar; but gosh, I fooled 'em. All I ever wanted was to share the long day with nature and enjoy the sights and sounds around me before it was too late. I always kind of felt folks was born with eyes to see with instead of snoozing over long, and I knew my bed-ridden time would come soon enough, and then the outdoor world would be lost forever."

I also remember visiting with a friendly old farmer one day after the markets had taken an upward flip a couple of years ago. He stood on his porch smiling and looking enchanted over something. I accosted him with the greeting of the day and remarked that I presumed he was grinning at the prospects for twelve-dollar pork and forty-cent butter fat. "Not a bit, mister," he said, hitching up his pants, "I was just feelin' good because the martins have come back and settled in our barn yard in the new house I spent the winter fixin' up for them."

FUNDAMENTALLY of course this general state of goofiness possessed by us hayseeds shows up eternally in our annual confidence in the bounties of nature. No other occupation carries so much of that blissful resumption of tasks where the rewards are so uncertain. Even the ruralites whose lives have been spent in coaxing plant life on barren acres seem to regain a new hope and a new courage every spring. There must be some powerful sedative mixed with some mighty potent stimulant in the alliance of man and nature —something that economists haven't charted.

Again I often conjecture whether we have any right to measure rural success by the same yardsticks and financial goals we use in doping out the achievements of a banker or a lawyer or a merchant. As long as we do follow that identical method of measurement we are going to find so many goofy chaps getting off the track that we are bound to be discouraged. So many folks just farm it because they like to live in the country that I am persuaded that we are making an error sometimes in these hefty surveys and analyses we make at public expense.

Moreover, there is nothing in this way of looking at it which prevents us from keeping our buildings decent, our fields fertilized, and our cattle tested. Just because they use the fiddle to amuse themselves in certain "no account" regions of the countryside is no reason why the fiddle is bad medicine for the more prosperous denizens to adopt. If happiness and success interfere with each other in agriculture, by all means let's get rid of success!

GOOD ACT

Vaudeville Manager: "Why don't you go on with your animal act?"

Lady Trainer: "Pleathe, thir, I can't find my panther."

Vaudeville Manager: "Never mind your clothes, get on with the act."

Jack: "Aw, c-mon, tell me about the new girl of yours."

Bill: "Why should I?"

Jack: "Because I'm your buddy."

Bill: "No siree—my girl ain't no buddy's business."

The Sunday School teacher had been telling the story of spring and the miracle of the growth of the Easter lily.

"Now children," she said, "who can tell me what it is that makes the lily spring from this little bulb?"

"God does it," replied one boy who had learned his lesson well, "but fertilizer helps some."

A hillbilly edged up to the ticket window of a little jerkwater railroad station.

"Mister," he said, "I aims to go to New York to fiddle in Zeb Stewart's Kentucky Band. Can you fix me up for to get there?"

"Certainly," replied the agent. "The Special goes through here in about five minutes, and I can flag her for you—but what about your trunk?"

"Trunk?" asked the puzzled mountaineer. "What's a trunk for?"

"To put your clothes in," replied the agent.

"What!" cried the scandalized hillbilly. "An' me go nekked!"

"Pat, didn't you tell me that a brother of yours is a lawyer?"

"Yis, sor," replied Pat.

"And you a hod carrier? The good things of life are not equally divided, are they?"

"No, sor," said Pat. "Poor fellow—my brother couldn't do this to save his loife."

"Well, I think I'll put the motion before the house," said the chorus girl as she danced out onto the stage.

DEVOTION PLUS

"A pennyworth of liquorice, please, said the little girl.

"I'm afraid I have no liquorice dear," said the sweet shop proprietress. "Must it be liquorice?"

"Yes, I'm afraid it must," replied the child. "You see, our canary is dead and I'm in mourning."

"Do you know what good clean fun is?"

"No, what good is it?"

THREE FINGERS?

Frosh: "Ginger ale."

Waiter: "Pale?"

Frosh: "No, just a glass."

"How does it feel to be marrying an heiress?"

"Great! Every time I kiss her I feel as if I were clipping the coupon off a government bond."

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Better Crops with PLANT FOOD

June-July 1938 10 Cents

The Pocket Book of Agriculture

Better Crops with PLANT FOOD

The Whole Truth—Not Selected Truth

R. H. STINCHFIELD, *Editor*

Editorial Office: Investment Bldg., Washington, D. C.

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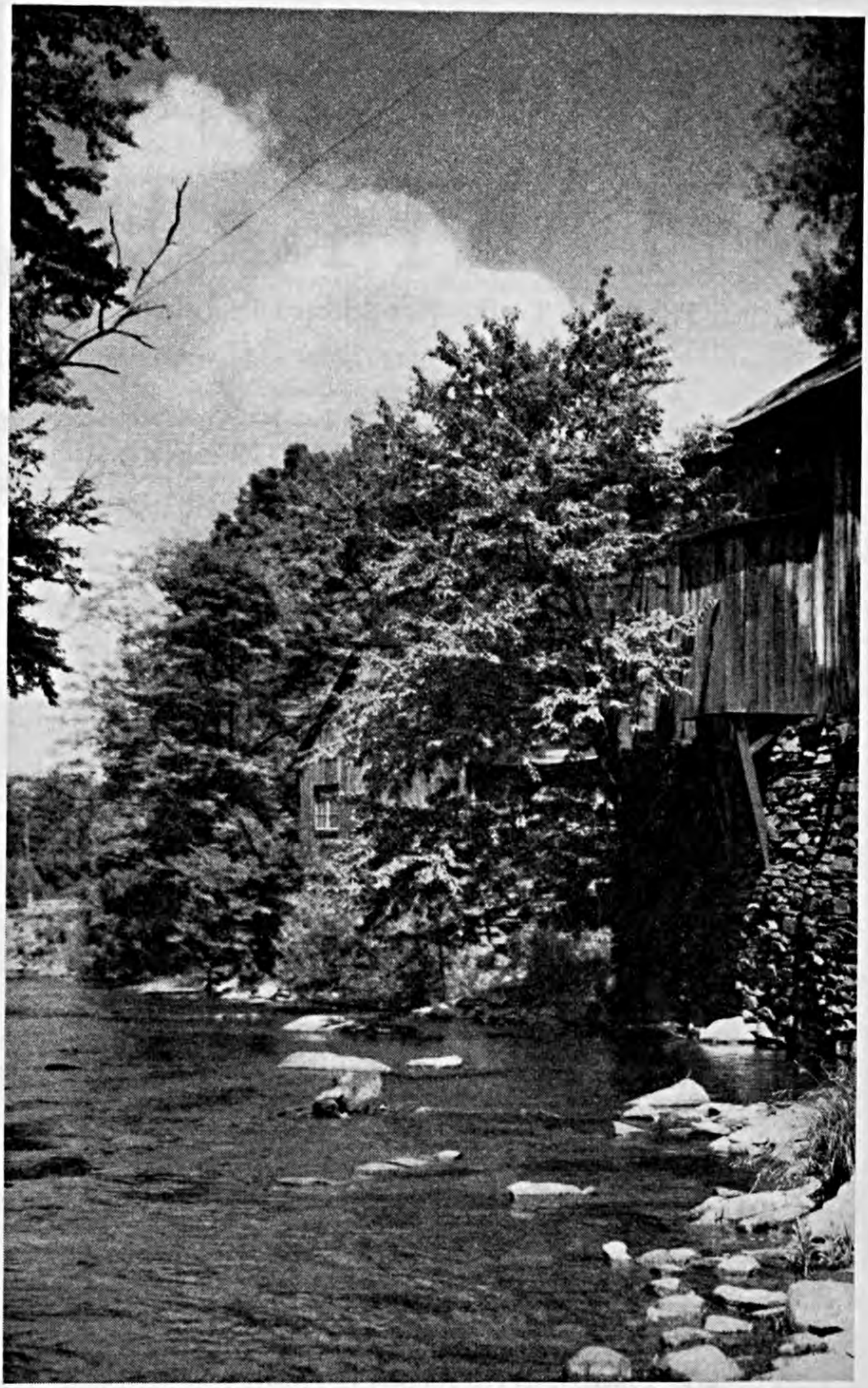

A NATURAL "STOP" FOR THE MIDSUMMER MOTORIST.

Better Crops with PLANT FOOD

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VOL. XXII WASHINGTON, D. C., JUNE-JULY 1938 No. 6

You can define your gardening

Landsc(r)aping

Jeff McDermid

I AM engaged in the ancient problem of summertime, i. e. and to wit, namely: whether to secure a good garden for a little money, as the books aver, or to spend good money for a little garden, which I usually do. One might infer that a chap with the soil of centuries of agriculture bred in his bones and under his finger-nails ought to produce a superabundance of herbiferous garlands and esculent edibles from a plot of rich alluvia, not too replete with broken beer bottles and scrap iron.

It is not stretching the imagination over much to vision the joy with which a sedentary classical scholar like myself should awaken with the woodpecker's rap on the roof to grab his breeches and seize the spade for a foray in the realms of botany.

Whilst the season is young and the mornings dewy, our intentions in the direction of an early partnership with nature seem logical and simple to achieve. But as the warmth of July dawns finds you wringing perspiration from your limp pajamas, those bookish allurements of winter garden studies grow dim in the grip of ennui, or even ordinary laziness.

Not being a born fisherman, I detest the fellow who abandons the row boat and the reel for a measly purchase at the nearest market on his dissappointed journey homeward. Being a gardener, however, I see no harm in eking out my laudable vegetative ambitions with a basketful of beans or a head of cabbage produced by a successful muckland artist, or depending on the florist for enough sweet peas to make a respectable smell around the house.

I eschew all alibis and renounce all cheap excuses. There are no vicious boys to tramp the daylights out of my dahlias. Nary a neighbor keeps a dog to leg-it over my choicest evergreens, and the ordinance under which I pay taxes abolishes that common nuisance of the home seeder—the clawing, four-toed hen.

On the contrary, I live in a community where the best of advice can be had without asking for it, and several renowned doctors of plant structure and deans of landscape carpentry are or have been almost clubby with me betimes. Moreover, my long list of erudite acquaintances includes men of discernment in matters of manure and experts in soil-saving dams and damn-saving soils. To each and all of them I dedicate this treatise—sans malice and sans reproach.

HAD I been as faithful with my hoes and harrow as they were in writing bulletins, the result would have been too prosaic for these captivating pages. Unfortunately I have two neighbors who never read anything touching upon the agricultural or botanic arts, and yet their ardent toil is recompensed by a veritable rainbow of gorgeous bloom and a surfeit of salubrious saladry and kale. Not that I have the slightest envy in my make-up, but I feel hurt over the success of those who have never courted the counsel of my wise and helpful professional friends. I spend hours wondering why nature flouts the men of learning and caters to clodhoppers with more sweat than sense.

I owe these savants a modicum of praise for what they have contributed. For a time I was the editor of the farmers' almanac and gardeners' guide. With the rare help of my technical friends who relished giving free advice, I was able to relay countless answers to perplexed readers at no cost to myself or our periodical. I trust that the cost thereof to readers was not any greater than one or two seasons' setback at least, as I usually added only a *few* instructions of my own to the tested formulas prescribed by the faculty. I shall touch upon a few of those old notes and comments.

AFTER the first front fence is decided upon comes the matter of the sides and back, and these depend a good deal on your neighbors," the sentence says. My experience is that if you have congenial neighbors who like to talk about the same things you do, and who do not toss mean remarks, old cans, and dead cats too frequently upon your property, then no hedge is needed. For the other kind you need a cute combination of annuals and perennials to afford permanent barriers. I suggest using blackcap brambles planted a foot apart and well fertilized, and a generous spring combination seeding of beggar lice, poison ivy, sunflowers, and hemp, or any set of annuals that are famous for blocking both visits and vision. If you can get through this breastworks some night during the siege and sow rock salt on his verbenas, the season will truly be a successful one.

"It may be that you prefer a wide expanse of lawn running behind your house with only a few cultivated garden plots." This advice is about as complete as giving one an alternative of dying through overwork or overworry. It all depends on whether you love to push the mower for time and a half or grub around on your shins with a trowel. I was raised in the dear old days when both lawns and cow pastures were gifts of the gods, and anybody who tried to fertilize either beyond the natural supplies they got from quadrupeds was considered fit to be candidate for office on the Prohibition ticket. Nowadays a prudent householder is in a stew all the time with lawn troubles. He must keep it growing with top-dressing and he has to give the boy a dressing down to keep it cut.

"FROM the first of June to the middle of September the wise gardener will undertake only what he can do in *half* his leisure time." It may be a trifle hard to figure out exactly what half your leisure time amounts to.

One is so apt to spend more than half of the allowance of leisure on the links, or over at the neighbors sampling mint julep, or showing him how to prune his potatoes. So I suggest that this be left to the wife. She keeps better track of the leisure of her spouse than any other person, and she can also cut it in half much quicker.

"You will have gifts of plants from neighbors and old friends who are touched by your earnestness and industry." Yes, indeed, plenty, such as they are. I have a neighbor lady with an expansive and expensive garden, and every time we go up there to admire it she finds some specimen to load me down with. At the insistence of my frugal wife and with a certain Scotch instinct besides, I totter home with bushel baskets of *Nepeta mussini, Thalictrum* or *Henchera,* and work beneath a waning moon and amongst a bevy of beetles trying to find a decent burial place for them. Then here cometh that doughty dowager who gave birth to my wife, bringing us some cute weeds she located on one of her dizzy rambles—presenting them to us for our wild-flower nook. Luckily none of us have hay fever, because the stuff that woman has unloaded on us accounts for the highest pollen count ever recorded on a suburban sneeze patch.

"AVOID all ugly flower-holding contrivances for your gardens and lawns." After several years of fertile invention and original design, I can second that motion pronto. The list of bizarre effects successively tried on my premises have caused some folks to drive in with patients for the asylum through mistake. They include old cart wheels and auto tires discreetly laid down in sod and planted to moss roses; Uncle Ike's steamer trunk filled with fertility and sown to phlox; rows of old lodge spitoons edging a bed of petunias; an abandoned wire bedspring used to train up sweet peas and morning glories; and a clump of golden glow growing in one of my old hip boots. I had to quit experimenting because the junk dealers woke me up mornings outbidding each other for the salvage. Commercialism interferes with esthetic repose.

"Use care in ordering nursery stock to get hardy, acclimated species and varieties." My usual system is a simple one in regard to planting stock. In midwinter I read all the marvelous ads and put my son to work writing postcards for free catalogs and brochures, using him for this purpose because he is taking night school lessons in English and typing. When the clutter has accumulated I look at the pictures and study the text for hints on how the landed gentry grow their gooseberries. In order to get rid of the pamphlets I loan them to friends. Then when the ground is soft enough to dig, I take a spade and grub-axe and trundle my

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Can Sea Island Cotton Return to Georgia?

By E. C. Westbrook

Cotton and Tobacco Specialist, Agricultural Extension Service, Athens, Georgia

GEORGIA produced approximately 900 bales of Sea Island cotton last year. This compares with a production of 71 bales for 1936. The State formerly grew 50,000 to 75,000 bales annually. In 1918 Georgia planted 129,000 acres in Sea Island cotton, from which 34,000 bales were harvested. A total of 65,000 bales was produced in Georgia, Florida, and South Carolina in 1918. In 1920 the total production for Georgia, Florida, and South Carolina was only 2,000 bales.

Since 1920 production of this type of cotton has been too small to be of commercial importance and the advent of the boll-weevil caused farmers to abandon the crop. It is slower in maturing than short cotton, and the bolls are softer, thereby making it more susceptible to boll-weevil injury.

There have been attempts from time to time to revive the production of Sea Island, but not until the successful crop in Florida in 1935 were there any encouraging signs. The 71 bales produced in Georgia in 1936 were from seed distributed by the U. S. Bureau of Plant Industry. In order to give a more definite picture before the advent of the boll-weevil, we give below Georgia production by counties for 1911:

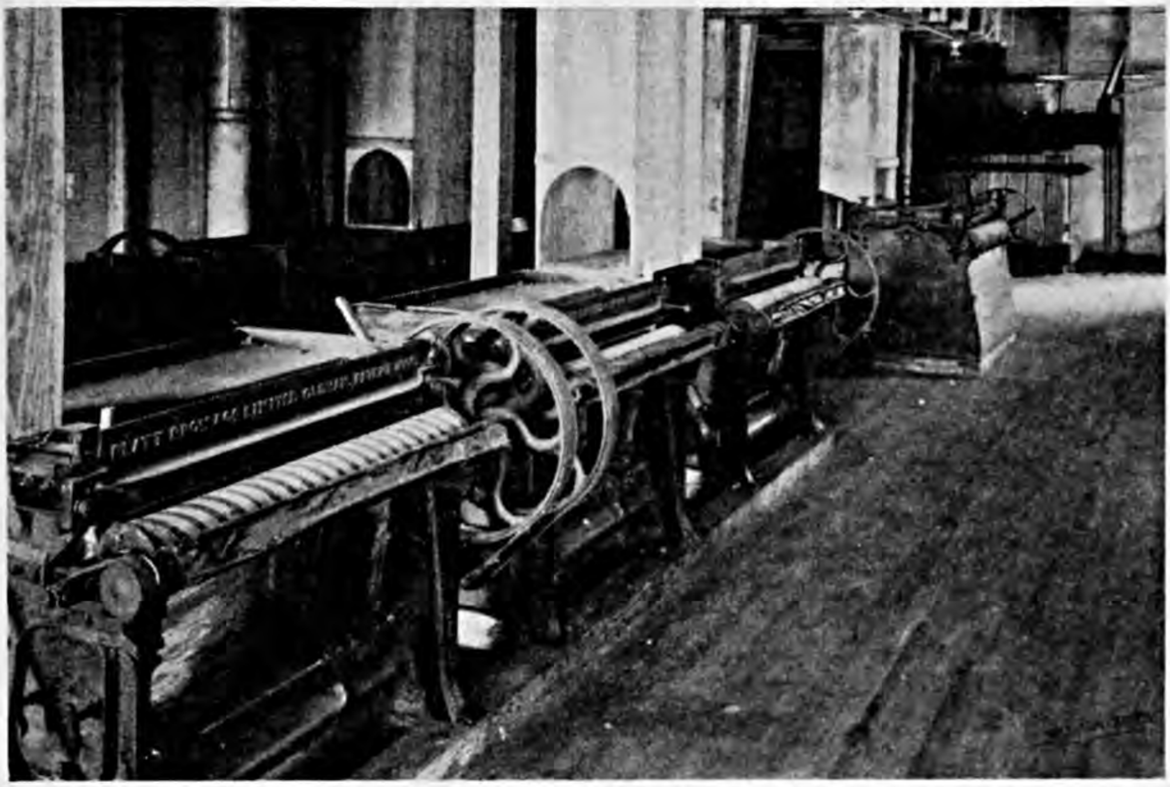
Appling	4,590
Bacon	0
Berrien	11,535
Brooks	2,586
Bulloch	9,268
Candler	0
Clinch	1,049
Coffee	8,372
Colquitt	2,067
Echols	530
Emanuel	141
Evans	0
Lowndes	11,819
Pierce	5,585
Tattnall	9,066
Ware	768
Wayne	3,204
All other	2,324

It is estimated that in 1937 between 4,000 and 5,000 acres of Sea Island cotton were planted in Georgia. Enthusiasm at the beginning of the year ran high, because the prospects for an excellent crop were good. There was also a decided revival of interest among a number of manufacturers, both domestic and foreign. Sea Island cotton was planted in approximately 40 Georgia counties distributed all the way from the Alabama line to the Atlantic coast.

Georgia was visited by a heavy infestation of boll-weevil, and this, combined with almost daily rains from the latter part of July until September, caused a much smaller yield than was anticipated earlier in the season. The weather and weevil conditions also resulted in the production of a considerable amount of low-grade cotton. Despite the unfavorable conditions, many growers came through with very successful crops.

The price for Sea Island cotton varied from 19 to 25 cents per pound. The major portion of the crop was sold for approximately 22 cents per pound.

The old roller gins which were used to gin Sea Island cotton have been furnished by the Triple-A was used on 100 bales ginned at Valdosta. About the biggest objection made to the use of the cotton bagging was that it was



Inside view of a Sea Island Cotton Gin owned by The Southern Cotton Oil Company, Valdosta, Georgia.

abandoned since 1920. Some of this old equipment was pulled out of old gin houses and the rollers recovered and put in condition to gin the 1937 crop. The towns where Sea Island gins were operated and the number of bales ginned at each place are as follows: Valdosta, 376; Mershon, 189; Baxley, 182; Offerman, 72; Savannah, 50; Nichols, 35; and Willacoochee, 18. Most of the gins used were of the Foss double roller type, although there were a few English Platte single roller gins used. A total of 922 bales, averaging approximately 400 pounds each, was ginned at the seven gins. It is estimated that of this number between 20 and 25 bales were produced in Florida. There were a few bales produced in Georgia that were ginned on Florida gins.

The charge made for ginning varied from 1½ to 2 cents per pound of lint. The number of ties used on the bale varied from two to six. Cotton bagging

7 to 8 pounds lighter than the sugar cloth bagging used on most of the Sea Island bales.

Incomplete Records

It has been rather difficult to make recommendations as to methods of fertilization and culture which would give the largest yields of Sea Island. Very little of this cotton has been grown for the last 20 years, and records of methods formerly used are very incomplete. Most of the farmers who formerly grew it are somewhat hazy as to the methods they used. Also, conditions under which the crop is grown today are very different from those when it was an important crop in many south Georgia counties.

In addition to the boll-weevil menace, the labor situation has changed. Farm labor today is not as plentiful and cheap as it was before the World War. More labor is required to pick Sea Island

A field of Sea Island Cotton grown by the Coastal Plain Experiment Station at Tifton, Georgia.

cotton than is required for short cotton. The Sea Island bolls are smaller, and more hand labor is required in sunning the cotton after it is picked and in picking out hard locks, trash, and other foreign matter before the cotton goes to the gin. Sea Island has approximately 25 per cent lint as compared with 35 to 40 per cent for most varieties of short cotton. Sea Island seed weigh approximately 40 pounds to the bushel as compared with 30 pounds for short cotton seed. Therefore, the turnout at the gin is not as good as for short cotton.

The quality of the fiber is the finest of all cottons. It is long, fine and silky, and very strong. The Seabrook strain was planted in Georgia. This strain has a staple 1½ to 1⅞ inches in length. Sea Island cotton is used in making thread, laces, and a variety of fine fabrics.

Made Thorough Survey

The 1937 season was very discouraging for a large percentage of Georgia farmers who planted the crop. Despite the fact that many farmers obtained very small yields, some farmers came through with very satisfactory yields. Believing that there were some very definite reasons why they made good yields while others made very poor yields, we set out in December to find out those reasons. A survey was made in which detailed records were obtained on about 50 crops in half a dozen counties. The yield for the crops studied varied from 9 pounds to 244 pounds of lint cotton per acre.

Samples of soil were obtained from the 50 crops of Sea Island studied. Micro-chemical analyses were made of the samples in which determination was made for the pH, or acidity, the total nitrates, and available phosphoric acid and potash. These and other data were tabulated and are shown in table I.

In analyzing the fertilizer treatment, we find the amounts and kinds of fertilizers used are not correlated as closely with yield per acre as might be expected. The principal reason for this, no doubt, was the very rainy season and the heavy infestation of boll-weevil. One of the most significant things which we learned from the survey, and which is not shown in table I, was the difference in yields on various soil types. The heavy Tifton pebble soils were outstanding. Most of the successful yields were produced on such soils. This was true for all the counties surveyed. This does not mean that it was the only soil type

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Potash Is Needed In Southern Illinois

By Fred J. Blackburn

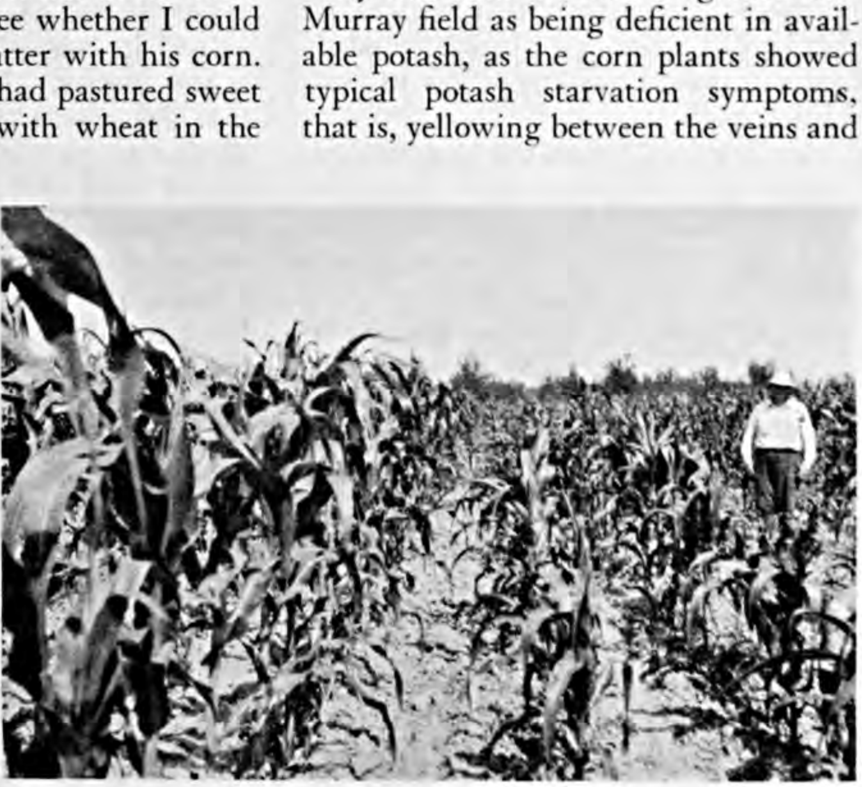
Farm Adviser, Salem, Illinois

FOR the past 7 or 8 years farmers in different parts of Marion County, Illinois, have been complaining of something wrong with their corn. Some thought the subnormal growth was due to insects or diseases, and others thought it might be a soil condition. And yet it seems that most of these farmers who had trouble reported it was on what they considered some of their best soil on the farm. Usually the affected corn field would produce a relatively large crop of wheat or oats, but failed to produce corn.

In 1934 I was called out to the farm of R. L. Murray to see whether I could tell what was the matter with his corn. In 1932 Mr. Murray had pastured sweet clover, following it with wheat in the fall, and the next year planted the field in corn. The corn was sickly looking, small, and in many parts of the field would produce practically no yield.

Since Mr. Murray has kept farm accounts in cooperation with the University of Illinois for the past 15 years, it has been interesting to study the field history. The soil had been limed, and 1,000 pounds of rock phosphate were applied in 1927. The 1933 wheat crop produced 22 bushels per acre, but the corn the following year averaged only 10 bushels per acre. Mr. Murray reported that he had similar trouble back in 1930 on this field, when corn produced only 12 bushels per acre following a 16-bushel wheat crop. In 1931, oats on the same field made 63 bushels. After the 10-bushel yield of corn in 1934, Mr. Murray produced a fair crop of oats and soybeans on the field, followed in 1936 by a yield of 28 bushels of wheat.

By that time we had diagnosed this Murray field as being deficient in available potash, as the corn plants showed typical potash starvation symptoms, that is, yellowing between the veins and



Left: 100 lbs. 0-0-50, right: no potash. Potash fertilized corn was normal green, while the unfertilized rows had lower leaves with brown marginal firing and yellowish streaks between veins. R. L. Murray farm, Centralia, Ill., July 20, 1937.

browning of the edges of the lower corn leaves. This abnormal condition had also been reported on corn from some other farms, including Hopkins' Poorland Farm.

Samples of soil from the Hopkins' Poorland Farm had been sent to the University for analysis in 1935, and the soil was found to be very low in available potash.

On Poorland Farm, the Murray farm, and others, experiments have been conducted recently using potash fertilizers, and some outstanding responses in yields have been obtained.

In 1936, W. A. Hunter, operator of Poorland Farm, applied 60 pounds of muriate of potash (0-0-50) per acre in the hill for corn on a field where a lime-phosphate-legume program had been followed for a number of years. In the center of the field he left a few rows without potash. This same year we also experimented with side-dressing potash along the corn rows after the severe potash starvation symptoms had appeared. The side-dressed corn regained its normal green appearance in a few weeks. However, due to the hot, dry season, the corn was cut for silage and no yield estimates were obtained from this field. An important observation during this hot, dry season was that the normal, green, potash-treated corn did not suffer any more from the drouth than the unfertilized rows. In fact those rows fertilized with potash furnished a much greater amount of corn for silage.

No fertilizer yielded 22.1 bu. 125 lbs. 0-8-24 yielded 54.8 bu. Hopkins' "Poorland Farm," Salem, Illinois, Oct. 29, 1937, showing effect of high-potash fertilizer on strength of stalks and yield and quality of corn.

More comprehensive fertilizer tests

Table 1.—Corn Yields Hopkins' Poorland Farm, Salem, Ill., 1937

Treatment	Yield per Acre Bu.	Per Cent Marketable Corn	Value per Acre @ 50¢ & 15¢	Fertilizer Costs per Acre	Net Increase Due to Fertilizers
Hopkins no treatment	23.81	93.8%	11.40	.....	......
LrP—no fertilizer	22.92	92.8	10.88	.....	......
" +125 lbs. 0–0–50 Hill	54.72	97.5	26.91	$2.67	$13.55
" +125 lbs. 0–20–0 "	33.09	94.0	15.87	1.62	3.75
" +125 lbs. 0–20–20 "	50.69	95.3	24.49	3.19	10.98
" —no fertilizer	22.14	87.9	10.13	.....	......
" +125 lbs. 0–8–24 "	54.80	97.0	26.90	2.47	14.30

comparing different fertilizer grades were conducted in 1937 on several farms. The yields in the test on Poorland Farm are shown in Table 1.

A similar fertilizer comparison was made in the R. L. Murray field whose crop history was described previously. The data are shown in Tables 2 and 3.

A locally adapted blue and white variety of corn called "Johnny Hill" was used in this test. This variety is somewhat resistant to chinch-bug injuries and is well adapted to the soils of the territory. The corn was drilled, and the fertilizers were applied in the row with the attachment on the corn planter.

All potash-containing fertilizers made a marked improvement in the growth and the appearance of the corn through the season. The unfertilized rows and those with phosphate alone (0-20-0) showed marked potash starvation symptoms, yellow streaked leaves with the brown marginal firing. The potash-starved stalks were weak and died prematurely. Note in Table 3 the percentage of down and leaning stalks. The unfertilized areas and the 0-20-0 plot had the greatest percentages of down stalks. The percentages of leaning and down stalks decreased as the amounts of potash supplied by the fertilizers increased. The 3-14-6 supplied some potash and increased the yield profitably, but the amount of leaning stalks was quite large in comparison to the plots receiving higher potash mixtures. The 3-14-6 furnished enough potash to start the crop, but not sufficient to mature it properly. The combination of 3-14-6 and 6 tons of manure produced about the same yield as 100 pounds of muriate of potash (0-0-50).

TABLE 2—CORN YIELDS, R. L. MURRAY, CENTRALIA, ILL., 1937

Treatment	Yield per Acre Bu.	Percentage Marketable Corn	Value per Acre* @ 50¢ & 20¢	Fertilizer Costs per Acre	Net Increase Due to Fertilizers
No fertilizer	12.31	49.2	$ 4.28	......	......
100# 0-0-50 Row	58.84	97.5	28.96	$2.34	$22.34
123# 0-8-24 "	56.24	98.3	27.85	2.44	20.09
115# 0-20-0 "	37.00	91.3	17.55	1.49	10.37
123# 0-20-20 "	53.57	97.6	26.41	3.14	17.11
100# 3-14-6 "	51.37	96.8	25.17	2.15	16.39
No fertilizer	17.47	68.9	7.10	......	......
100# 3-14-6 + 6 T. Manure	58.30	98.0	28.79	12.65	9.04

* Values: marketable corn 50¢, poor quality corn, 20¢.

TABLE 3—LEANING AND DOWN STALKS, R. L. MURRAY FARM, 1937

Fertilizer Treatment	Per Cent Leaning Stalks	Per Cent Down Stalks	Per Cent Leaning & Down Stalks
No fertilizer	22.2	39.5	61.7
100# 0-0-50 Row	13.4	6.0	19.4
123# 0-8-24 "	18.7	3.9	22.6
115# 0-20-0 "	33.0	30.6	63.6
123# 0-20-20 "	30.1	4.9	35.1
100# 3-14-6 "	41.9	9.5	51.4
No fertilizer	36.7	30.7	67.4
100# 3-14-6 + 6 T. Manure	40.4	8.3	48.7

We are not certain as to the response from phosphate in the fertilizer in addition to potash where rock phosphate has been applied previously, as on the Murray field. All through the season the 0-20-20 and 0-8-24 plots looked as if they would produce as much as the 0-0-50 plot. It must be recalled that

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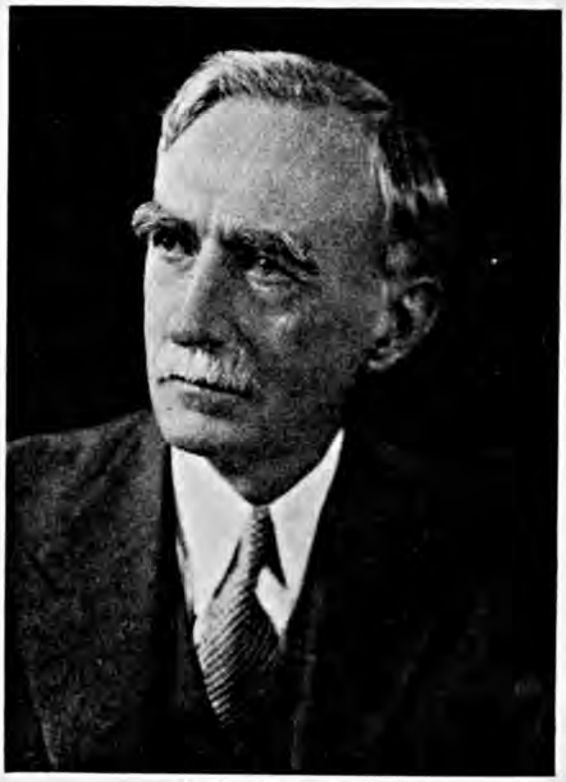
A Dean Retires

By H. M. Dail

Agricultural Extension Service, Columbia, Missouri



F. B. Mumford

LONG a prominent figure in the agriculture of the Midwest and nation, Dean F. B. Mumford of the University of Missouri College of Agriculture has announced his retirement effective this fall. He recently passed his seventieth birthday and feels it is time to give up his strenuous administrative duties. Much as they regret the termination of his active leadership, friends of the college believe that his successor, Professor M. F. Miller, veteran soils authority, is well qualified to occupy the position.

Dean Mumford started his long trip in the field of agricultural education and research in 1891, when he forsook the job of managing his father's 400-acre farm to take a position at his alma mater, Michigan State College. As far as the amount of work was concerned, he would have had an easier time had he remained on the farm. Filling the position of an assistant and working toward his master's degree demanded that he begin his tasks in the gray of the dawn and end them by the flickering light of lantern or lamp. His college duties included everything from teaching to assisting with the care of the animals on the college farm. After he obtained his degree, the college gave him the title of assistant professor and raised his salary to $1,000 a year.

A few years afterwards, in 1895, a young college in the Midwest which was seeking an addition to its staff wrote the nationally recognized Michigan school. Today, Dean Mumford will tell you he was recommended for the position largely due to the fact that he supervised the building of an extra straight and sturdy group of fences on the college farm. Be that as it may, he joined the Missouri school as professor of agriculture.

Won Public Confidence

In those early days of the college one was either professor or farm laborer. There were no assistants or even stenographers. Farmers writing in for information received letters in longhand from the professors. Unless writing ability was better then than now, farmers probably were still not very clear about what they were supposed to do.

In common with other comparatively new colleges of agriculture, the Missouri institution was strenuously attempting to convince a skeptical public that it was a worthwhile institution. Most rural people were of the belief that college teachers possessed only "book knowledge" of no practical value. Farmers insisted on farming as had their fathers before them. They strictly followed many misconceptions and fanciful ideas in the tilling of the soil and in raising flocks and herds.

Naturally, there were few students in the colleges then, and only a very few stayed for the full period of study. In 1895, only two students were in the senior class of the Missouri institution. No wonder, when even a national farm magazine carried such a statement as this: "It is the sheerest folly to send a boy to an agricultural college. In the agricultural colleges, boys are taught to be athletes, dudes, clerks, or anything but farmers."

Actually, the early colleges of agriculture were not such as to inspire great confidence. They had meager equipment and had not yet acquired any large body of teachable scientific knowledge. When Mumford began his duties at the Missouri College of Agriculture, the experiment station there was but 7 years old and barely had started investigations. Much of the teaching of livestock judging was done with the use of pictures, not with live animals. In the library of the college at that time there were but three volumes, two of them concerning economic plants and one on domesticated cats.

As the "gay nineties" passed, the Missouri college was making headway toward gaining the confidence of the people of the State, as the steadily increasing student enrollment indicated. However, many persons doubted the value of teaching the agricultural students such things as English, chemistry, zoology, and other subjects which were thought incapable of direct application on the farm. This feeling gave rise to agitation to separate and move the college away from the State university, the belief being that the university's influence affected the "practical" course of study which a college of agriculture should offer. Such a feeling evidently was general because many colleges of agriculture were set up as distinct educational units and had little or no connection with the universities of the State to which they belonged. However, the Missouri agricultural college remained a part of its university.

Authority on Farm Animals

Mumford continued to be professor of agriculture until 1904 and then, following the trend toward specialization, he was appointed professor of animal husbandry. In this position he did much investigational work concerning the breeding of farm animals. He soon became known as an authority on this subject and published an important book entitled "Animal Breeding," which has been a text book in many colleges of the country. The young professor also spent considerable time and energy in building up the college herds, his success being attested by the number of regional and national prizewinners he produced. From time to

M. F. Miller

time, he served as acting dean of the college.

In 1909 he was officially appointed to the position of dean of agriculture and director of the experiment station. As head of this rapidly growing institution he set for himself a triple goal of establishing efficient teaching, thorough research, and a close association of the college with the farmers of the State.

Believes in Research

He believed then and still is of the conviction that sound and careful research is of great importance. He has the research student's love for truth. Once in an experiment concerning the feeding of cattle, a laborer carelessly fed the animals chopped hay containing pieces of wire. As a result several of the animals died. In preparing a report on the experiment, one of his staff asked if he should not eliminate the cattle which had died from the entire account of the experiment. Dean Mumford insisted that the full report be published, since as he said, that showed what actually happened.

Though through the years many of his college's graduates have become outstanding in educational and service fields of national agriculture, Dean Mumford has always firmly believed as he said many years ago, "The most important service that we can render is the training of young men to go back to the farm. The country needs trained men and women for agricultural leadership in the rural community. The field of the college in this endeavor is unlimited."

Since there was no extension service in those years, the college made many of its contacts with farmers through farmers' institutes. These were brief training sessions held on the campus and also in various parts of the State. The dean and other members of the faculty brought to many farmers their first glimpse of scientific agriculture. Mumford had the ability to inspire confidence in his listeners, and he thus built a stronger interest and confidence in the college which he represented. Promotional trains were also popular methods of reaching farmers in those days, and Dean Mumford was a familiar figure on these. In 1913 the extension service was established in Missouri, and for several years he has served as its director, still bearing in addition his duties as dean of the college and director of the experiment station.

In 1917 as the war drums beat loudly, Dean Mumford was asked to take the position of food administrator for Missouri by Herbert Hoover, then

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The plots on which important experiments in soil erosion were carried on by Professor Miller. They have been referred to as the "birthplace of soil conservation in the United States."

Orchards Differ in Fertilizer Needs

By F. N. Fagan

Pennsylvania State College of Agriculture, State College, Pennsylvania

DURING the past 35 years many published reports on orchard fertilization have originated from orchard fertilizer tests conducted by the Agricultural Experiment Stations of the United States and Canada. It is needless to list all the work that has been done along this line; suffice it to say that much good to the industry has been the result.

Wide Range of Experiments

This work has been and is now being conducted in orchards planted on soils of many different types and under many different climatic conditions. It is only natural to expect that tree reactions to different treatments would not be the same in all cases. The soil organisms and chemical reactions could hardly be the same month by month in a soil having a surface soil temperature of 32° F. or below for a period of from 12 to 20 weeks, as the reactions would be in a soil where the surface soil is frozen intermittently only 1 to 3 inches deep. Soil bacteria and chemical reactions under such wide temperature differences could not be the same and must play a part in the fertility problems to some extent.

The writer has been fortunate during the last five summers to have been able to visit and inspect, with the owners or managers, about 85 different orchards in eastern United States. These orchards have been located on many different soil types and on many different elevations. The soils in these orchards have been under different systems of soil management in respect to fertilizers, cultivation, and cover crops —different because the "management" has had to "fit" a fertility practice to the needs of a given location and soil. Where the writer has seen orchard failures, and he has visited several, the cause of failure in most cases can be laid at the door of the "management" and not at the door of poor soil or location. The "management" has not been able to see the problems and solve them. Since orchards are being successful under a wide range of general conditions (peaches from Texas into southern Canada and apples from Tennessee and the Carolinas into Canada), we can say that orchard management has met the situation.

I salute with much pride the successful North American orchards. Their problems have been many and big, but good management has made a "Fruit Industry."

One outstanding fact coming from studies of orcharding, be these studies by experiment stations or orchard owners, is that an orchard can not be successful unless some type of soil fertility method is used. For many years nitrogen fertilization has been the method receiving the greatest amount of thought, and justly so, for this element by its very nature is the one that is lost from the soil most rapidly, the one most lacking as orchards become older. But as years rolled on, nitrogen fertilization did not solve the problem completely in all the orchard districts.

It is interesting and of value to see the determined efforts being made now in the studies of plant nutrition deficiencies in relation to orchard tree growth and production. These studies extend from zinc deficiencies in citrus culture through to calcium, magnesium, phosphorus, potassium, and even boron deficiencies of our many other tree fruits.

Using Complete Fertilizers

It is interesting to note the swing, in the eastern part of the United States, to the complete fertilizer recommendations as new studies are reported upon. No one complete fertilizer is going to meet the needs of all orchards, but recent recommendations of formulae extending from (N-P-K) 4-8-4 through 4-12-4, 4-16-4, 9-6-6, 5-10-5, to 10-6-4 are in the right direction in orchard fertilization.

Turning to recent published work on orchard fertilization we find Professors Blake, Nightingale, and Davidson stating in the New Jersey Agricultural Experiment Station Bulletin No. 626 as follows:

"Some orchard soils may be so well supplied with all the common nutrients that they will not show a beneficial response to applications of fertilizers. Other soils may be deficient in one or two nutrients but be well supplied with the remaining elements. In general, however, orchards planted upon Coastal Plain soils will be benefited by annual applications of a complete fertilizer.

"Orchard soils which are fertile enough to support a good growth of cover crops and trees should receive a complete fertilizer of a 3-12-6 formula at the rate of 500 to 1,000 pounds per acre broadcast.

"Orchard soils which are obviously deficient in nutrients and where neither sod, cover crop, weeds, nor trees are making enough growth should receive a complete fertilizer somewhat higher in nitrogen, such as 5-10-5. . . . If the trees and soil are not actually deficient in nutrients, this treatment is definitely unwise.

"Calcium should be regarded as a fertilizer material, rather than as a soil corrective. . . . When the reaction of the soil in the Experiment Station orchards at New Brunswick has been allowed to fall below pH 4.5, these varieties (Delicious and Stayman) have been found to give poor yields and poorly colored fruit. Moreover, it is desirable to grow such soil improvement crops as alfalfa, sweet clover, crimson clover, and vetch in orchards. A soil at a pH of less than 5.5 is unlikely to be favorable for best results with these crops.

"For apple orchards on the Coastal Plain soils in New Jersey, it is recommended that it be made a regular feature of orchard practice to apply a minimum of 1,000 pounds of ground magnesium lime per acre every 2 or 3 years. More than this may be desirable in some instances."

In Better Crops, May 1937, F. W. HofMann of the Virginia Agricultural Experiment Station, states, "If the orchard soil is not strong enough to maintain a good crop of grass or sod it should receive 600 to 800 pounds of an 8-6-6, 6-8-6, or 10-6-4 fertilizer. If the soil is capable of producing a lush growth of grass or sod the fertilizer application may be more confined nearer the area under the spread of the tree and to fertilizers with the higher nitrogen content."

Improved Cover Crop

In Better Crops of August-September 1936 E. H. Rawl of Clemson College, South Carolina, recommends the use of a complete N-P-K fertilizer in the peach orchard plus the use of dolomitic limestone. In the South Carolina peach tests not only foliage and tree growth but size of fruit was greatly improved by the use of complete fertilizer plus the limestone. Where such fertilization was given, it is interesting to note

Twenty-two-year-old Stayman in non-legume cover crop block. Non-legume covers have been rye when seeded in August and millets when seeded in early summer.

good stands of cowpea cover resulted even under the spread of peach tree branches.

The orchard soil fertility problem is not solved, however, with application of complete fertilizers or any one of the fertilizer elements. The fertility problem is interlaced with the general system of soil management of the orchard; i.e., cultivations given or not given, kinds of covers grown or not grown.

As reported in Pennsylvania State College Agricultural Experiment Station Bulletin number 294, "Twenty-five Years of Orchard Soil Fertility Experiments," the authors state:

"The fertility of an orchard soil is more than its plant-food content. It

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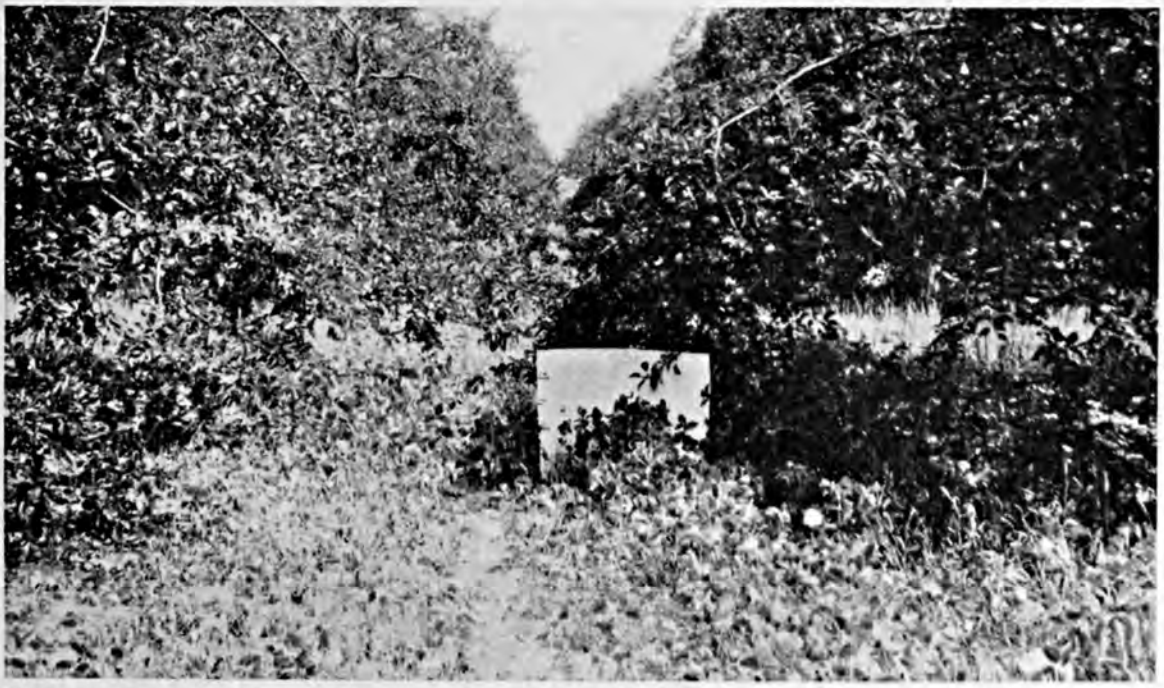

Twenty-two-year-old Stayman in legume cover crop block. Note branches meeting between the row. Legumes have been mixtures of clovers, including deep-rooted sweet clover, and soybeans each year.

It Takes Knowledge To Live With Soil

By E. B. Swingle

Michigan State College of Agriculture, East Lansing, Michigan

MICHIGAN'S 196,000 farmers have learned to live with soil and weather. They have learned, especially with potatoes, that efficient production and long-time farming mean tying down the soil with grass and legumes, and that profits are closely linked with commercial fertilizers supplemented where feasible with livestock.

One doesn't need to pile on adjectives about the State's use of fertilizers. Records for 1937 compiled by the soils department at Michigan State College indicate that 144,500 tons of fertilizers were purchased and applied on farms within the State. Typical of farming practices requiring wise use of fertilizer are the potato growers.

Take Alphonse Verschure, Manistique, for instance. He recently was crowned as the premier potato grower of the State for 1937. Cropping out of his production record are some of these facts:

On a 10-acre test plot entered for competition in the 300-bushel potato club in 1937, he produced an average

For growing 1,147 bushels of yellow globe onions to the acre, Carl McGuffey of Shelbyville is being crowned Michigan's new Onion King by another Michigan muck farmer, F. King Serviss, Owosso, past president of the Michigan Muck Farmers' Association.

A Michigan potato field after midsummer rains put soil and plant food and sunlight to work.

yield of 524 bushels to the acre of which 485 bushels were certified U. S. No. 1 grade. He applied 1,000 pounds of a 1-13-13 fertilizer to the acre, on May 28, planted 30 bushels of seed to the acre spaced 13 by 30 inches, and sprayed six times.

Right on his heels were Gaspardo Brothers, Franklin Mine, Michigan, growing 523 bushels to the acre, of which 440 were U. S. No. 1 grade. They used 950 pounds of 4-16-16 fertilizer to the acre, planted 25 bushels of seed to the acre spaced 14 by 36 inches, and sprayed five times.

Not all Michigan farms get similar fertilizer treatments. Visitors from Vermont were in Michigan last summer expressing amazement that in spite of the State's rating as a potato producer, the average field in July showed such little development.

"Must be a lack of fertilizer," they told E. J. ("Ernie") Wheeler, farm crops specialist of Michigan State College. Wheeler was showing them some of the best potato sections of the State and happened at the time to be on the farm of Reisner Brothers and Hopp, near Rogers City in Presque Isle County.

"Back in Vermont we get potatoes, and we get early and large growth of tops with a ton of fertilizer to the acre," the visitors bragged.

These eastern growers were surprised and almost inclined to scoff when they learned that the field they were looking at had an application of only 250 pounds of 2-16-8 fertilizer.

Unusual Conditions

Wheeler explains simply what makes Michigan agriculture in general and potato production in particular seem peculiar to farmers from other States. It's the combination of soil, climate, and cropping system. Fertilizer recommendations which were being followed on that farm near Rogers City were necessarily not high, because the farmers were practicing good business economy. They were putting on fertilizer at a profit and knew just when to stop.

Rains in July pushed that particular field along and put on good top growth for early maturity and harvest before chilling. The yield averaged 473 bushels to the acre on a 5½-acre field. Seventy-five per cent were U. S. No. 1 grade certified for sale as seed. As a contest entry the yield rated tenth place in the State for 1937.

"Extra fertilizer on the field would not have paid. What was applied was

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Were the Professors Wrong?

By F. H. Jeter

Agricultural Experiment Station, Raleigh, North Carolina

RED clay lands, so the professors explained rather patiently to me as a college student years ago, contain enough potash to make fairly good acre yields of most crops. It is only necessary, therefore, to use just the ordinary amounts of potash contained in the average fertilizer mixtures. In some instances it may not be necessary to use any potash at all. There is enough in the soil for all ordinary uses, they explained, and if the farmers only had gumption enough to rotate their lands with legumes, plow under a part of the legume crop every year, then all potash requirements for crops on these lands would be beautifully solved.

I rather think the professors believed what they taught. As a rule, they are an honest bunch of fellows. I have been associated with them nearly the whole time since I was graduated on that glorious June day and have found them so. Therefore, after they had armed me with such an important bit of wisdom, I did my best to pass it on to all farmers with whom I came in contact. For the first few years out of college, I did it rather dogmatically, because I had the facts. I suspect I was at times somewhat arrogant about it, because no one ever knows so much as the right recent college graduate. It takes a long time for him to accumulate any real knowledge.

Just a short while ago, however, I was on the farm of W. L. Smith of Lexington, route 6, in Davidson County, North Carolina. Mr. Smith is a good farmer, owns 331 acres of fertile land

John Arey (left), chief of the State College Extension Dairy Office, and A. R. Morrow (right), county agent of Iredell County, are seen here knee deep in some red clover grown with potash and phosphate on the red clay land of Iredell.

along the Yadkin River, and depends for his cash income on sales of lespedeza seed, wheat, and some hay, corn, and swine. Just this past year he sold $2,400 worth of lespedeza seed and some 600 bushels of wheat. His wheat heads up well, the stalks are strong, and the grain weighs heavily. His soil is, I think, composed of that Davidson clay which is known as good land.

Top-dressed With Potash

Since this is not a technical treatise but rather an explanatory story, I have not searched to find the potash content of his soil, but Mr. Smith told me that he top-dressed his wheat with muriate of potash in addition to fertilizing it at seeding time with a mixture containing potash. Keep in mind also that he grows lespedeza in quantity and probably plows under a good bit of stubble that should do the work of releasing all that potash about which the professors instructed me years ago.

Then, later I made a visit to Alexander County where the farmers also grow wheat and other small grain. They plant some tobacco, and while the farms are small, these men are all good farmers. During the day, County Agent J. P. Leagans and I visited five or six farms seeking information about the new hydraulic rams which are being installed throughout the county, but as we rode along from farm to farm and talked over things, Mr. Leagans explained that not only did the farmers use potash in the fertilizing mixtures applied when the grain was seeded, but they also used it in side applications.

Naturally, a high potash content would be used in the tobacco fertilizer, but despite the fact that these Alexander farmers grow legumes in their rotations, they also are finding that side applications of the material pay on their soils for both corn and cotton.

The same thing is true in Iredell County. Those acquainted with North Carolina agriculture will rate Iredell farmers as among the best in the State. The other afternoon, I drove up there with John A. Arey and A. C. Kimrey of our dairy extension office to see some of the good pastures which A. R. Morrow, the county agent, is having planted all over the county. We visited some fine demonstrations. The men seeding them are using ground limestone on the land, cutting it thoroughly with a disk harrow pulled by a tractor, and are then dragging the seed bed with the smoothing harrow. They plant 12 pounds of orchard grass, 6 pounds of herds grass, 6 pounds of blue grass, and 2 pounds of white dutch clover to the

A. C. Kimrey of N. C. State College shows the difference in alfalfa growth. The left hand measures alfalfa in check plot, the right shows growth on that part of the field fertilized at the third cutting last year with potash and phosphate. No "yellows" occur in the alfalfa in the background.

acre. This is seeded with a grain drill along with 200 pounds of 16 per cent superphosphate and 100 pounds of muriate of potash. Each winter the pasture is top-dressed with manure and the same fertilizer.

There were 275 farmers out to see two pastures on the farms of H. W. Wilson and his brother-in-law, L. B. Haas. Each of these men owns about 90 acres of land and secures his principal income from selling milk and cream to a local ice cream plant. They have plenty of manure to spread about over their cultivated acres, and so they make from 1 to 2 bales of cotton an acre. But both expressed the thought that 1 acre of the pasture was worth 2 acres of any other land on the farm, and there was less work connected with the pasture. The cows are allowed to graze for 1 hour in the morning and for 1½ hours each afternoon.

Additional Pasture

Mr. Haas said the animals get all the grazing they want during that period of time and are soon lying down contentedly chewing their cuds. He grazed 18 cows from March until November on the 5 acres in his pasture, using some supplementary grazing crops as needed in the late summer. Mr. Wilson has 8 acres in his pasture, and he grazed 15 cows on this for the 2½ hours a day all of last summer. Both men are now planting additional pasture fertilized in the same way.

Mr. Morrow said that G. S. Smith, route 2, Cleveland, found his cotton yield declining to where he made only 3 bales on 6 acres of land. Last year he added 100 pounds per acre of muriate to his regular fertilizer and produced 6 bales on 5 acres. Mr. Smith is another of those good Iredell farmers who plant lespedeza and clover, but who have found that perhaps the professors were wrong.

"Where we grow lespedeza and clover in this county, we must have additional potash," Ray Morrow said.

I am not a scientist, but it seems to me that these legumes feed upon the available phosphate and potash in the soil and if the two elements are not replaced by extra applications, the plant food in the soil gets out of balance with consequent loss of production rather than gain.

Results Tell a Story

To prove this, Mr. Morrow took me over to the county home where he has a fine 7-acre field of alfalfa. The crop has been on the ground for 7 years, and last year at the third cutting, Mr. Morrow fertilized or top-dressed the field with 200 pounds of superphosphate and 200 pounds of muriate of potash per acre. In a little section just at the roadside, he used none. This section was afflicted with yellows or "summer disease" on April 29 before real summer had ever begun, and the alfalfa growing there looked as if it would be a long time in producing enough growth to cut. On the remainder of the field where the potash-phosphate treatment had been applied, the crop was about ready to cut and had a fine, vigorous, deep-green growth that would yield handsome returns in hay.

"But, Ray," I said, "why not use some boron on this. Down in the Sandhills they are using about 15 cents worth of boron per acre, and it is seemingly overcoming the yellows disease."

"We have tried it, but it doesn't work here," Morrow replied. "This soil seems to need the potash and the potash gives the desired results."

Across the road were 23 acres of the finest Red Hart wheat that I have ever seen. Seeded on it are lespedeza and some of the other clovers. These will be allowed to grow and take the land when the wheat has been cut, and then next year the field will go to corn. It was in corn last year and produced 49 weighed bushels to the acre. The wheat had followed the corn and was seeded at the rate of 1 bushel of seed per acre. Three hundred pounds per

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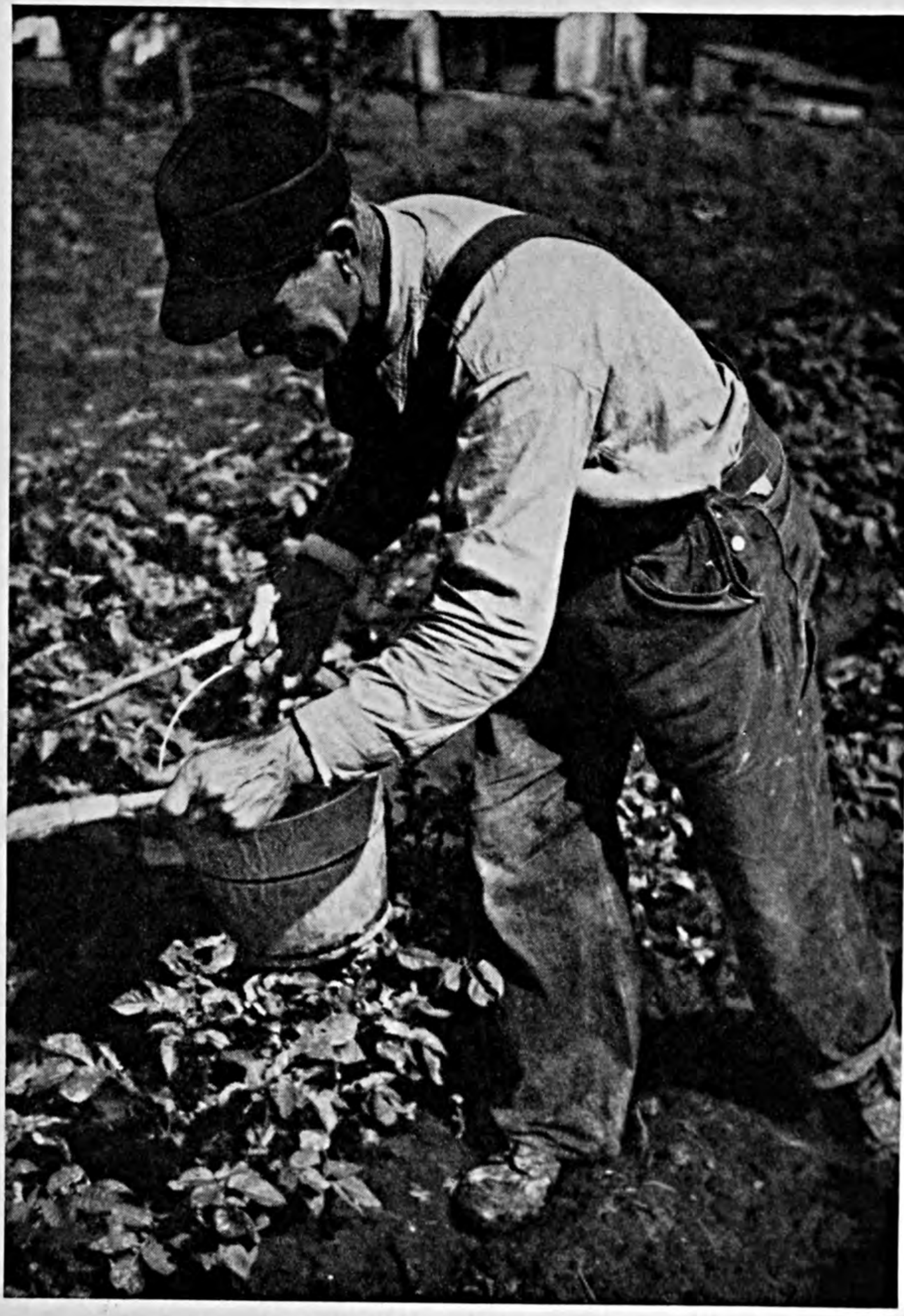
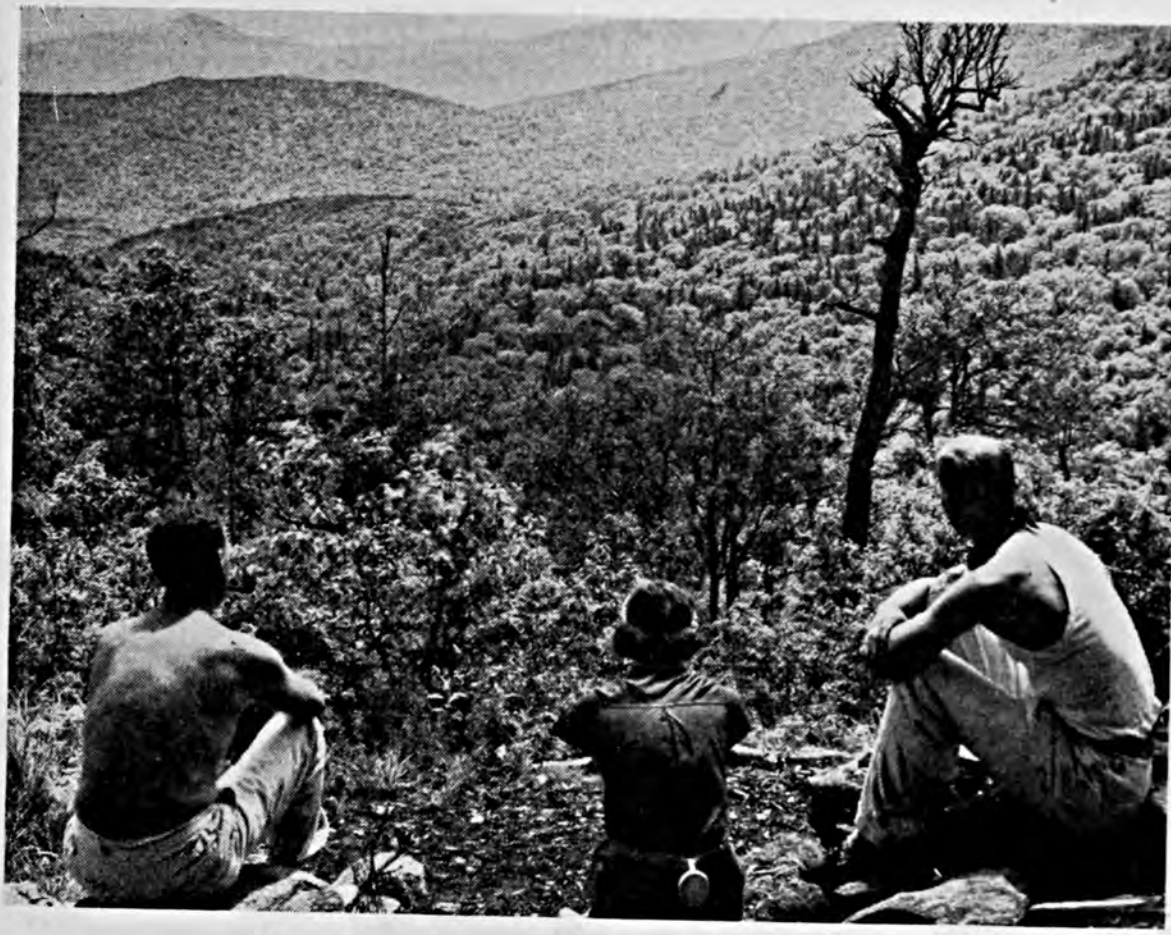
PICTORIAL



"Back" in the "good old days."

PROMISES



HOLIDAYS

Fences in
Midsummer.

The Editors Talk

For the Sake of the Cause

A great many people are wondering how we can make our national agriculture more successful than it is. All sorts of cures are proposed. Curtailing acreage, with the hope of maintaining a higher price level, helping the farmer put land into soil-building crops, payments to the farmer of various kinds, all have a place in the national program.

But in addition to all this, for ages men have done things and have met their mutual problems by assembling together to help the cause. And when that cause is a better agriculture and service on the part of public officials and industry, the assembling is well worth the trouble and the cost.

A number of important meetings either have been or will be held in June. Among them was the Annual Convention of the National Fertilizer Association at White Sulphur Springs, West Virginia, on June 6; a meeting of the fertilizer trade with the staff of the Pennsylvania State College June 14 and 15; and later this month a tour in Indiana of the Plant Food Research Committee to examine fertilizer plots. In Ottawa towards the end of the month there will be an important joint meeting of the American Association for the Advancement of Science, the Northeast Section of the American Society of Agronomy, and the Canadian Society of Technical Agriculturists. These meetings have special features in which the groups meeting together are particularly interested, but underlying all of them is the common purpose of learning how to meet the problems of our national agriculture.

At the Convention of the National Fertilizer Association, a substantial budget was approved for soil improvement work including many educational projects which will enable the fertilizer industry to better serve the farmer in supplying him with the fertilizers that give him maximum returns. As pointed out by one of the speakers, industries serving the farmer are becoming more and more service organizations and not merely selling agencies. The fact that if agricultural industries are to be successful the farmer must first conduct his farming operations in a successful manner is becoming more and more appreciated. If he does not make a success of his spraying or the use of his fertilizers or other farm activities, then the industries supplying those needs become more and more conscious that they have an important relation to that farmer in helping him solve the problem.

At State College, Pennsylvania, the agricultural staff of the college met many members of the fertilizer trade. A number of subjects of mutual interest to agricultural workers and the trade were discussed. The views of college officials on fertilizer problems in relation to producing apples and other horticultural crops and the requirement of a general farming rotation, truck crops, and other problems were fully discussed. At State College is located the oldest continuous fertilizer experiments in the United States. This test has been running more than 50 years.

On a very interesting tour of the experiment station these plots, as well as experimental work on vegetable crops, golf lawns and fairway grasses, fertilizer experiments on orchards, potatoes, pastures, and other crops were inspected by the visitors.

Such meetings and tours are among the best means possible for bringing before members of the industry the fertilizer problems of the farmer and how the State is trying to solve them. Nothing but good can come out of such a mutual attack on our everyday problems of crop production. States holding such meetings and giving the time to industries serving the farmer are to be congratulated on their enterprize and efforts in this direction.

The Plant Food Research Committee represents the entire fertilizer industry. The function of the Committee is to study fertilizer problems. Because of unusual interest in many States in fertilizer placement in the soil, heavy applications of fertilizers have been made broadcast on a number of soil types. The purpose of the June tour in Indiana is to study the effect of such applications on crop production and on the amounts of available plant nutrients in the soil.

The Joint Meeting in Ottawa of the American Association for the Advancement of Science and affiliated groups with the Canadian Society of Technical Agriculturists and other Canadian organizations adds an international aspect to the conferences held in June. Members of these important national and international societies will thus have an excellent opportunity to confer personally with agricultural workers across the line. Many of the problems in connection with the production of potatoes, pastures, fruit, tobacco, and other crops are interrelated and common to both countries. No doubt, as a result of this meeting, there will be a better understanding of such problems and the work that is being done to solve them.

As long as men interested in agriculture get out individually and in groups to do something themselves about a more successful agriculture, there is every reason to believe that in the long run our national agriculture will remain a virile and successful enterprise.

Their Work Will Live

Coming as a shock to their wide circles of friends and acquaintances, the deaths of two of America's outstanding agriculturists occurred the latter part of May. Dr. George F. Warren, professor of agricultural economics and farm management at Cornell University, passed away on May 24, while May 31 marks the passing of Herbert W. Mumford, dean of the college of agriculture at the University of Illinois.

Both were farm-reared in an era which frowned upon any scientific approach to farm problems. Both early recognized the power of the mind and the value of research work and cooperative action. Years of preparation equipped them for consideration as authorities in their respective fields.

For those not more particularly informed, press eulogies have outlined the contributions of these men to the betterment of our national agriculture. Sincere in interest and effort, over a long span of years, they won respect not only for their common-sense attack on current problems but for their foresightedness on the agricultural future of this and other countries. As our destinies are determined, there will be many references to their teachings. The names of George F. Warren and Herbert W. Mumford will live on.

This section contains a short review of some of the most practical and important bulletins, and lists all recent publications of the United States Department of Agriculture and the State Experiment Stations relating to Fertilizers, Soils, Crops, and Economics. A file of this department of BETTER CROPS WITH PLANT FOOD would provide a complete index covering all publications from these sources on the particular subjects named.

Fertilizers

¶ Although the various parasitic diseases doubtless take the heaviest toll from the annual production of cabbage and other plants of the Cruciferae family, soil-mineral deficiencies are among the chief nonparasitic maladies which result in considerable damage in production. Much valuable information concerning the control of cabbage diseases influenced by the soil and climate as well as the common parasites is contained in U. S. Department of Agriculture Farmers' Bulletin 1439, entitled "Diseases of Cabbage and Related Plants," by J. C. Walker. This publication is a revision of and supersedes Farmers' Bulletins 925 and 1351.

Cabbage is a heavy user of potash, and when the soil supply of this nutrient falls below a certain level, disease symptoms appear. Characteristic symptoms of this condition are revealed by the yellowing of the foliage between the veins and particularly around the outer leaf margins. At this point the tissue ultimately disintegrates, and saprophytic fungi develop. Plants so afflicted produce heads that remain soft indefinitely, thus resulting in an unmarketable crop. To safeguard against this condition, the author recommends that the soil be tested before planting. There should be from 250 to 400 pounds of available potash per acre for a normal crop of cabbage.

A low level of available magnesium in many of the soils in the eastern United States results in characteristic disease symptoms on cruciferous crops. Yellowish areas later becoming light-colored desiccated spots between leaf veins indicate lack of sufficient magnesium. This deficiency can ordinarily be corrected by using fertilizers made slightly basic with dolomitic limestone and containing soluble magnesium salts.

Internal spot of rutabaga, turnip, and cauliflower is a common trouble due to boron deficiency in the soil. This nutritional disorder can usually be prevented by applying about 20 pounds of borax to the acre.

The parasitic diseases are preventable in the main by simple means of plant sanitation and planting resistant varieties, the author emphasizes. Rotation of crops should be practiced and crops belonging to the cabbage family, such as cauliflower, turnip, brussels sprouts, and kale should be avoided in the rotation. Drainage water, refuse from diseased cabbage fields, and stable manure with which diseased material has been mingled will carry infection. The greatest pains should be taken to insure healthy plants grown in the seedbed. Specific precautionary measures and ways of controlling clubroot, root knot, blackleg, and other common diseases too numerous to list are thoroughly explained in this bulletin.

"Fertilizer Experiments with Cotton — 1937," Agr. Exp. Sta., Fayetteville, Ark.

"Phosphate Investigations on Irrigated Crops, 1937," Agr. Exp. Sta., Bozeman, Mont., Bul. 356, Mar. 1938, Jesse R. Green.

"Report on Sugar Beet Field Demonstrations in Wisconsin—1937," Agr. Exp. Sta., Madison, Wis., Mar. 1938, A. O. Collantine, O. S. Aamodt, and C. J. Chapman.

Soils

¶ Several noteworthy bulletins giving the latest and most complete instructions on terracing have been issued by State and Federal authorities in recent months. A list of these has appeared under this department from time to time, and to this are added two new publications that should be of much value to farmers, county agents, and vocational agriculture teachers who seek practical information on terracing to conserve soil and water on sloping terrains.

The North Carolina Agricultural Extension service has just released Circular 222, "Terracing to Reduce Erosion," by David S. Weaver and H. M. Ellis. The authors devote considerable attention to the essential points of proper spacing, grade, cross section, and maintenance of the broad-base, drainage type terraces. This type of terrace has been found by experience to be most suitable in North Carolina and other States. Terracing is only one phase of a well-rounded soil conservation practice, and alone will not solve the problem of soil erosion. But terracing on slopes and on soil types where it is practical forms a basis upon which a more complete soil conservation program may be developed.

¶ Covering a somewhat wider field but including the essential principles of improved terrace construction is C. L. Hamilton's U. S. Department of Agriculture Farmers' Bulletin 1789 on "Terracing for Soil and Water Conservation." In this interesting bulletin the author traces the use of field terraces in this country from colonial days to the present time. He explains why early efforts at terracing generally failed and describes new developments now incorporated in terrace construction, widely used in all parts of the country. Stressing the need for careful planning and a thorough understanding of the needs and adaptabilities of fields to be terraced, the author states that "unless properly constructed and coordinated with other practices, terraces often accelerate rather than retard soil loss."

These bulletins are a compilation of the best information obtainable on terrace construction and should afford a better understanding of its role in a complete soil conservation program. Each is written in very readable style, and is freely illustrated.

"The Reclamation of Alkali Soils," Agr. Exp. Sta., Berkeley, Calif., Bul. 617, Dec. 1937, W. P. Kelley.

"Soils of Fergus County, Montana," Agr. Exp. Sta., Bozeman, Mont., Bul. 355, Feb. 1938, L. F. Gieseker.

"Implements and Methods of Tillage to Control Soil Blowing on the Northern Great Plains," U. S. D. A., Washington, D. C., Farmers Bul. 1797, Jan. 1938, John S. Cole and George W. Morgan.

"Spreading Water for Storage Underground," U. S. D. A., Washington, D. C., Tech. Bul. 578, Dec. 1937, A. T. Mitchelson and Dean C. Muckel.

"The Chemical Composition of Soils and Colloids of the Norfolk and Related Soil Series," U. S. D. A., Washington, D. C., Tech. Bul. 594, Jan. 1938, R. S. Holmes, W. E. Hearn, and H. G. Byers.

Crops

¶ John S. Gardner in Kentucky Agricultural Extension Circular 308, "Sweet Potato Growing," gives the major points involved in producing Kentucky's fifth value-ranking crop. This comprehensive publication explains pertinent facts relating to the different varieties and their characteristics, plant or "slip" production, seed treatment, handling the plant beds, preparing the soil, fertilization, cultivation, and harvesting the crop. The latter section of the circular gives specific instruction for controlling diseases and pests, and also ways and means for curing and storing.

The light sandy loams, commonly known as the "freestone" soils, are best adapted to sweet potatoes, since they offer least resistance to the formation of shapely tubers. A soil that produces about 25 bushels of corn should be ideal. A 2-8-8 or 2-10-8 fertilizer is recommended for sweet potatoes. The suggested rate of application is 500 pounds per acre, although good results may be expected when 300 pounds are used. The soil and fertilizer should contain only moderate amounts of nitrogen, since an excess of nitrogen and humus produces long, twisted "strings" instead of the short, plump tubers the market demands.

The Nancy Hall variety, according to the author, is most widely grown in the State. Its golden flesh and bright skin color have made it a favorite in the markets in which Kentucky sweet potatoes move. Its top growth is not too luxuriant and the tubers are of acceptable size and uniformity when properly fertilized and certified seed is planted. The Puerto Rico strains, Big-Stem Jersey, and Red and White Bermuda, are likewise popular varieties.

"The Home Garden," Agr. Ext. Serv., Auburn, Ala., Cir. 134, June 1932 (Rev. 1938), W. A. Ruffin.

"The Alabama Home Orchard," Agr. Ext. Serv., Auburn, Ala., Cir. 138, June 1933 (Rev. 1938), W. A. Ruffin.

"Forage Crops for Hogs," Agr. Ext. Serv., Auburn, Ala., Cir. 158, June 1937, J. C. Lowery and F. W. Burns.

"Cotton Improvement in Alabama," Agr. Ext. Serv., Auburn, Ala., Cir. 159, June 1937, J. C. Lowery.

"Kudzu," Agr. Ext. Serv., Auburn, Ala., Cir. 161, Feb. 1938, J. C. Lowery.

"Arizona's Changing Agriculture—Forty-eighth Annual Report for the Year Ending June 30, 1937," Agr. Exp. Sta., Tucson, Ariz.

"Apricot Growing in California," Agr. Ext. Serv., Berkeley, Calif., Cir. 51, Dec. 1930 (Rev. Dec. 1937), A. H. Hendrickson.

"Ladino Clover," Agr. Ext. Serv., Berkeley, Calif., Cir. 81, Dec. 1933 (Rev. Dec. 1937), B. A. Madson and J. Earl Coke.

"Asparagus," Agr. Ext. Serv., Storrs, Conn., Bul. 260, Jan. 1938, Albert E. Wilkinson.

"Annual Report for the Fiscal Year Ending June 30, 1937," Agr. Exp. Sta., Gainesville, Fla.

"4-H Garden Club Manual," Agr. Ext. Serv., Lafayette, Ind., Ext. Bul. 227, May 1938, W. B. Ward and W. R. Amick.

"Report on Agricultural Research for the Year Ending June 30, 1937. Part I, Project Reports, Publications, Staff, and Financial Statement," Agr. Exp. Sta., Ames, Iowa, R. E. Buchanan, Director.

"Lawn Building, Maintenance, and Renovation," Agr. Ext. Serv., Ames, Iowa, Cir. 242, Sept. 1937, J. B. Wingert.

"The Vegetable Garden," Agr. Ext. Serv., Ames, Iowa, Ext. Cir. 245, Dec. 1937, E. S. Haber.

"The Vegetable Garden," Agr. Ext. Serv., Lexington, Ky., Cir. 309, Feb. 1938, John S. Gardner.

"Grapes for the Home," Agr. Ext. Serv., Lexington, Ky., Cir. 209 (Rev.), Feb. 1938, A. J. Olney.

"Potato Growing," Agr. Ext. Serv., Lexington, Ky., Cir. 307, Jan. 1938, John S. Gardner.

"Cold Resistance Studies with Satsuma Orange Trees," Agr. Exp. Sta., University, La., Bul. 295, Jan. 1938, W. D. Kimbrough.

"Louisiana Program for Strawberry Production," Agr. Ext. Serv., University, La., Ext. Cir. 152, 1933 (Rev. June 1937), George L. Tiebout and J. G. Richard.

"Fattening Steers of Different Ages on Pasture, with and without Grain, and Influence of Method on Quality of Meat," Agr. Exp. Sta., University, La., Bul. 296, Apr. 1938, Chas. I. Bray.

"Sweet Potato Culture, Storing and Curing in Louisiana," Agr. Ext. Serv., University, La., Hort. Hints, Vol. 1, No. 2, 1933 (Rev. June 1937), G. L. Tiebout and J. G. Richard.

"Bush Beans as a Truck Crop for South Louisiana," Agr. Ext. Serv., University, La., Hort. Hints, Vol. 1, No. 4, 1933 (Rev. June 1937), George L. Tiebout and J. G. Richard.

"Cucumbers as a Truck Crop for South Louisiana," Agr. Ext. Serv., University, La., Hort. Hints, Vol. 1, No. 5, 1933 (Rev. June 1937), George L. Tiebout and J. G. Richard.

"Bell Peppers as a Truck Crop for South Louisiana," Agr. Ext. Serv., University, La., Hort. Hints, Vol. 1, No. 6, 1933 (Rev. June 1937), George L. Tiebout and J. G. Richard.

"Shallots as a Crop for South Louisiana," Agr. Ext. Serv., University, La., Hort. Hints, Vol. 1, No. 7, 1933 (Rev. June 1937), George L. Tiebout and J. G. Richard.

"Root Crops as Truck Crops for Louisiana," Agr. Ext. Serv., University, La., Hort. Hints, Vol. 1, No. 8, 1936 (Rev. June 1937), George L. Tiebout and J. G. Richard.

"The Small Vegetable Garden," Agr. Ext. Serv., College Park, Md., Bul. 70 (Rev.), Dec. 1937, W. R. Ballard.

"The Massachusetts Commercial Vegetable Grower," Agr. Ext. Serv., Amherst, Mass., May 1938.

"Tomato Varieties," Agr. Exp. Sta., East Lansing, Mich., Sp. Bul. 290, Apr. 1938, Gordon Morrison.

"The First Twenty-five Years of the Northeast Experiment Station," Agr. Exp. Sta., Duluth, Minn., Apr. 1938, M. J. Thompson.

"Leader's Guide—Farm Forestry. II—Forest Seeding and Planting," Agr. Ext. Serv., Columbia, Mo., Dec. 1937.

"Farm Forestry. II—Forest Seeding and Planting," Agr. Ext. Serv., Columbia, Mo., 4-H Cir. 52, Dec. 1937, Ralph H. Peck and T. T. Martin.

"Oats and Barley on New York Farms," Agr. Ext. Serv., Cornell Univ., Ithaca, N. Y., Bul. 376, Sept. 1937, F. P. Bussell.

"Why and How to Treat Cotton Seed," Agr. Ext. Serv., Raleigh, N. C., Ext. Folder 39, Apr. 1938, Luther Shaw.

"Use of Organic Acid in Rooting Cuttings," Agr. Ext. Serv., Raleigh, N. C., Ext. Cir. 221, Apr. 1938, J. G. Weaver.

"The Culture of Flue-cured Tobacco in North Carolina," St. Dept. of Agr., Raleigh, N. C., Bul., Jan. 1938, W. Kerr Scott, Comm.

"Limited-grain Feeding and All-year Pasture for Dairy Cows," Agr. Exp. Sta., Knoxville, Tenn., Bul. 163, Jan. 1938, C. E. Wylie and L. R. Neel.

"Abstracts of Bulletins 539-557, Circulars 79-80, and Other Publications During 1937," Agr. Exp. Sta., College Station, Brazos County, Texas, Cir. 81, Apr. 1938, A. D. Jackson.

"Forty-seventh Annual Report for the Fiscal Year Ended June 30, 1937," Agr. Exp. Sta., Pullman, Wash., Bul. 354, Dec. 1937.

"The Washington and Tahoma Red Raspberries," Agr. Exp. Sta., Pullman, Wash., Pop. Bul. 153, Mar. 1938, C. D. Schwartze.

"Growing Fruit for Home Use," U. S. D. A., Washington, D. C., Farmers' Bul. 1001, Rev. Feb. 1938, H. P. Gould.

"Muscadine Grapes," U. S. D. A., Washington, D. C., Farmers' Bul. 1785, Jan. 1938, Charles Dearing.

"Farm Production of Sorgo Sirup," U. S. D. A., Washington, D. C., Farmers' Bul. 1791, Mar. 1938, C. F. Walton, Jr., E. K. Ventre, and S. Byall.

"Relation of Growth to the Varying Carbohydrate Content in Mountain Brome," U. S. D. A., Washington, D. C., Tech. Bul. 598, Jan. 1938, Edward C. McCarty.

"Rubber Content and Habits of a Second Desert Milkweed (Asclepias Erosa) of Southern California and Arizona," U. S. D. A., Washington, D. C., Tech. Bul. 604, Feb. 1938, R. E. Beckett, R. S. Stitt, and E. N. Duncan.

"When to Cut Rice," U. S. D. A., Washington, D. C., Leaflet 148, Dec. 1937, W. D. Smith and Jenkin W. Jones.

"Production of Parsnips," U. S. D. A., Washington, D. C., Leaflet 154, Feb. 1938, J. H. Beattie and W. R. Beattie.

"Production of Salsify or Vegetable-Oyster," U. S. D. A., Washington, D. C., Leaflet 135, Feb. 1938, W. R. Beattie.

Economics

¶ According to Charles S. Chathcart, State Chemist at New Brunswick, New Jersey, in his report "Analyses of Commercial Fertilizers and Ground Bone; Analyses of Agricultural Lime, 1937," Bulletin 640, the average composition of fertilizers sold in New Jersey was 4.39% nitrogen, 9.56% available phosphoric acid, and 7.63% potash. In 1928 the average analysis was 3.27% nitrogen, 8.78% available phosphoric acid, and 6.36% potash, with a total plant-food content of 18.41% as compared to the total plant-food content of 21.58% in 1937. Although the farmer is getting more plant food per ton, he is paying considerably less for his fertilizers. In 1928 for approximately 18½ units of plant food he paid $37.03, whereas in 1937 he paid only $29.44 for 21½ units.

Fertilizer sales in the State have shown considerable increase since 1927, when 141,635 tons were sold, as compared to the total sales of 183,952 tons in 1937. Figures for total tonnages of mixed fertilizers and fertilizer materials are secured from two reports from manufacturers which are required each year. One is rendered in April and the other in November. Unfortunately, however, the tonnages of the individual brands are not given. Thus, the average analysis must be computed from the State Chemist's samples. In 1937, 163,093 tons of mixed fertilizers were sold, and based on the average analysis as reported in the Bulletin, this would represent 7,160 tons of nitrogen, 15,592 tons of P_2O_5, 12,444 tons of K_2O, or a total of 35,196 tons of plant food.

¶ In Bulletin 393, "Registration, Labeling and Inspection of Commercial Fertilizers; 1937" published by the College of Agriculture of the University of Missouri, is shown a comprehensive summary of the various fertilizer mixtures and materials sold in the State in 1937. The leading analysis from the tonnage standpoint was 2-12-2, which was followed by 0-20-0, 0-16-0, 2-12-6, and 4-12-4. Missouri is still one of the newer States from the fertilizer standpoint, with 1937 sales of only 61,357 tons of fertilizers, containing approximately 1,015 tons of nitrogen, 8,567 tons of available phosphoric acid, and 1,338 tons of potash. The Experiment Station has recommended a list of high-grade analyses which they feel should give the best results under most conditions, and carry plant food in a most economic form. Although sales of these recommended brands are increasing, a large quantity of fertilizers which contain less than 20 units of plant food is still sold. In 1937, 8,287 tons were high-grade mixed fertilizer, 28,254 tons were medium-grade, and only 7 tons were so-called low-grade mixtures.

"Illinois Farm Economics," Agr. Ext. Serv., Urbana, Ill., Nos. 34 and 35, Mar. and Apr. 1938.

"Indiana Crops and Live Stock," Agr. Exp. Sta., West Lafayette, Ind., No. 147, Dec. 1937, No. 148, Jan. 1938, No. 150, Mar. 1, 1938, No. 151, Apr. 1, 1938, and No. 152, May 1, 1938.

"Crop Report for Michigan, May 1938," St. Dept. of Agr., Lansing, Mich., Verne H. Church, Grant D. Clark, and Manfred L. Lowe.

"Farm Planning," Agr. Ext. Serv. Univ. Farm, St. Paul, Minn., Pamphlets No. 43, 44, 45, 46, 47, 48, 49, and 50, Jan. 1938, S. B. Cleland and W. A. Peters.

"The Dairy Farmer's Response to Changes in Natural and Economic Conditions," Agr. Ext. Serv., Univ. Farm, St. Paul, Minn., No. 185, May 20, 1938, G. A. Pond and W. P. Ranney.

"Effects of Better Selection of Crops and Pastures on Farm Income in Missouri," Agr. Exp. Sta., Columbia, Mo., Res. Bul. 282, Apr. 1938, George W. Collier and O. R. Johnson.

"Analyses of Commercial Fertilizers, Fertilizer Supplies, and Home Mixtures for 1937," Agr. Exp. Sta., New Brunswick, N. J., Bul. 637, Nov. 1937, Charles S. Cathcart.

"A Picture of the Asparagus Industry for New Jersey Farmers," Agr. Exp. Sta., New Brunswick, N. J., Bul. 641, Feb. 1938, K. R. Slamp and L. A. Bevan.

"Report of Analyses of Commercial Fertilizers Sold in New York State, July 1, 1936 to June 30, 1937," Dept. of Agr. and Mkts., Albany, N. Y., Bul. 315, Mar. 1938.

"Current Farm Economics," Agr. Exp. Sta., Stillwater, Okla., Series 49, Vol. 11, No. 2, Apr. 1938.

"Inspection of Feeds and Fertilizers," Agr. Exp. Sta., Kingston, R. I., An. Feed and Fert. Cir., Contb. 513, Nov. 1937, W. L. Adams, T. Wright, Jr., and Louis Linton.

"Department of Agriculture—Immigration of Virginia," Richmond, Va., Rept. of the Comm., 1936-1937.

"Historical and Geographic Aspects of Wheat Yields in Washington," Agr. Exp. Sta., Pullman, Wash., Bul. 355, Dec. 1937, Ben H. Pubols and Carl P. Heisig.

"Fertilizers Licensed for Sale in Wisconsin," Wis. Dept. of Agr., Feb. 1, 1938.

"A Graphic Summary of Farm Crops," U. S. D. A., Washington, D. C., Misc. Pub. 267, Mar. 1938, O. E. Baker and A. B. Genung.

"Balanced Farming—1938," U. S. D. A., Washington, D. C., Reg. Inf. Series, ECR 202, Delaware, Kentucky, Maryland, North Carolina, Virginia, and West Virginia.

"Summary of the 1938 A. A. A. Farm Program, Northeast Region," U. S. D. A., Washington, D. C., Reg. Inf. Series, NER 213, Rev. Apr. 8, 1938.

"The 1938 Farm Program for Nebraska and South Dakota," U. S. D. A., Washington, D. C., Reg. Inf. Series, NCR 202.

"How the A. A. A. Farm Program will Operate in 1938," U. S. D. A., Washington, D. C., Reg. Inf. Series, SR 201, Mar. 1938 and SR 202, Apr. 1938.

"Improvement and Conservation of Oklahoma and Texas Range Lands," U. S. D. A., Washington, D. C., Reg. Inf. Series, SR 251, Apr. 1938.

"Information on Proposed Potato Marketing Agreement Program for the State of La. and Certain Designated Counties in the States of Ala., Ark., Calif., Fla., Ga., Md., Miss., N. C., Okla., S. C., Texas, and Va.," U. S. D. A., Washington, D. C.

"Marketing Agreement Regulating the Shipment in Interstate and Foreign Commerce, and Such Shipment as Directly Burdens, Obstructs, or Affects Interstate or Foreign Commerce of Cantaloupes, Honeyball and Honeydew Melons Grown in Imperial County, Calif. and Yuma County, Ariz.," U. S. D. A., Washington, D. C., Agreement No. 75, May 17, 1938.

"Order of the Secy. of Agr. Issued Pursuant to Public Act No. 10, 73rd Congress, as Amended and as Reenacted and Amended by the Agr. Marketing Agreement Act of 1937, Regulating Such Handling of Milk in the Cincinnati, Ohio, Marketing Area as Is in Interstate Commerce, and as Directly Burdens, Obstructs or Affects Interstate Commerce," U. S. D. A., Washington, D. C., Order 22, Apr. 27, 1938.

"Order of the Secy. of Agr., Issued Pursuant to Public Act No. 10, 73rd Congress, as Amended and as Reenacted and Amended by the Agr. Marketing Agreement Act of 1937, Regulating the Handling in Interstate Commerce, and Such Handling as Directly Burdens, Obstructs, or Affects Interstate Commerce, of Irish Potatoes Grown in the State of La.; and in the Counties of Atascosa, Bexar, Colorado, Fort Bend, Harris, Liberty, Medina, Wharton and Wilson in the State of Texas; the Counties of Warren, Hinds, Rankin, Scott, Newton and Lauderdale, and all Counties South Thereof, in the State of Miss.; the Counties of Baldwin, Escambia and Mobile in the State of Ala.; and the Counties of Escambia and Santa Rosa in the State of Fla.," U. S. D. A., Washington, D. C., Order 23, May 9, 1938.

"Order of the Secy. of Agr. Issued Pursuant to Public No. 10, 73 Congress, as Amended, and as Reenacted and Amended by the Agr. Marketing Agreement Act of 1937, Approved June 3, 1937 (Public No. 137, 75th Congress), Regulating the Handling in Interstate and Foreign Commerce and Such Handling as

Directly Burdens, Obstructs, or Affects Interstate or Foreign Commerce of Cantaloupes, Honeyball and Honeydew Melons Grown in Imperial County, Calif., and Yuma County, Ariz., U. S. D. A., Washington, D. C., Order 24, May 17, 1938.

"Recent Changes in the Florida Citrus Industry," U. S. D. A., Washington, D. C., GCM-5, 1938.

"Quality of Cotton Ginned in the Irrigated Southwest, Crops of 1928-36," U. S. D. A., Washington, D. C., W. B. Lanham, F. H. Harper, and G. E. Miller.

"Revised Production Estimates of Fruit and Nut Crops," U. S. D. A., Washington, D. C., Mar. 1938.

"Marketing Agreements for Fruits and Vegetables," U. S. D. A., AAA, Washington, D. C., GCM-3, 1938.

"United States Agricultural Trade with Canada 1937," U. S. D. A., Washington, D. C., F. S.-74, Mar. 1938.

"Revised Production of Apples, Peaches, Pears, Grapes, and Cherries, 1919-1935," U. S. D. A., Washington, D. C., June 28, 1937.

"Revised Production of Almonds, Filberts, Pecans, and Walnuts (English), 1919-1936," U. S. D. A., Washington, D. C., July 20, 1937.

"Grade, Staple Length, and Tenderability of Cotton in the United States 1928-29 to 1936-37," U. S. D. A., Washington, D. C., July 1937, W. B. Lanham.

"Soil and Water Conservation and Plant-Soil Relationships in the Southwest," U. S. D. A., Washington, D. C., Reg. Bul. 20, Soil Series No. 1, Nov. 11, 1937, Evan L. Flory.

"Printed Publications Issued by the Bureau of Agricultural Economics," U. S. D. A., Washington, D. C., Feb. 1938.

"The 1938 Range Conservation Program—Western Region," U. S. D. A., AAA, Washington, D. C., Reg. Inf. Ser., WR Leaf. 202, 1938.

"Determination of Fair and Reasonable Prices for the 1938 Crop of Puerto Rican Sugarcane Pursuant to the Sugar Act of 1937," U. S. D. A., AAA, Washington, D. C., S. D. No. 18, Mar. 9, 1938, H. A. Wallace.

"Corn Loans, Acreage Allotments and Marketing Quotas," U. S. D. A., AAA, Washington, D. C., 38-Corn-1, Mar. 1938.

"The 1938 Farm Program for Indiana, Illinois, Iowa, Missouri, Michigan, Minnesota, Ohio, and Wisconsin," U. S. D. A., AAA, Washington, D. C., Reg. Inf. Ser., NCR Leaf. 201.

"Balanced Farming for Tennessee—1938," U. S. D. A., AAA, Washington, D. C., Ref. Inf. Ser., ECR 202—Tenn.

Plenty of Citrus Fruits Assured for a Few Years

PLENTY of citrus fruit juice is in store for consumers during the next few years.

The large number of young trees just coming into bearing assure an abundant supply of oranges, lemons, and grapefruit.

In its annual Outlook Report, the Bureau of Agricultural Economics points out, for example, that a big portion of the orange-tree population is still very young. Of the 34,600,000 orange trees of bearing age (5 years old and over) estimated in the groves of California, Florida, Texas, and Arizona in 1937, 45 percent had not reached full production and 26 percent were in the relatively young group of 5 to 10 years of age. With almost one-half of the bearing trees to come into full bearing, average production during the next 5 years is expected to be larger than that of the past 5 years.

Only about one-third of the grapefruit-bearing trees had reached the age of full production in 1937. And only about two-thirds of the bearing acreage of lemons in California had reached full producing capacity.

The Bureau points out that the production of citrus fruits has shown a big increase in recent years. From 1919 to 1936 orange production increased about 80 percent; the production of apples, on the other hand, declined about 12 percent during this period.

Southern Vegetable Crops

WITH improved transportation facilities and changing food habits, the production of vegetable crops in the South for local markets and shipment to the North has enjoyed a truly remarkable growth. This has created a very healthy situation; healthy to the Northern consumers who are now able to get fresh vegetables during the winter months and healthy to Southern agriculture in promoting greater diversification.

Owing to its comparatively rapid growth there has been comparatively little collected information on this important branch of agricultural industry in the South. Those interested therefore will welcome the recently published book, "Southern Vegetable Crops," by George Whitaker Ware of the University of Arkansas (American Book Company, Cincinnati, $4.00). The author, who is in charge of the Fruit and Truck Branch Experiment Station of the University of Arkansas, is well qualified to write on the subject, and in order to bring in even wider experience he solicited a number of eminent authorities in all parts of the country for chapters on their specialties. In addition to sections written by the author himself, other chapters have been written by J. E. Knott, New York; J. B. Edmond, South Carolina; H. A. Jones, California; P. Work, New York; E. M. Emmert, Kentucky; H. C. Thompson, New York; J. G. Woodroof, Georgia; L. R. Hawthorn, Texas; J. J. Taubenhaus, Texas; S. W. Bilsing, Texas; W. D. Kimbrough, Louisiana; W. A. Sherman, U. S. Dept. of Agriculture; R. A. McGinty, South Carolina; B. D. Drain, Tennessee; J. C. Miller, Louisiana; F. S. Jamison, Florida; R. Schmidt, North Carolina; H. H. Zimmerley, Virginia; H. P. Stuckey, Georgia; G. O. Randall, North Carolina; E. H. Rawl, South Carolina; H. L. Cochran, Georgia; E. F. Burk, Oklahoma; Otis Woodard, Georgia; L. C. Corbett, U. S. Dept. of Agriculture; and C. Woolsey, Arkansas.

The first part of the book is devoted to giving the general principles which are necessary or desirable to know in efficiently producing vegetable crops. Chapters are devoted to the general statistical background of the vegetable industry; the botanical classification of vegetables; the botany and physiology of plant growth and development; the principles of vegetable feeding and improvement; seed growing; the management and fertilization of soils; growing, hardening, and transplanting of plants; planting, cultivating, rotating, irrigating, and forcing of the field; the control of diseases and insects; and vegetable storage and marketing.

Covers Wide Range

The second part contains chapters devoted to the growing of the individual crops. The material in this section is very concise, complete, and practical. The systematic arrangement of the subject matter in the various chapters is greatly to be commended and enables one quickly and easily to locate the information, thereby increasing the value of the book as a text and reference. In practically all cases the chapters on individual crops are divided into the following sub-heads; Classification, origin, and history; scope and importance; average production cost; climatic requirements; varieties; seed; soil preferences; preparing the soil for planting; fertilizing; liming; manuring; cultivating; controlling diseases and insects; harvesting, processing, and marketing. In addition, special sections, as may be necessary owing to the peculiarities of individual plants, also are given.

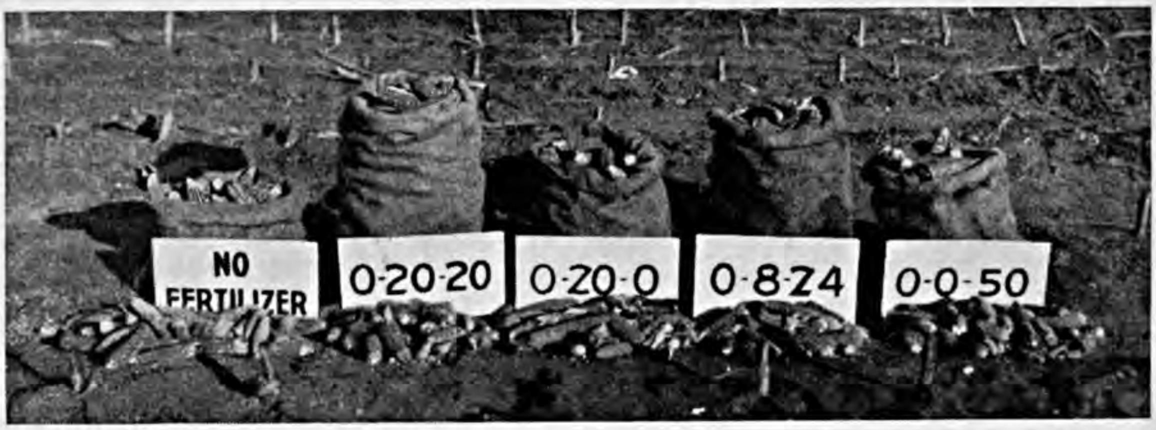
There is a chapter on the home vegetable garden giving practical information on locating, laying out, and planting gardens. Helpful and often elusive information is given in the appendix, which includes the location of the various State Agricultural Experiment Stations, the vitamin contents of individual vegetables, the chemical composition of vegetables, rainfall and frost data for various locations in the Southern States, approximate weights of common vegetable marketing units, and a glossary of technical, chemical, and scientific terms that are likely to be met in literature dealing with vegetable crops and their production.

Potash is Needed in Southern Illinois

(*From page* 11)

the 100 pounds 0-0-50 supplied 50 pounds of actual potash (K_2O) per acre, while the 0-8-24 plot had only 36 pounds of actual potash plant food per acre. It is possible that a 200-pound application of 0-8-24, which would supply nearly as much actual potash (K_2O) as 100 pounds muriate of potash (0-0-50), would have produced a still higher maximum yield. The 0-20-0 alone seemed to give a slight increase in yield both on the Murray field and also at Poorland Farm.

In another section of the Murray field, which had been manured at about 6 tons per acre, some broadcast applications of muriate of potash were made before planting at rates of 85, 275, and 475 pounds per acre. The manured area was yielding about 42.3 bushels per acre, while the unmanured and unfertilized adjacent rows produced but 12.3 bushels of corn. The additional broadcast application of potash increased the yields, but not profitably. No doubt row applications of potash would have been



On the H. J. Heinzman farm, Sandoval, Illinois, a combination of phosphate and potash, as 0-20-20, gave the most profitable yields. No fertilizer—15.3 bu., 76.4% marketable; 125 lb. 0-20-20—27.7 bu., 92.3% marketable.

profitable, and 100 pounds 3-14-6 in addition to manure gave an average increase of about 7.6 bushels of corn per acre.

Where manure is available in large quantities, a farmer may maintain the potash supplies in the soil. It is not possible on most farms in this section to produce sufficient manure from the crops grown to supply 6 to 8 loads per acre for each corn crop. Apparently we shall have to depend on some supplementary applications of commercial fertilizers, especially to supply the potash. Phosphate must be added in some form. In general we have found the addition of raw rock phosphate has been cheaper than superphosphate.

On the J. H. Heinzman farm, where sweet clover was plowed under for corn, the 0-20-20 gave the best returns with a yield of 27.65 bushels. The other yields were as follows: 0-8-24, 24.39 bushels; 0-0-50, 20.26 bushels; 0-20-0, 20.00 bushels; and the unfertilized areas averaged only 14.9 bushels per acre. This field had been limed but has had no rock phosphate. The maximum yields are relatively low due to drouth and chinchbug damage. The important thing to note is that a combination of phosphate and potash in the 0-20-20 gave the maximum production. Phosphate or potash alone each gave an increase of about 5 bushels per acre, but the combination of the two essential plant foods produced over 12 bushels more corn per acre. The 0-20-20 and 0-8-24 plots also produced above 91 per cent marketable corn, while the average of the unfertilized plots showed about 70 per cent marketable corn.

In this field the potash starvation symptoms appeared on the 0-20-0 and unfertilized plots about the middle of the season, but were not as severe as on the Murray field or Poorland Farm.

A test was conducted on the farm of Roy Malan, where former crops had indicated a need for potash. Due to variations of soil conditions within the field, the results of our fertilizer comparisons are not very conclusive. However, it was evident that in one part of the field, where average yields were above 50 bushels, there was little or no definite response to the fertilizer. On one of the less fertile areas of the field, yield estimates on the differently fertilized plots were as follows:

No fertilizer	30.69 bu.
130# 0- 8-24	48.23 "
125# 0-20-20	45.48 "
130# 0-20- 0	36.24 "

Very few symptoms of potash hunger appeared on the corn of the Malan field even on the unfertilized rows in the less fertile areas of the field.

The results of the demonstrations conducted the past season and observations in Marion County for the past 10 years indicate that the growing of legumes for organic matter and nitrogen is the important factor in getting soils into a high state of productivity. It was on those soils where organic matter had been added by sweet clover that the largest responses from the high-potash fertilizers and the greatest maximum yields were obtained.

To grow legumes successfully, the acid soils should be limed at a rate large enough to give a nearly neutral reaction. Sweet clover, a deep-rooted legume, when properly inoculated, will add nitrogen and humus to the soil faster than any other legume that can be grown in this country. Another advantage of sweet clover is that it makes such poor quality hay that there is less temptation for farmers to cut it for hay and sell it rather than to plow the crop down as a green manure. Still another advantage of deep-rooted sweet clover is that more of the nitrogen collected from the air and converted into a form available as plant food is stored in the roots of the plant rather than in the tops, as in some of the more shallow rooted legumes.

On all the fields mentioned above, good yields of corn were secured for a few years after applying limestone and turning under sweet clover or other legumes. Eventually, however, the available phosphates and the potash were used up by the crops. There is a large supply of potash in the soil in an insoluble form, but apparently the decaying organic matter does not liberate the potash as fast as Dr. C. G. Hopkins and other soil scientists once expected.

The use of sweet clover as a green manure crop apparently increases the need for potash for two reasons. The addition of nitrogen and organic matter improves the yields of following crops. Each ensuing larger crop demands more potash per acre and removes larger quantities from the soil when harvested. When the rate of potash removal by crops exceeds the amount of potash becoming available from soil minerals, then the lack of potash becomes the limiting factor of crop yields. But shall we condemn sweet clover as a green manure now that we may classify it as a "soil robber" as far as potash is concerned? No. The advantages of sweet clover are too great. However, it appears from our observations and fertilizer trials that we shall have to supply potash as well as phosphates to our soils in order to grow maximum yields and profitable crops. Small supplementary fertilizer treatments on corn, and possibly on wheat, will probably maintain and improve the fertility levels of our soils.

Corn seems to need a greater amount of potash than wheat, while wheat responds more to phosphates. Most of our soils have not reached the stage where potash is the limiting element for wheat, since fair yields of wheat are grown without potash fertilization, even on soils where corn is stunted from the lack of this plant food. Phosphates have given good increases in wheat yields, while potash produces somewhat smaller additional improvements in productivity.

Can Sea Island Cotton Return to Georgia?

(*From page* 8)

on which successful yields were obtained, because fairly good yields were obtained on some of the heavier Norfolk sandy loams and Norfolk loamy fine sand. The smallest yields were obtained on the poor sandy soils, such as are found very generally in Echols County. The average yield per acre for all the crops studied was 110 pounds of lint cotton.

Micro-chemical analyses were made of soils on which the crop was grown, with the hope that they would give some lead that would be valuable and furnish some sort of a guide as to what practices farmers might use to assure them of successful crops of Sea Island.

The micro-chemical analysis method of determining the crop and soil needs is new to us in Georgia, and it is necessary to supplement the analyses with a considerable amount of agronomic information in order to be certain of the correct interpretation. Only the nitrate nitrogen content of soils can be determined with the method of analysis which we used, and, since the nitrate content in the soil varies considerably from season to season, it seems that the nitrate content is not as important as the phosphorus and potash content, as well as the pH, or acidity, of the soil.

The most outstanding thing revealed by the micro-chemical analyses of the soil samples was the effect of the potash content of the soils on yield. The average yield on soils which showed less than 100 pounds of K_2O per acre was slightly less than 100 pounds of lint cotton as compared with an average of 156 pounds of lint cotton per acre for soils with 100 pounds or more of K_2O per acre. It can be observed by studying table I that the highest average yields were on soils that ran the highest in K_2O, as shown by the micro-chemical analyses. There were exceptions. These might be explained by the influence of other factors on yield.

The analyses of some of the soils taken from fields near the coast, which are not shown in table I, may give us a definite lead on many of the soils in the coastal counties. For the few fields tested, the phosphoric acid content was extremely low. There appeared to be an ample amount of potash and an abundance of nitrate in most of the soils. The yield of cotton along the coast, in most cases, was low. A part of the low yield may be due to an insufficient amount of phosphoric acid to balance the nitrogen and potash content of the soils. On some of the coastal soils the nitrogen content was high and both the potash and phosphorus content low. We expect to check on the micro-chemical analyses of the coastal soils by laying out some definite fertilizer demonstrations. Very little experimental data have been obtained for soils in coast counties on which to base fertilizer recommendations for Sea Island cotton or other crops.

According to the best information which can be obtained, the old Sea Island growers did not use much fertilizer on their crop. Many of them used only an application of Kainit, while others used a complete fertilizer. Some agricultural workers are of the opinion that the reason Kainit was so generally used by these growers back in the earlier days was due not only to the potash content of Kainit but because of effects from other ingredients, especially magnesium. Experiments are under way whereby effort is being made to determine the effect on yield of the application of magnesium in the form of dolomitic limestone. Not enough data is available yet on which to draw conclusions.

We saw a great many crops last season which showed signs of having had too heavy applications of nitrogen. In such fields, plants grew as high as 10 feet, making it impossible to dust the cotton for boll-weevil control and causing a good many of the bolls to rot. This condition was aggravated by the very rainy season and by the boll-weevil which kept the plants from setting as much fruit as they would have otherwise.

In order to check further on the 1937 Sea Island crop, we sent out questionnaires to about 600 growers. We asked the growers to fill out the questionnaire, giving complete information on the crop grown in 1937. Of that number, 111 of the questionnaires returned were complete enough for tabulation. The 111 farmers grew 590½ acres. The records came from 19 different counties. The average yield of lint cotton per acre for the 111 growers was 81 pounds. Back in the days before the boll-weevil, the average yield of lint cotton per acre for Sea Island was between 100 and 150 pounds. For 1917 the average yield for Georgia was 125 pounds. Possibly the low yield back in the old days was due to the fact that only small quantities of fertilizers were used.

Of the 111 growers 5.4 per cent had yields from 200 to 252 pounds of lint per acre; 8.1 per cent had yields of 150 to 200 pounds; 20.8 per cent had yields of 100 to 150 pounds; 37.8 per cent had yields of 50 to 100 pounds; 28.8 per cent had yields less than 50 pounds per acre.

The 111 growers indicated that they would plant 250 acres of Sea Island in 1938 as compared with 590½ acres in 1937. The successful growers, that is, those who made yields of 150 pounds or more, indicated that they would plant about the same acreage in 1938 as they did in 1937. Most of the farmers who had yields lower than 150 pounds either stated that they would not plant any in 1938 or that they were undecided whether they would plant any more or not.

Farmers who made yields of 200 pounds of lint cotton or more used an average of 376 pounds of a complete fertilizer per acre as compared with 410 pounds for those making a yield of 150 to 200 pounds; an average of 425 pounds for those making yields of 100 to 150 pounds of lint; 361 pounds for those making yields of 50 to 100 pounds of lint; and 337 for those farmers making a yield of less than 50 pounds of lint cotton per acre. Yields of Sea Island apparently were not in direct proportion to the amount of fertilizers used. The very rainy season and heavy weevil infestation had a very decided influence on yields. Fields which were liberally fertilized could have made very attractive yields had weather and weevil conditions been more favorable.

crops in the other yield groups, however, were listed as being on pebble land. The yields on some of them were low because of late planting or because of too much rain and other factors. Some good yields were made on very sandy soils, but those soils were not what would be classed as very poor sand. They were considered good, productive soils. On one farm where a large acreage was planted, part of the crop was planted on a heavy pebble soil and the rest of it on sandy soil. The farmer made the statement that the yield on the

TABLE I—RECORD OF SOME SEA ISLAND COTTON GROWERS, 1937 CROP ARRANGED IN ORDER OF YIELD OF LINT COTTON PER ACRE

No. of Record	County	Acres Sea Island	Lbs. Lint Per A.	Kind of Fert.	Lbs. Fert. Per A. at Planting	Kind of Side-Dressing	Lbs. Side-Dressing Per A.	Micro-chemical Analysis pH	Lbs. of Nitrates Per A.	Lbs. of P_2O_5 Per A.	Lbs. of K_2O Per A.
45	Pierce	14	244	8-4-4	300	None	None	6.0	10	103.5	120
60	Chatham	1	243	9-3-5	600	M. Pot.-N. S.	300-150	6.1	24	276	156
6	Lowndes	4	217	10-4-6	400	None	None	6.4	6	184	120
44	Pierce	5½	191	8-4-4	325	"	"	5.8	8	92	120
35	Clinch	3½	180	8-4-4	400	N. Soda	100	5.6	24	46	60
3	Lowndes	3	179	9-3-5	400	Kainit	70	6.2	12	115	144
8	Lowndes	12	170	10-4-6	400	None	None	6	10	115	60
7	Lowndes	10	164	10-4-6	400	"	"	6.2	6	138	108
49	Pierce	8	150	8-4-4	400	"	"	5.5	8	69	48
9	Lowndes	8½	144	10-4-6	400	0-9-10	200	5.3	16	69	144
1-A	Lowndes	75	139	10-4-6	600	10-4-6	200	---	--	---	---
1	Lowndes	--	---	------	---	------	------	5.8	24	195½	144
2	Lowndes	--	---	------	---	------	------	6.0	14	138	96
46	Pierce	4	125	8-4-4	300	None	None	5.8	4	34½	48
52	Pierce	5	120	8-4-4	400	"	"	5.6	20	80.5	48
14 & 15	Echols	20	119	9-3-5	400	"	"	6.0	6	69	60
10	Lowndes	7	117	8-3-5	400	"	"	6.1	20	57.5	60
41	Pierce	2	115	9-3-4	400	0-9-15	100	5.8	16	92	48
37	Clinch	2	113	7-5-5	200	N. Soda	100	5.2	6	27.6	48
47	Pierce	5	112	8-4-4	400	None	None	5.8	6	69	48
11	Lowndes	4	100	10-4-6	300	M. Pot.-N. S.	40-60	5.7	18	46	112.8
43	Pierce	3½	100	9-3-5	400	None	None	5.9	8	69	48
51	Pierce	2	98	8-3-5	400	"	"	6.1	8	207	134
29	Clinch	4	95	8-4-4	400	N. Soda	75	5.5	2	103.5	48
40	Pierce	32	94	8-4-4	300	None	None	5.5	4	92	134.4
25	Echols	3	93	?	400	None	None	6.1	3	57½	60
4	Lowndes	5	90	8-4-4	400	0-9-15	200	5.8	8	211.6	84
16	Echols	3½	88	9-3-5	230	None	None	6.4	5	34½	48
36	Clinch	5	76	8-4-4	400	"	"	5.0	24	34½	48
32	Clinch	2	75	8-3-5	300	"	"	5.2	12	27.6	48
38	Clinch	2	75	8-4-4	---	------	------	5.1	8	46	48
19	Echols	14	72	7-5-5	200	Kainit	100	6.1	2	57½	48
48	Pierce	3½	70	10-4-6	400	None	None	5.7	14	46	48
17	Echols	8	69	8-4-4	200	N. Soda	50	6.0	0.5	138	72

NOTE: Micro-chemical analyses of soil samples were made by C. N. Wilder, Chemist, College of Agriculture, Univ. of Georgia.

As was the case with the crops of Sea Island studied in table I, the type of soil had a very decided influence on yield. Out of the 111 farmers, six of them made yields of 200 pounds of lint or more per acre and all of the six crops were planted on stiff pebble land. Many pebble land was about twice as great as that on his sandy land.

Not more than half of the farmers who returned the questionnaire used any poison to control the boll-weevil. It is rather difficult to obtain any very reliable information as to the effectiveness of the boll-weevil control measures used, due to the fact that almost daily rains washed the poison off the cotton about as fast as it was applied. However, it was very clearly demonstrated that mopping the cotton with liquid calcium arsenate mixture throughout the season was not nearly so effective as applying calcium arsenate in the form of dust. The mopping method was effective until after squares began to form, but after that time it appeared to be rather inefficient in killing the weevils.

Just what the ultimate outcome will be regarding the production of Sea Island cotton, we cannot foresee; however, we are hopeful that, in the light of experience gained the past 2 years, the more successful growers will demonstrate that it can be grown successfully under weevil conditions. Many farmers succeeded last year under about the worst conditions that South Georgia has ever experienced. If they can succeed bad years, it would seem that they would be still more successful with average weather and weevil conditions. The low grades produced last year as a result of rainy weather and weevil conditions may give some of the consumers of such cotton a rather poor impression of the quality of Georgia Sea Island. It should be remembered that for many years Georgia produced a very fine quality, and with average conditions, we see no reason why high quality Sea Island cannot still be produced.

It Takes Knowledge to Live with Soil

(From page 19)

figured on the basis of increasing the yield 150 bushels to the acre at a cost of $5.50," Wheeler reports. "In other sections of the State and on other soils the applications could have been up to 400 or 500 pounds to the acre or even more with profit."

On this particular farm the planting was made on one field on June 18, with fertilizer applied at the time of planting. A band was spread alongside seed pieces. Other later care included seven applications of Bordeaux with calcium arsenate added to the first two spray applications to take care of potato bugs. Applications of 12 loads of manure to the acre before plowing in spring were put on because it was readily available. The farm is a dairy farm, with general diversified production of stock and crops thrown in to make balance. The soil is sandy loam underlain with lime rock, with 220 acres of eight sections of land now tillable.

On muck soils, of which the State has millions of acres scattered in all the important agricultural counties, fertilizer treatments are different. There usually is a greater supply of soil moisture and nitrogen present. Some of the growers use formulas for commercial fertilizer which seem high in phosphorus and potash and perhaps out of balance, but they prove out in yields and profits.

Take the State's new onion king as an example. He is Carl McGuffey, Shelbyville. That's a town more easily located by putting it between Kalamazoo, the celery and paper manufacturing center, and Grand Rapids, famed for furniture in style and volume.

McGuffey's record for onion production in 1937 credits him with growing 1,147 bushels of onions to the acre.

He's modest, but he knows his onions, does McGuffey. When he was 13 he started in onion production with his dad, and he's been at it for 27 years on from 140 up to 225 acres of muck in onions each year.

He uses rye for green manure and fall plows to get good usage from the green manure and allow him to beat other planters in spring by about 10 days. For fertilizer he uses a mixture containing copper sulphate, which he figures is 0-13½-23. The formula closely follows tests and recommendations of soils and fertilizer authorities at Michigan State College. They find that a ratio of about one to two between phosphorus and potash makes the best yields on muck.

McGuffey uses an application of 800 pounds to the acre, applied in thin bands about 5 inches deep on each side of the rows. His onion king title, conferred in an annual meeting of the Michigan Muck Farmers' Association, proves out his methods.

Orchards Differ in Fertilizer Needs

(*From page 17*)

involves the nature of the soil, its depth and topography, its previous treatment, the use of fertilizers and manures, the amount and nature of the cultivation, and the cover or sods grown. Fertilizers are only part of the problem of soil fertility.

"In this orchard any treatment that has influenced the trees at all has done so in the following order: first, the cover crops; perhaps several years later, leaf color; shortly after, branch growth and circumference increase; and last of all, yield.

"The reason for this sequence of results is that the treatments—whether chemical fertilizers, manure, or cover crops—have influenced yields chiefly by changing the organic matter content of the soil; that is, those treatments which have resulted in the production of larger cover crops have ultimately resulted in the production of more fruit.

"A short, non-legume sod rotation is an efficient means of building up a depleted orchard soil. After a sod of any kind becomes thick, tree growth is checked and yields decline. Orchard sods should be turned under, or partially broken, frequently.

"Trees receiving annual tillage with July seeding of cover crops have not done so well as those under sod rotations. If the cover crops are seeded in early June, as has been practiced since 1929, the difference may not be marked."

The following data from the Pennsylvania State College Bulletin indicate what may be expected from the use of a complete fertilizer in an apple orchard to increase cover crop growth as well as tree growth and fruit production. The covers grown in Project 332 during the 24 growing seasons here reported were non-legume covers. The tree yield equals the total pounds of fruit produced per tree in the 24 seasons. Trees were planted in April 1908, so the 1932 crop was harvested after the orchard's 24th growing season.

In Project 332, Plot 9, rows 18-19, NPK, is nearly at the low point, topographically, of the area occupied by this project. Plot 12, rows 24-25, NPK, is nearly at the highest point where the soil is naturally thin. Moreover, the fertilizer treatment in Plot 12 was not begun until 1912, while in Plot 9 it was begun in 1908; this difference probably has had some effect.

Such tree yields speak well for a balanced fertilizer program, and such a program will support covers of legume or non-legume sods of short rotations.

Most orchard owners are interested

EFFECT OF TOPOGRAPHY COMBINED WITH HEAVY FERTILIZATION

		Rows	York	Stayman	Baldwin
Av. green wt. per acre cover crops, 1929–32, pounds	Plot 9,	NPK 18–19	13,545	9,191	7,138
	Plot 10,	Check 20–21	3,235	4,859	3,300
	Plot 12,	NPK 24–25	6,579	10,471	6,192
Total branch growth, 1929–32, inches		NPK 18–19	23.1	25.7	34.4
		Check 20–21	17.9	15.1	15.0
		NPK 24–25	18.0	21.1	25.1
Av. circumference, 1933, inches		NPK 18–19	42.75	42.93	44.83
		Check 20–21	37.56	35.66	31.93
		NPK 24–25	41.41	42.00	41.62
Total yield per tree through 1932, pounds		NPK 18–19	4,457	4,879	5,073
		Check 20–21	4,393	3,818	2,901
		NPK 24–25	4,866	5,418	4,808

to learn that it took 16 years of clean cultivation and late summer seeding of non-legume covers to so deplete this Hagerstown clay-loam soil of organic material and exhaust the nutrients to points low enough to even show in tree growth and yield. Cover growth began to show the need of food in the fifth to seventh year.

In the case of the legume covers, nitrogen was being returned to the soil by the legume plants. This resulted in better covers each year. The trees with legume covers show no need of food, as the picture indicates, after 22 years of growth.

As orchards grow older, the need of complete fertilizers for both the trees and cover crops will become more marked.

Were the Professors Wrong?

(*From page 22*)

acre of an 0-10-4 fertilizer were used under the wheat, and it was top-dressed last March 10 with 100 pounds of nitrate of soda. This wheat will thresh out at least 25 to 30 bushels of grain per acre. But Ray says he knew better than to try to grow it without the potash.

These few random facts are not given to scoff at the professors. They taught then what they thought to be facts, and many other students in the South have been taught the same as I. The effects of this teaching linger today. There are many who believe that little or no potash is needed for ordinary crops on the ordinary red clay soils of our upland piedmont country. The facts prove this to be otherwise. It is not my purpose here to advocate any radical change in the methods of fertilizing, but it is my purpose to point out that many of our good farmers have found that, of necessity, they must use extra amounts of potash fertilizers until they restore the depleted potash content of their red clay lands.

Perhaps the outstanding results which we see secured now in a multitude of field demonstrations may run into a declining scale as the applications of extra potash are continued through the coming years. Be that as it may, there

More than 275 good farmers turn out to study Ray Morrow's pasture demonstration on the farms of H. W. Wilson and L. B. Haas of Iredell County, where Jersey cows get their fill in 2½ hours of grazing daily on grass fertilized with phosphates and potash.

are thousands who yet do not secure the greatest possible acre yields because they do not know about this potash need. Nor will this need be met simply by plowing under legumes, in the hope that the legumes will tend to liberate from the soil the extra potash required for the use of the crops following.

Plowing or disking under legumes is an excellent farming practice which should never be discouraged on any farm, certainly not on the red clay lands of the piedmont South. But this is not the whole answer to the potash problem with these soils. The professors of my student days knew their science and their theories and taught them well. The farmers of today are coming to know that "science when well digested is nothing but good sense and reason," and when they see a fact continuously demonstrated on their own fields, it furnishes them with a dependable guide for future action.

A Dean Retires

(From page 14)

national food administrator under President Wilson. Patriotically he accepted this position and also that of chairman of the Missouri Council of Defense. Many remember the days of "Wheat will win the war," "Use fewer pastries and cakes and thereby conserve wheat, lard, and sugar," and "Make a garden if possible." Dean Mumford spent an enormous amount of labor in publicizing and administering this food program. That his work was effective was shown by the fact that Missouri farmers upped production miraculously in a short time. The Country Gentleman said of Mumford's work, "Missouri farmers are making a pig and a half grow where one pig grew before, and they are producing this year almost two grains of wheat to each grain they have been harvesting heretofore."

After his war duties ended, Mumford was named on the Mission Americaine De Rapprochement, a commission of some 12 university representatives chosen by the French Institute of America to visit the leading French universities and commercial centers with a view to increasing the educational and economic relations between that country and the United States. Mumford was the representative of agriculture and agricultural education on the commission.

As the Missouri college grew in stature and reputation, its dean found himself frequently called upon for national duties. Thus, in 1920 he became a member of the executive committee of the American Association of Land-Grant Colleges and Universities, which position he has held ever since. In this connection he was called upon to write the Purnell Act. This is an important law which provides for annual appropriations to the agricultural experiment stations of the country for scientific research. The act was passed by unanimous vote of both the House and Senate and signed by the president. Mumford also assisted in framing the Bankhead-Jones Act and other important measures for the benefit of agriculture.

Received Recognition

Honorary degrees have come to Mr. Mumford. His alma mater, Michigan State College, conferred upon him the honorary degree of Doctor of Agriculture and at the same time gave a similar degree to his brother, the late H. W. Mumford, Dean of the College of Agriculture of the University of Illinois. At that time mention was made of the similarity of the careers of the two brothers in reaching positions of importance in American agriculture. They were referred to as the "Siamese twins of agriculture."

Dean Mumford also received a degree of Doctor of Agriculture from the University of Nebraska. As much as he appreciated these honors, he has seldom used the title of doctor because it was not an earned degree. He prefers to be called "Dean." Twice Dean Mumford was recommended for the position of secretary of agriculture by Midwestern groups. Whether or not he would have accepted such a position is not known, as he has turned down several commercial offers in order to continue his work in the field of agricultural education. With those of other agricultural leaders, Dean Mumford's portrait hangs in the Saddle and Sirloin galleries at the Union Stock Yards in Chicago.

An Active Man

His 70 years have touched Dean Mumford lightly. While his hair and familiar mustache have grayed, his step is still brisk and his carriage erect. His mind is alert, and he keenly watches over the activities of his institution. He enjoys walking and seldom uses his car to get from his home to his office. If he wishes to talk with any of his staff he frequently walks to see them in place of calling them to his office. Very few Sundays find him absent from the morning service of his church.

In a recent letter to Dean Mumford, Secretary of Agriculture H. A. Wallace said, "Your comprehension of the need for including in the research of the land-grant institutions the study of economic and social factors in agriculture and rural living is reflected in the projects of the experiment stations the country over. Your long and helpful service in the correlation of research as a member of the joint committee of the Land-Grant College Association and the Department is remembered gratefully. And from your demonstration of the nature of true cooperation we have all learned much."

And E. O. Holland, president of the State College of Washington, paid this tribute, "Dean Mumford is recognized as one of the constructive leaders in the great field of agriculture in the United States. He has won for himself an honored place in the councils of the Association of Land-Grant Colleges and Universities. All of the Land-Grant colleges of the country are the beneficiaries of his fine devotion and constructive leadership."

The man who will succeed to the deanship, Professor M. F. Miller, has established his reputation in the study of soils. That it should be in such a field is natural, for he has great love and reverence for the soil—feelings which show in his constant effort to convince others of the importance of saving and protecting the basis of all agriculture. Many years before the words, soil conservation, became generally used, Professor Miller was stressing the idea in his research and in his teachings.

He long realized the great damage being done to the soil by rainfall erosion, but found that he needed some actual figures to convince many people of something that was happening before their eyes. So in 1917, he set up plots from which the amount of erosion occurring under normal conditions could be measured. The results of this investigation were so startling that they called the attention not only of farmers but also of other soil students to the enormous amount of loss. In commenting on these experiments Dr. H. H. Bennett, chief of the Soil Conservation Service, recently said, "These plots were the birthplace of soil conservation in the United States."

Miller's path led him from a farm in Ohio, through Ohio State University, and then to Cornell University for an advanced degree. Next he went on to the position of field assistant in the Bureau of Soils. Back to Ohio State he came in 1904 to become connected with the department of agronomy. After 10 years there, he joined the Missouri College's faculty in 1914 and rose to become chairman of the soils department and assistant dean.

Though his soil erosion work has been important, he has by no means limited himself to this type of investigation. The effect of fertilizers on soils, the effect of cultivation on plant nutrients, the nitrogen relationship of the soil, the rate of accumulation of organic matter are only a few of the subjects in which he has headed vital research.

Professor Miller long has been a believer in knowing the kinds of soils with which he and the people of his State had to deal. So he has conducted thorough-going surveys—surveys which came to be regarded as standard patterns for similar work in other States. His work did not lack appreciation by others engaged in similar activities throughout the nation, for the American Soil Survey Association chose him to be president. A similar honor came from the agronomists of the nation when they selected him to serve as president of the American Society of Agronomy. In addition to writing a large number of agricultural bulletins and articles for technical publications, Professor Miller is the author of a textbook, "The Soil and Its Management."

Landsc(r)aping

(*From page* 5)

bus out on the adjacent back roads. My theory is that the safest shrubs for *my* bower are those which thrive without much tender care. Accordingly, I uproot the lowly sumac, the hawthorne, and the wild crab—with or without permission. If I discover an old homestead wall somewhere with lilac bushes and syringas growing there, they become my property. Then I take them home and call in the plumber, the garage mechanic, and the garbage collector, and with their advice I chuck the purloined shrubs into proper juxtaposition. One secures in this manner a nifty element of *sang-froid* and a racy effect of *laissez-faire* not possible when you are slavishly copying arboreal hints by Liberty Hyde Bailey.

Our little middle-class gardens appease the palate, appeal to the perceptions, promote physical welfare, and protect the purse. Much of these things my garden has done for me at least, and it has also kept me from falling victim to the golf craze—although a country club with a professional instructor and a prodigious debt is located half a mile distant. No, I have never perfected a stance. I prefer to do my sod chopping where it will be of some normal use. My leathery coat of tan and my wife's fresco of freckles have been acquired right on our own fairways of bucolic content.

NORTHERN gardening on old soils amid the breeding grounds of all the insects known to the State entomologist is a great thing for stamina as well as sunburn. Despite lice on my turnips and slugs on my tomatoes, despite long winters and short asparagus, I would not trade my honest hours with the hoe for all the largess of the tropic zones. They tell me that the flowers of the orient and the equatorial regions are often bold and flashy like some overdressed vixen, but highly unsatisfactory from the aesthetic viewpoint. They are said to be fat and luscious, and either smell too rank or not at all—while most of our old favorites are personal and sort of affectionate. The overfed, easy-living tropical blossoms are usually gross and bestial. Up here the tough battle which the flowers have to undergo from weather on one hand, and chaps like me fooling around on the other hand, is apparently all they need to make them charming.

Landscaping and country gardening appeal to lots of philosophers because they embody the oldest arts of man and always carry something new and worth striving for. The first man and woman set up housekeeping in the Garden of Eden and the most tragic sorrow of the universe occurred in the Garden of Gethsemane. Archaeologists digging into the sites of ancient cities discover traces of garden ornaments, and our own red brothers cultivated the humble kitchen garden long before we led him astray with corn whisky.

Many a colonial patriot probably objected to leaving his garden duties long enough to put his spluttering signature to the Declaration of Independence. Our brave New England mothers found that sage, pennyroyal, rosemary, mint, and rambling roses were reminders of home ties severed forever, and their own pioneering daughters treasured bulbs, seeds, and corms in their lonely trek across the prairies to found our western empire, where these plants stirred within them old memories of cozy eastern homesteads. Gardening is in our blood, but the most unhappy are those who must do it by proxy instead of soiling their mitts.

I THOROUGHLY enjoy attending a convention of landscapers and horticultural experts. To be sure and to be frank, I go there to "gawp" and smell more than I do to listen with intelligence to their ordinary conversation and platform remarks.

I surely try hard to appear discerning and appreciative while strolling down the bosky aisles of the flower show with the lady secretary of the Nineteenth Ward Home Grounds Circle and the bespectacled herb shark from the State society. I dare not confess openly that I scarcely know more about their jargon than I do about balancing the government's budget or my own.

"Notice the exquisite blend of color in that fine *Aquilegia,*" remarks the plant phrenologist, and I look over my shoulder at the geraniums when I should have nodded with deep conviction at the columbines. Or the learned lady finally catches me off base by naively inquiring whether I prefer *Lilium candidum* or *Lilium superbum,* and all I can stutter back is "I always admired lily of the valley most."

Personally I might pick a fuss with the American Joint Committee on Horticultural Nomenclature if I knew enough to begin it. But it's a wise guy who stops fighting before he starts along lines where he is not familiar. Why the dickens some folks insist on calling "baby's breath" by the cognomen, "Gypsophila," or mother's old favorite, the "bleeding heart," under the disguise of "Dicentra" and forget-me-nots as "Myosotis" seems to me like making it tougher for us rough-necks to get real chummy with culture and good influences.

I DEEM it rather risky business, too, for if a tyro gets verbal orders to whack off *Polygonum aviculare* and he mows down *Polygonatum giganteum* through mistaken intensity, his cultured frau will be the first one to horrify his harassed soul with the shocking news that he doesn't know knotweed from Solomon's-seal.

The good old English language should be used in back-fence conversation in private home gardens, and let the Latin version be saved for high mass among the horticulturists, or pink teas in the sewing circle.

Some day if I get much more of this into my system, I shall cross a sunflower with a skunk cabbage and then dare anybody to malign it with the title, *Jeffersonimus Macdermidicum.*

Yet, taking the whole subject into consideration, the improvement of the domestic landscape earns my lasting support and commendation. This should be a great boon to the industry alone.

For as I observe the trend outward from narrow flats and small city lots into wider and greener spaces by those able to afford either site with relative ease, it strikes me we are bound to raise a generation of youth with finer sensibilities and a fundamental attitude toward lasting values which some of the older generations lost in the rush for land conquest and profits.

It is no longer the retired gentleman and his lady who cultivate the sod and make the home arbor glorious to see. It is no longer an exception in the open country to see a farmstead taking pride in its drives, walks, and flower borders. Something which roots deep and expands in our natures has taken hold of us, altering for a little at least our coarse scramble for the financial rewards at the cost of psychic enjoyments. And as the chief cost lies in muscular effort and common sense, plus as much study as one would put into a capable game of bridge, there are mental and physical returns involved that weigh well in the balance.

It now devolves upon us to find a way to extend the privileges of this communion with nature and the arts of plant culture to the submerged groups in some form or other. Maybe some disguised form of WPA or PWA is the answer here, making little difference on party lines I am sure—so long as we get the green goods growing.

THEN when that time arrives I need not pull down the window shades of the parlor car when riding into old Chicago or approaching old Atlanta, for fear of seeing too much of the ash heaps of the underworld. And it will do us as much good as any national movement I am aware of, and probably put some ginger into the circulation business—both of money and blood. A chap who can grab a hoe and chop the stuffing out of some quack-grass encroaching on his violets is not apt to seize a torch and set fire to the courthouse.

So let my blessing descend in peace and comfort upon all those myriads of votaries of the landscape arts who assiduously tend to their grubbing. And mayhap I'd better get busy myself and let you do the same!

MASCULINE PRIDE

Recently, in the French Parliament, one of the Deputies, making a speech urging the improvement of the legal status of women, cried: "After all, there's very little difference between men and women!"

With one accord, the entire Chamber of Deputies rose and shouted as one man: "VIVE LA DIFFERENCE!"

"Bredren, we must do something to remedy de Status Quo," said a negro preacher to his congregation.

"Brudder Jones, what am de Status Quo?" asked a member.

"Dat, my brudder," said the preacher, "am Latin for de mess we's in."

CHILD PRODIGY

Little Lucy had just returned from the children's party and had been called into the living room to be exhibited before the tea guests.

"Tell the ladies what mama's little darling did at the party," urged the proud mother.

"I frowed up," said little Lucy.

He (driving): "I always keep both hands on the steering wheel."

She (sourly): "Well, I'm right here in case you need a handkerchief."

"Did you see my new girl?"

"Yes."

"How did she strike you?"

"We didn't get that well acquainted."

Drunk, hanging to a piling at the foot of Ocean Street: "Shay, what's that bright thing down there in the water?"

Lounging sailor: "Why, that's the moon."

Drunk: "Then please tell me how the 'ell I got up here!"

THEIR OWN PROBLEM

"Say, Josh, how can you tell the ganders from the geese?"

"Oh, we never worry about that. We just turn them all out together and let them figure that out for themselves."

Mrs. McWhuskey (watching a loving couple): "Et's just disgustin'. I'm verra glad ye didna make sic a fool o' yersel' when ye were walkin' oot wi' me, Sandy."

Mr. McWhuskey: "Ye manna juidge, wife. I hadna the same provocation."

MARKS OF IDENTITY

"No, I don't know where my wife is. But wherever she is, she has a cigarette in one hand and a weak no-trump in the other."

"So your name is George Washington?" the old lady asked the small colored boy.

"Yessum."

"And you try to be exactly like him, or as nearly as possible?"

"Lak who?"

"Why, like George Washington."

"Ah kaint help bein' lak Jahg Washin'ton, 'cause dat's who ah is."

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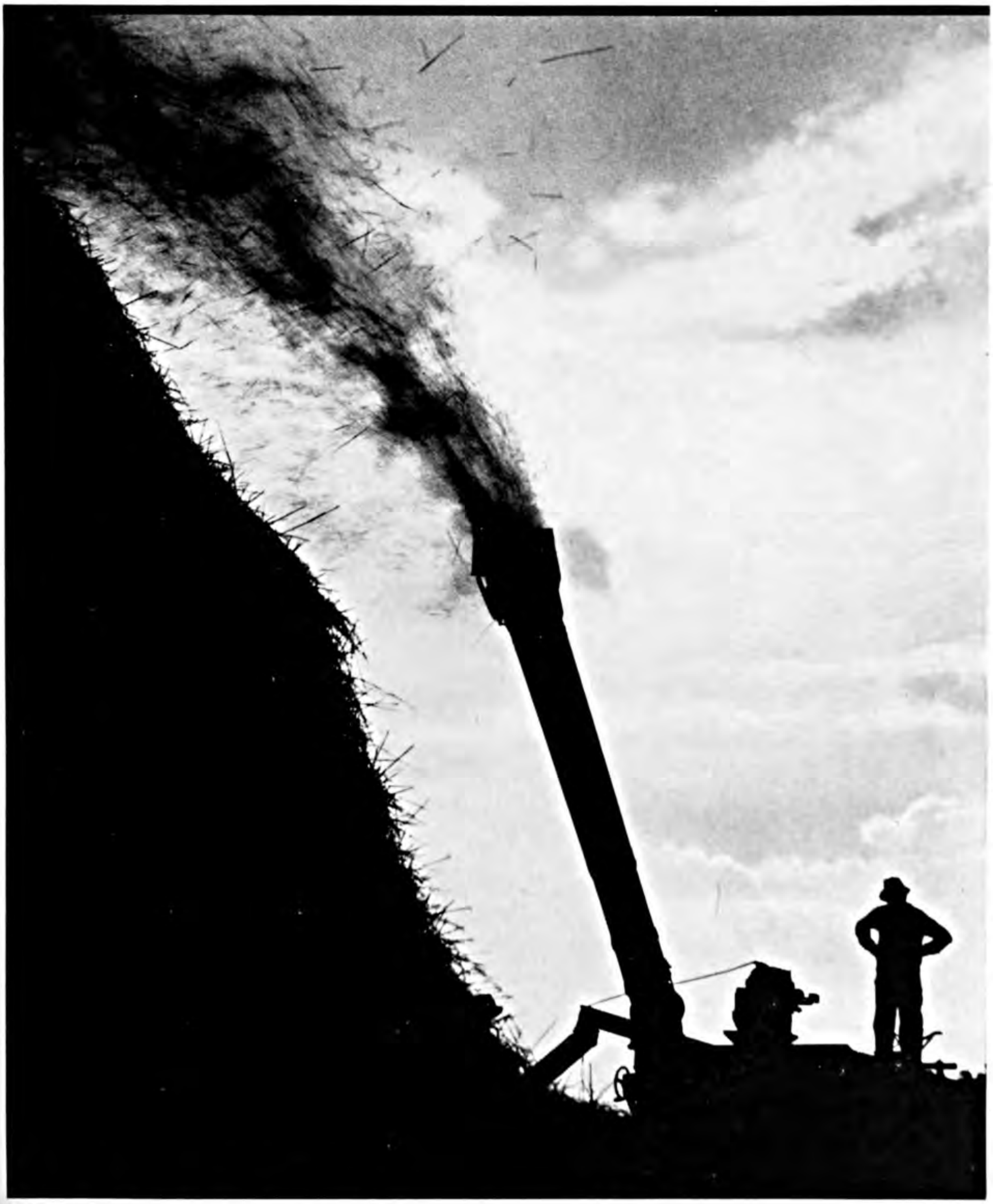

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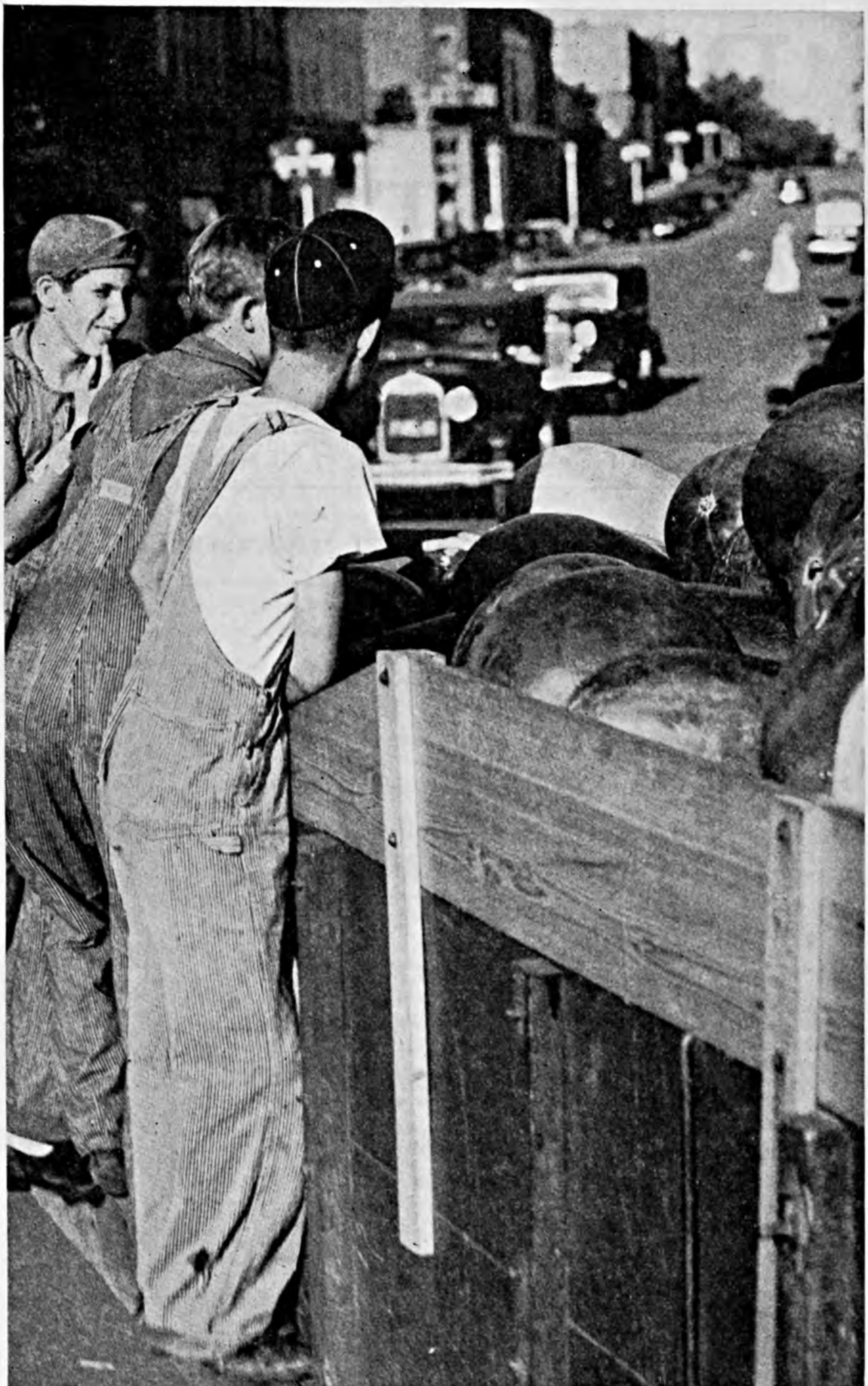

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Education or Organization— Which, *and if so,* Why?

By Jeff McDermid

BEING in a meddlesome profession and argumentative by nature and disposition, I arise to propound a useless question. I ask you if anybody knows which has done the more for agriculture—education or organization? Around our parts there are quite some considerable proponents, not to say adherents and bigoted believers, in the virtue and value of both. Having mingled with these cranks for many moons and dealt with them in a professional way; and being guilty of advancing ideas more or less half-baked which they sometimes gave me for public digestion, I am in a neutral position between the lines.

I have no fixed opinions either for or against the long-haired savants or the leather-lunged leaders, so I can meander up to and edge all around this profound topic without becoming vexed or visionary. Moreover, not being very highly organized or intensely educated myself, I can sit down out in the sticks with some geezers in overalls and let them take the hide off both these noble institutions without blanching.

I firmly believe that these back-country skinning operations and dissecting debates would be good medicine for plenty of the rural educators and rural organizers too, just as it is good stuff for me to take a course in English composition once in awhile.

I presume this question is like the old wheeze about the priority of the hen or the egg. I suspect that it's mighty hard to tell which came first, education or organization of, for, and by farmers. Even if we went clear back to fundamentals and tackled old Adam, the original horticulturist, I suppose both the professors and the organizers would get their innings. No doubt the teachers would say that if Adam had been well educated beforehand he would not have eaten any pippins until they were sprayed and graded; and the joiners would reply that if he and his frau had been properly organized they could have stayed in Eden regardless of the snakes or the angels.

AND following up later history since we began to settle America in earnest, I suppose both sides would have to admit some degree of active partnership. That is, we farmers could not have secured free education without some organization, and organization seldom gets very far minus both leadership and followship. (I use "free" before education advisedly, although I know that many taxpayers see red when it is so described.)

Folks who attend farm society meetings know full well that it takes plenty of persuasion to keep the boys hooked up and steam heated to pull steady in harness. Part of that persuasion is straight education, and the rest of it is enthusiasm—otherwise known by another less dignified name. Other folks familiar with the doings in regent meetings and boards of education know that organized effort puts over more new courses and new appropriations than book larnin' ever did.

Personally, I think right at the present time organization is running a trifle ahead of education in direct effect on farmers. I refer mainly to the agricultural conservation program as I observe it. Here you have a glorious example of how well a set of educated leaders can set up a national machine with well-integrated local cogs and levers, and make it work without most farmers knowing much about the reason why or the modus operandi.

Plenty of farmers I meet are no better off above the collar button since the program began, but their bank reserves and alfalfa acreages are somewhat bulkier. Most of the education has stayed in the headquarters offices and in the bulletins and regulatory rule books, while the benefits have got into the soil. This after all is nothing to worry over.

Now mind you, I do not claim that the soil committeemen are the only educated farmers we have anent the program specified, which possible error I hasten to correct. There are indeed many, who by prior training or personal research, or through political leanings, are convinced that it is all right or all bunk, depending on their respective viewpoints. But no checks have been returned just the same, not even by the widows of the opposition, as far as I know.

One might conclude hastily that this signifies the first instance in agricultural history where either education or organization has panned out into hard cash to farmers for small effort, but mark you, I have not said that myself. I don't want you to quote me on anything which is apt to shut off my sources of inspiration. Charlie McCarthy and I both need help to put on a performance. (Many others do too, but they won't admit it.)

SOME association with lawyers taught me that before going into a case too far we must fix our limits and set our sights. This calls upon me to define what I mean by organization and education, because the world is full of things which are called by those names whether they deserve it or not.

By organization in this little thesis I mean a degree of agricultural unity directed toward progress in achievement of goals. These goals are varied enough goodness knows, but for this purpose I confine it to organization in the realm of plant and livestock breeding and organization dedicated to social, economic, and moral improvement.

By education I mean the acquisition of new ideas and principles. In farm life education has always taken at least two broad and not always related courses. Educated farmers are those who have acquired dexterity and skill in the use of new implements, equipment, and methods, and who have suf-

ficient familiarity with them to work independently with more or less assurance of success. Likewise, educated farmers are those who have not overlooked the value of acquiring knowledge of economic trends and doctrines, history, scientific facts and principles, and who keep up alertly with current events.

Now we can leave out the commonplace system of dividing all education into bookish kinds and practical kinds. I see in my acquaintance with farmers a great mingling of the mental and the manual. One complements the other and both are essential in the rounding out of a satisfying life anywhere.

WITHOUT doubt the average farmer has acquired far more of the mechanical and inventive education and put it to greater daily use than he has the less positive branch of learning. I doubt much if we would be able to keep our youngsters back home on the farm were it not for the modern ways of doing things and the inspiration it gives them to possess this speed, power, and ease of achievement. I often journey through a countryside which was settled in the days of the flail, the ox cart, and the candle; and every field at harvest time has its tractor-binder or combine, and each home has its brilliant electric light and pulsing power.

Here it seems to me lies a field in which education rules supreme with less help from organization, as such, than in other more mental and abstract lines. Many would close the chapter here and declare the case won. But this does not include enough of the picture to make a finished masterpiece. It is but one side of the question.

FORMAL education such as the high schools and the agricultural colleges teach has always tried to include both the manual and mechanical courses and the classwork in the realm of the mind; but unfortunately too many of the graduates turned from farm life to commercial pursuits and spoiled the result in the eyes of those back home, that is, those who wanted rural communities to absorb major benefits from each new career. It would be foolish to insist, of course, that he who is born on a farm must stick by the family tradition, which observation I insert because it is the basis of much misunderstanding and misdirected living.

But there is still a rather nice discrimination we must mention. It hovers on the border line between our two subjects, education and organization. It bobs up often in everyday contacts with farm folks.

In my experience I have frequently noted that the more highly skilled, the more self-reliant and purposeful farmers, and again, those with considerable formal training, have shunned the hurly-burly and horse-play of mass farm organizations, particularly on the economic and social side, and have gravitated more generally, if they did so at all, toward the plant and animal improvement societies. Sometimes they even deserted the latter.

(*Turn to page* 47)

Permanent Clovers for Permanent Pastures

A. R. Midgley
Agronomist, Agr. Exp. Station, Burlington, Vermont

WHAT place does clover have in permanent pastures and what is the relative value of individual strains with different fertilizer treatments? To determine these questions considerable research work has been conducted at the Vermont station, using Ladino, common white Dutch, English and natural wild white clovers.

Characteristic Growth

Ladino is a mammoth white clover which originated in northern Italy and was brought to this country in 1912. It has an erect habit of growth with large leaves and long stems, which enables it to compete with the tall-growing grasses. Ladino, however, cannot stand as close grazing as the other clovers because of its erect habit of growth, large fleshy runners which are quite easily injured by the tramping of grazing stock, and its long internodes which do not form a very close turf. It has a remarkable comeback after being cut or grazed and under proper conditions yields more than other clovers.

Common white Dutch clover has growth habits intermediate between the Ladino and wild white clovers. The plants have larger leaves, fewer and stouter runners than the wild white types, and because of its longer internodes it does not root or spread so readily. It usually has a longer growing season, since it often starts growth earlier in the spring, blooms 1 to 2 weeks earlier, and continues growth later in the autumn than the wild strains.

English wild white clover has very small leaves, short stems and internodes, and forms a close, compact turf. This plant is much smaller than the other clovers and thus requires close grazing to get sufficient light in competition with other, taller-growing plants. England has found this clover to be a true perennial, a long-lived, persistent, rapidly-spreading type. It has been the main contributing factor in making the pastures and livestock of Great Britain so famous. Their pastures are seldom if ever plowed, and they take great pride in referring to their "old pastures." Seed from these old established pastures are used for the reseeding of other pastures.

Natural wild white clover has growth habits intermediate between the small English wild white and common Dutch varieties forming a close, compact turf. This clover is found in old permanent pastures or comes in under proper fertilization and management. It is quite likely that these plants are the more persistent strains which originated from the common white Dutch clover, as available evidence indicates that this clover is a native of Europe and was brought to this country by the early settlers in hayloft sweepings. It took root readily and is now found along practically every road and forest trail. Some Indian tribes called this plant "White Man's Foot Grass," as it seemed to follow white men, establishing itself readily on newly cleared or burned-over forests where fertility and organic matter contents were high. Natural selections have no doubt taken place, and as it readily establishes itself under proper conditions, it can well be called natural wild white clover.

Experiments were started in the spring of 1934, using these four clovers, on three different soil types. Since the data from the three experiments were similar, only one will be discussed here. Woodbridge loam, because of its importance as pasture land, was selected for one of the trials. This soil occupies the gently rolling hillsides in the north central plateau of Vermont. It is derived mainly from granite, and while it is non-calcareous at all depths, it is not so acid as to prevent a good growth of pasture clovers and grasses (pH 5.6). While this area has a rolling topography, it is still quite ideal for pasture clovers, because its compact substratum (hardpan) retards the movement of water and thus supplies sufficient moisture.

Nature of Experiment

A sufficient area was plowed, fitted, and seeded to Ladino, common white Dutch, and English wild white clovers. Adjacent unplowed areas containing some native wild white clovers were used as the fourth type, since seed for these plantings were not available. Ladino and Dutch seed were obtained from a reliable seed house, English wild white seed directly from London and was certified as "Genuine Kent wild white clover from old pastures." Seeding was done at the rate of 5 pounds per acre, which is in excess of the normal rate but deemed advisable to insure good stands. Normal seedings of timothy and Kentucky bluegrass were used with the clovers in order to simulate pasture conditions.

A part of each plot was enclosed within a wire fence, the remainder being subjected to actual grazing conditions. Yield data were obtained only on the enclosed areas. The plots were cut frequently when 4-6 inches high, in order to favor clover rather than the grass. The results are presented in tables 1 and 2.

The results presented in table 1 show the superiority of natural wild white clover in persistence and longevity. It continued to increase each year, while the other clovers greatly decreased after the third growing season. Why natural wild white clover is more persistent than the other clovers is not definitely known, but it is true that white clovers growing in various habitats show marked differences, such as size and number of leaflets, length of nodes, manner of growth color of flower, etc.

This is the first year's growth of these three clovers which were planted in adjacent rows. Note the difference in size of their leaves.

TABLE 1—PERCENTAGE OF EACH CLOVER PRESENT ON WOODBRIDGE CLAY LOAM WITH DIFFERENT FERTILIZERS AT THE END OF THE FIRST AND THIRD YEARS AFTER SEEDING

	Nature of Fertilizer Application[1]				
	Check L	$L+P_1+K_1$	$L+P_2+K_2$	$L+P_2+K_2+N$	$L-P_2-M$
	Native Wild White Clover				
1934..............	7	10	10	11	12
1936..............	9	22	75	60	78
	Ladino Clover				
1934..............	52	75	85	85	87
1936..............	3	6	10	6	12
	Common White Dutch Clover				
1934..............	50	78	82	78	80
1936..............	2	4	6	5	8
	English Wild White Clover (Kent)				
1934..............	35	70	80	76	81
1936..............	3	2	6	4	7

[1] P_1 = 500 lb. 16% superphosphate. P_2 = 1,000 lb. superphosphate per acre.
K_1 = 200 lb. muriate of potash. K_4 = 400 lb. muriate of potash per acre.
N = 300 lb. ammonium sulfate alternated with eq. sodium nitrate yearly.
M = 8 tons of fresh barnyard manure.

It is likely that some strains have a deeper root penetration and are thus better able to withstand drought and midsummer heat, as well as utilize to better advantage soil minerals which are more or less held in difficultly available forms.

The creeping stems or stolons of wild white clover are small and tough, so they may not be injured by tramping and grazing stock to the same extent as the types with more fleshy stems. They also tend to stop active growth earlier in the fall and thus store more food reserves in their roots, which would help make them more resistant to heaving and winter-killing. It is possible that they are more resistant to diseases, more tolerant of soil acidity, and produce more seed under close grazing, but whatever the cause, natural wild white clover is more persistent than the other strains that have not been subjected to soil and climatic conditions peculiar to a particular locality.

It is a waste of time and money to plow and reseed without adequate fertilization. This plot was plowed, seeded to white Dutch clover, bluegrass, and timothy. A very poor turf resulted and the soil baked and cracked badly.

The common white Dutch decreased most rapidly, as very few plants remained after the second year. It may even be that some of these plants reported in 1936 came from seed which failed to germinate the previous year or was an incropping of the na-

Unplowed and unfertilized native sod. The turf and thin layer of organic matter help prevent excessive evaporation. Note the small amount of native wild white clover.

could have been utilized, but since the land was plowed in preparing the seed bed, the organic matter was turned under and was then positionally unavailable to the clover.

Fertilizer plays an important role in maintaining pasture clovers. The high rate of superphosphate with manure proved best in this respect. Manure not only supplies potash, but soluble organic matter and minor elements

tural wild white clover, as these two types are difficult to differentiate. It is little wonder that white Dutch is not more persistent, as much of the seed is produced in foreign countries or in the southern States where the climatic conditions are very unlike those in the northeastern States.

Ladino clover seldom lives more than 2 or 3 years in Vermont, but it was somewhat more persistent than the common white Dutch variety. Here again, part of the plants recorded in 1936 may have been from seeds which failed to germinate the previous year, or came from freshly produced seed.

Though the English wild white (Kent) is considered a true perennial in England, it also rapidly decreased in these experiments. It is possible that this clover may have been more persistent if the plots had been cut more frequently; but in actual practice, especially under rotational grazing, it is doubtful if the plots would have been more closely grazed, since they were cut five or six times a season when growth of 4 to 6 inches was attained. This clover may also have been more persistent if the original sod

which have a beneficial effect in maintaining and establishing clovers. "Night pastures," which naturally receive large amounts of manure, usually have a good stand of white clover. This is not due to its nitrogen content, since this usually decreases the percentage of clover.

The results presented in table 2 show that yields are greatly increased by the use of fertilizers, and that this yield is in proportion to the fertilizer used. While nitrogen and minerals gave the greatest total yield, the added nitrogen did not give sufficient increase to pay for its use. This would be expected under these conditions where a good stand of clover was present, since the

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High mineral fertilization without plowing and seeding changed the turf of poverty grass and weeds to a good stand of persistent natural wild white clover.

Reprinted from 1938 American Rose Annual

How I Control Black-spot

By Charles Mallerin

Amateur Rose Hybridizer, Vice-President of the Rose Section of the National Horticultural Society of France, Varces, Isère, France

Editor's Note.—It is through the kindness of Prof. Earl J. Hamilton, of Duke University, Durham, N. C., now engaged in research work in France, that this remarkable paper, which he has translated, is made available to us. M. Mallerin speaks from experience, and Professor Hamilton's letter accompanying the translation tells us, "I have never seen black-spot so completely controlled as it was at M. Mallerin's establishment last October. Nor was the climate responsible, for roses in that district that had not received his type of fertilizer were largely defoliated by black-spot." Obviously, M. Mallerin is controlling black-spot *from the inside,* through larger use of potash—a proposition for careful study.

Readers are urged to experiment cautiously in the lime-sulphur spray application, for American suns are harsh in comparison with those of France.

SEVERAL rose-lovers from France and other countries have taken note of the results attained in my fight against black-spot, which was practically non-existent in my establishment in 1937. In response to their desire to learn the causes of these results, I am glad to make them known.

First, one must recognize that the disease singles out the varieties which have a deficiency of foliage at certain periods, particularly the first leaves of maidens after they are cut back. Next come the Pernetianas, especially the early varieties, which at present are resistant, their congenital weakness having been overcome. Finally, come the little cutback seedlings.

Rose hybridizers know that new varieties attain more or less the characteristics of a normal plant when they are budded onto understocks, but that the seedlings on their own roots generally remain poor plants, and that when cut back a large percentage dies. This extraordinary vegetative deficiency subjects seedlings to frequent attacks of black-spot that are difficult to control. Hence, if I had neglected to provide fungicidal protection, my visitors in October, 1937, would have found black-spot as bad as in their own gardens.

I have also observed that if one stimulates growth by application of nitrogenous fertilizers in the spring or (in liquid form) during the summer, severe attacks of black-spot and mildew are invited. The cause of this is the excess of nitrogen.

A friend (a leading rose nurseryman) to whom I have given advice for rendering his fields immune to black-spot has not had completely satisfactory results. One must partially attribute this to insufficient fungicidal protection at the proper time. Another important factor was a deficiency of lime in the soil; a pH too low produces foliage of inferior resistance.

The problem consists then in giving plants proper soil: (1) drained when necessary, for nothing is more injurious to roses than soils lacking aëration and porosity; and (2) an adequate content of available lime, that is a pH of about 7.5. This may be called *hygiene,* and it is as necessary for roses as for men.

The nourishment of roses, another essential point, demands a carefully studied balance. In this matter a fortuitous occurrence put me on the right road. Like most amateurs, I used "complete" fertilizers, usually about 3 to 6 of nitrogen, 8 to 12 of phosphate, and

3 to 4 of potash. (A rose savant had written that roses need a great deal of nitrogen and very little potash.)

About 10 years ago, having pulled up all except a few plants and the border of a bed of roses, I planted beans in their place, after an application of fertilizer containing four times as much potash. I was amazed to find that the roses thrived on this heavy dose of potash. The extraordinary fact was that they had no black-spot or mildew, while their neighbors, having received the "complete" fertilizer and the habitual fungicides, were attacked by these diseases as in previous years. *It seemed evident that potash had imparted disease resistance, and systematic experimentation has confirmed my conclusion.*

No rose cultures are more difficult to protect against disease than those where one cultivates thousands of seedlings; for, while there are many sturdy varie-

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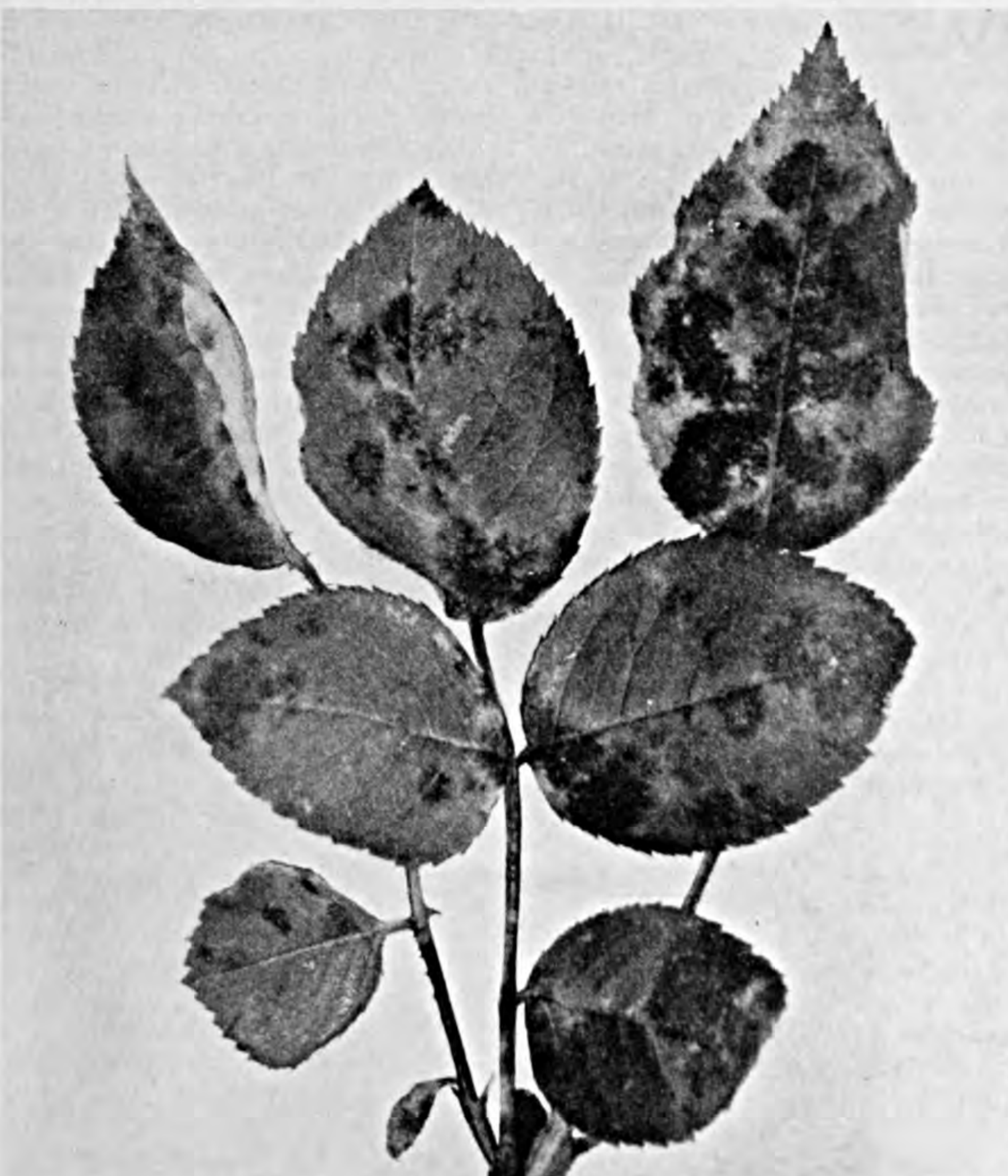


Black-spot on rose leaves appears first as small, isolated areas scattered over the upper surface of the leaf. The spots increase in size and may grow together until almost the entire leaf is covered.

Cooked Potatoes Blacken Because . . . .

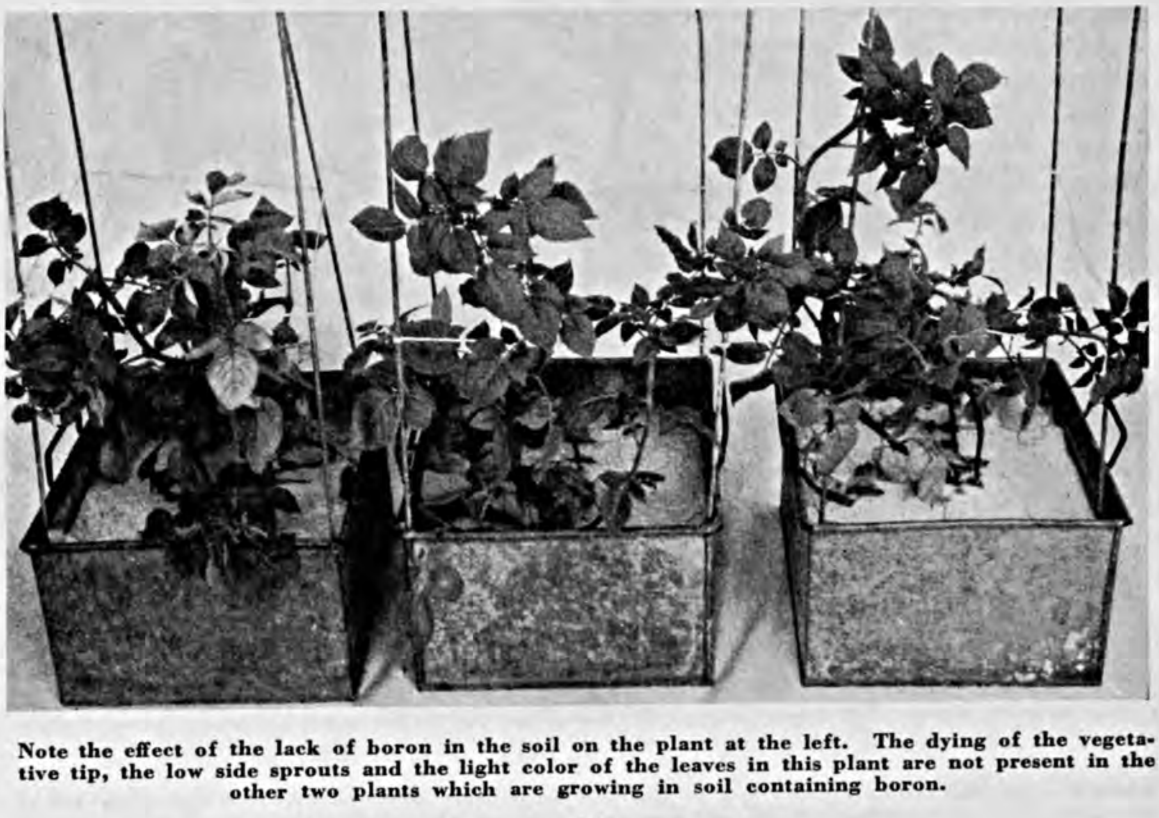
By A. W. Hantke

Madison, Wisconsin

"WHAT causes potatoes to blacken after cooking?" ask potato growers and consumers in this country. The housewife, desiring to serve food which is attractive and tempting, objects to darkened potatoes. This attitude, in turn, affects potato growers because they are striving to meet consumer demands. Due to these facts, and because the blackening of potatoes is being noticed in various sections of North America, Dr. W. E. Tottingham, associate professor of agricultural chemistry at the University of Wisconsin, began research on the subject.

The blackening, which occurs soon after harvest, is not the same type which is often seen on potatoes that have advanced stages of sprouting in spring storage. The darkening we are considering is usually found in the tissue layers just beneath the potato skin. Although it may affect all portions of the tuber, causing a gray or blue appearance, it is more likely to be found at the stem end.

The lack of minerals in the tuber causes free amino acids to form instead of proteins. Due to enzymes, some of the acids react with oxygen to form substances which become blue and black pigments after cooking.



Note the effect of the lack of boron in the soil on the plant at the left. The dying of the vegetative tip, the low side sprouts and the light color of the leaves in this plant are not present in the other two plants which are growing in soil containing boron.

Note the injury from lack of boron in the soil, and its partial correction by a liberal potassium supply. The middle plant is growing in soil low in potassium with no rare minerals, the right one is growing in soil low in potassium but containing boron and manganese, and the left plant is growing in soil high in potassium but with no rare minerals.

The blackening of potatoes is not new in the history of agriculture. According to a report by Wallace of England, the condition was found, after a dry, hot summer, in one or two varieties grown on land to which manure and a commercial nitrogenous fertilizer had been added. The trouble was overcome, to a great extent, by adding potash to the soil.

Potash is Tested

"After finding that the blackening was not caused by a disease," says Dr. Tottingham, "we considered the effect which potash in soil might have on the condition. In 1935 experiments were carried on at the university plots in Antigo, Arnott, and Madison, Wisconsin, with Burbank, Cobbler, Katahdin, and Rural New Yorker potatoes. At the time of planting, the Truog method was used to determine the amount of available potash in the soils. When the potatoes were planted, fertilizers containing different proportions of potash were placed in the furrows. It was found that in all varieties of potatoes an increase in the amount of potassium in the soil was associated with a decrease in the amount of blackening. Similar results were obtained in a greenhouse on synthetic sandy soil to which potash had been added."

During the winter of 1935 and 1936 potatoes were planted in a greenhouse on pure sand with the addition of fertilizer mixtures compounded from relatively pure salts. These salts carried boron, copper, manganese, and zinc, in addition to the more common and essential elements. The yield of tubers was good, even on a low potash supply, and none of the tubers darkened after boiling. Thus, although the level of available potash in the soil may be a critical blackening factor, in this case the potatoes grown on a low potash supply did not darken.

In 1936 experiments were carried on at Antigo, Madison, and on a new location at Hancock, Wisconsin. Although potash was added to the soil when the potatoes were planted, tests at the close of the growing season showed that, to a great degree, the potash had not remained available for the plants. The unusual dryness of the 1936 growing season was probably a factor in rendering the potash unavailable. Since all samples of these tubers blackened upon cooking, we are led to state that potatoes raised on low potash soils or soils in which the potash is not available, show a greater tendency to darken than those grown on soils containing liberal supplies of available potash.

Effects of Rare Minerals

"Because some of the darkened potatoes contained more than 1.8 per cent potassium in their dry matter, which previously appeared sufficient to prevent blackening," continues Dr. Tottingham, "perhaps darkening is also related to the amount of rarer mineral elements, such as copper, manganese, boron, and zinc, in the soil. In the winter of 1936 and 1937 potatoes were planted in galvanized iron boxes filled with sand, to which a fertilizing salt mixture was added. Because the sand would absorb zinc from the boxes, only the copper, manganese, and boron content of the soil was varied. The Cobbler, Chippewa, and Rural New Yorker varieties of potatoes were used for this experiment."

The leaves of potato plants growing in soil containing little potash and none of the rare minerals became partially bleached and curled. Later the vegetative tips of the main stems died, and the lower branches began to grow more vigorously. The few potatoes that did grow on these plants were about the size of pigeons' eggs. This same reaction took place in plants which grew on low potassium soil to which copper and manganese, but no boron salts, were added. In fact, this boron response, which has been noticed by other research workers, was found to be typical of potato plants grown on soils lacking this mineral. Although the relationship of boron to the darkening of potatoes has not been determined, a lack of

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Note the darkening of the lower left group of potatoes. Available potash was lacking in the soil in which the lower left potatoes were grown. The upper and right groups of potatoes were grown in soil having sufficient available potash and did not darken upon cooking.

Keep Bees for Fruit and Honey

By A. B. Bryan

Clemson Agricultural College, Clemson, South Carolina

THE "busy-ness" of bees is good business for farmers. This is eminently, doubly true despite the fact that bees are busy in their own interest rather than in the interest of farmers. It is true if and when farmers are intelligent enough to take advantage of the thirftiness of bees and even to encourage their thrift and their industrious, activity, and then utilize their labor and the product of their labor.

Doubly true, we said. And how doubly? Flitting from flower to flower in an apparently aimless manner, bees gather nectar and in so doing fertilize to greater yields the fruits and other plants that farmers cultivate. Returning with this nectar to their hives, bees industriously manufacture it into honey to be stored for their own needs against seasons when they cannot gather nectar; and thus they are a source of an important supply of the sweets which are essential in human food. Yet many farmers fail to capitalize on bees.

Many fruit crops, but more especially apples, must have insects to pollinize them. Of course it is not the honeybee alone which is of value in this respect; but our agricultural operations have so depleted the other pollinizing insects that we now have to depend largely on the honeybee.

A great and growing industry is building up in southern sections of the United States in the production and merchandizing of bees for pollination work in apple orchards. In some cases the orchardist owns his own bees and moves the colonies into the orchard each spring just before the apples bloom. In other cases the orchardist rents the bees from beekeepers for the duration of the apple-blooming season. The usual procedure is to place the bees in the orchard at the rate of one colony or hive of bees per acre, with a special effort to place the bees near the varieties of apples which produce suitable pollen.

In many apple orchards in the United States only small or average size crops are the rule because too few bees are present in the orchards at blossoming time. It is time that orchardists and beekeepers realize more fully that there is a chance to cooperate in the matter of bees and apples to their mutual advantage. This phase of beekeeping is not yet being promoted to the full advantage of fruit growers and beekeepers.

An Early Immigrant

The honeybee as we know it in America was not originally a native insect, for there were no true honeybees in this country when the first Europeans arrived here. Of course there were the many kinds of wild bees which we still have, and there were many bumblebees native to this country. The value of the true honeybee was early recognized by the colonists, and as early as 1638 importations of honeybees were made to New England.

The earliest importations were of the black bee or so-called German bee from Europe, and that type is still very common in some sections of the country. However, because the yellow or Italian bee was later found to be much more gentle and tractable, it has replaced the black bee to a large extent.

Honey, it seems, was considered a prize food long before people learned beekeeping methods that made it possible for honey to become an article of commerce. Before there was anything that could be called "beekeeping," man robbed wild bees of their stores of honey wherever and whenever he could. And what is honey, and why is it the inimitable product of one of Nature's laboratories not possible of duplication in the laboratories of man?

"Honey is a material elaborated by certain insects from the sweet secretions of blossoms of plants," one authority states. "Honey is made by several kinds of insects in addition to the honeybee. But the honeybee in its various species is the only insect which makes honey in quantities sufficient to offer commercial possibilities.

"Honey is made only from nectar gathered mainly from the blossoms of plants. Now when this nectar is gathered by the bees it is far from being real honey. Many things have to be done to it before it becomes the delicious article we know as honey. In the first place, this nectar is a weak sugar solution containing sugar identical with what we know as common white sugar. It carries also coloring materials peculiar to the plant from which it is gathered, as well as some minerals and other materials.

"Now begins a wonderful process. First, the water content is reduced by the bees from about 80 per cent to about 20 per cent. The sugar is almost completely changed from the original complex sugar to two simple sugars known as dextrose and levulose."

A county agent helps a beekeeper in more efficient beekeeping.

Valuable Human Food

Noteworthy is the fact that the two sugars found in honey, dextrose and levulose, do not need to be digested when eaten by man, but are ready to be directly absorbed into the blood stream. It is a remarkable feature of honey as valuable human food.

There are other things that happen to the nectar in the process of changing it into honey; the bees add to it certain delicate aromas during the process. These aromas make honey the distinctive "flavor food" that it is, making it impossible for men to duplicate natural honey by any synthetic product.

The two simple sugars, dextrose and levulose, which are principal ingredients of honey, do not occur in the same proportions in all honeys. Thus clover honeys of the northern states have a large proportion of dextrose and not so much levulose. On the other hand, such southern honeys as tupelo of the coastal areas and sourwood of the Appalachian mountains have an unusual amount of levulose and a smaller proportion of dextrose.

This variation in the proportion of the two sugars has a very definite effect on the honey concerned. Dextrose readily forms crystals something like ordinary white sugar, while levulose is difficult to crystallize. Thus a honey with a high proportion of dextrose, such as clover honey, will readily form crystals or "turn to sugar." A honey with a preponderance of levulose, such as tupelo or sourwood, will remain in liquid form almost indefinitely.

Collecting The Price

By C. B. Sherman

U. S. Department of Agriculture,
Washington, D. C.

A Federal inspector checking a carload of potatoes.

TO RAISE a better crop is one thing. To sell it for an adequate price is another. To collect the price after it is agreed upon and the crop is sold is yet another, and sometimes that is the hardest part of all.

That it is essential to collect, if a man is to get anywhere with his farming, goes without saying, yet many a farmer the country over has seen a good crop go for nothing—or for a deficit if he has had to pay transportation on it.

But today a remedy is at hand, if a farmer will grow one or two good business papers along with his potatoes. If he will have a clearly written contract of sale and an inspection certificate covering his shipment, he will get his money—though even then it may take time.

Honest Dealing

A shipper in Minnesota sold a car of U. S. No. 1 size A potatoes to a dealer in Iowa. When the car arrived the buyer said he would have to reject it because the sacks were not branded U. S. No. 1 and because he thought the potatoes were not large enough. The shipper protested to the U. S. Department of Agriculture. The Department asked the broker to report by wire the terms of the sale, and the shipping-point inspection was looked into. The terms were clear and the inspection certificate showed that the sacks were new and branded and that the potatoes graded U. S. No. 1, size A. The buyer was notified of these facts and that he should accept the shipment at once. Without further delay the buyer accepted and paid the farmer the contract price of $619.20.

But the contract must be clearly stated to be of best use. A grower in Utah sold two cars of onions to a dealer in Chicago. The contract said the shipment would be made the first week of the month. When the cars arrived a dispute arose about the meaning of that time phrase in the contract and the dealer didn't want the shipment. The shipper filed a complaint with the Department, which advised the buyer that apparently the seller had made good delivery under the contract as it was worded. Thereupon the buyer paid the drafts for $630.00 covering the purchase price on both cars. The grower got his money because he had a contract and called on the Government to sustain it,

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Dixie—Land of Cotton and Forests

By Lyle Brown

Extension Forester, Alabama Polytechnic Institute, Auburn, Alabama

DIXIE is not only a land of cotton, according to claims of those who are enthusiastic about the forestry future of that section. This potential forestral garden spot of the country comprises the 11 southern States from Virginia to Texas, whence came the long leaf and other yellow pines, and to which pulp and paper mills and seekers of plentiful raw wood fiber are making their way in goodly numbers.

The two foremost reasons for such claims by the sponsors of a southern forestral renaissance are that a sensible land-use program will involve forest trees for the proper protection and utilization of nearly two-thirds of the land area in the region. Favorable climatic conditions permit the production of lumber, poles, posts, staves, railroad ties, etc., and wood fiber in other forms more abundantly and cheaper than in any other section of the United States. Here the value of forests as a restraining influence on soil erosion and other destructive agencies is widely gaining recognition, as this is one of the forest's more important functions.

This region of 296 million acres, including Virginia, North Carolina, South Carolina, Georgia, Alabama, Florida, Mississippi, Arkansas, Louisiana, and eastern Texas and Oklahoma, from whose virgin timber stands a large quantity of the world's finest timber products have come, still has almost 192 million acres in woods. The proportion of practically 2 acres in woods to 1 in open land is being increased by the present trend of 3 acres turned back to forestry for every 1 cleared for agricultural purposes. Such a trend can hardly be expected to show a decrease for several years, with the present alteration of cropping systems and the soil conservation programs in vogue.

To those who are interested in the integrated uses of forests rather than monetary returns alone, it is quite evident that the topography, quality, and general condition of much of the land is going to demand a very large proportion of timber for protection against the ravages of soil erosion. Reconnaissance surveys have established the already admitted fact that upward of 75 per cent of whole States within the area is showing some degree of erosion. Unprotected areas are recorded as losing 75 to 100 tons of soil per acre per year with huge losses in water run-off, while research has recently shown that even rough lands with good forest cover properly protected from fire will show a very small water run-off and little or no actual loss of mineral soil. These facts are encouraging many land-owners to reforest by planting open lands and countless others to adopt systems of protection to encourage early natural regeneration of stands.

Large Export Business

Looking at the purely economic side of forestry in the Southeast, we find that the region is, as it always has been, a large exporter of lumber and other timber products. During the year 1936 the lumber cut in these 11 States was more than 74 billion board feet of soft-wood, mostly yellow pine, and 21 billion board feet of hardwood.

To such figures we may add other products including the rather recently created demand for nearly 4 million cords of wood annually by pulp and paper mills. A very large portion of such business can be maintained permanently because of the high productivity of the land. While recently cutover acreages are yielding poorly now, it will require only fire protection and a few years until they will be mostly well-stocked and showing a good per-acre production, which may be ready for pulpwood or naval stores in 15 to 20 years, poles in 20 to 30 years, and sawlogs in 30 to 40 years. The better sites of the yellow pine lands will give an annual production of 400 to 500 board feet per acre, while choice sites under good management may yield more than twice that amount.

Industrially, a large number of the permanently located saw mills are adopting selective cutting methods and are working toward placing their operations on a sustained yield basis which will afford a continuous cut of timber. Smaller mills having no appreciable holdings of their own are dependent upon local production, which in many cases is adequate to sustain them, or they may move from one location to another to provide more accessible raw material.

Paper Mills Move South

The influx of pulp and paper mills into the South during recent years is a result of research which has shown that southern pines, previously considered unfit for newsprint and better grades of paper, can be used quite successfully and very economically, not only in the making of the original Kraft paper, but in the manufacture of finer quality products, which have heretofore been obtained only from spruce and other less resinous trees.

This movement of the paper industry to the South is apparently very definitely to the advantage of the industry, but it remains for time and the adoption of procurement and cutting practices by the industry to tell whether or not it is to benefit the producer of the trees which are made into these products. Doubtless, competition with each other and with other wood-using industries will force the general level of prices for

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Short-leaf pine being cut for pulpwood. Good well-spaced trees are left for a future harvest of poles, piling, or saw logs.

Strike a Balance Of Soil Fertility

By R. E. Stephenson

Oregon State Agricultural College, Corvallis, Oregon

THE tonnage of commercial fertilizers used in Oregon increased 50 per cent in 10 years following 1926. The amount used at present is relatively small, 12,000 tons in 1936. Perhaps no one can state accurately the amount of fertilizer necessary to replace removal of fertility from the soil. How much fertilizer might be profitably used is also elusive of estimation.

Grain occupies a third to half the cropped land in Oregon. Small grain is mostly sold off the farm and therefore removes fertility. To replace fertility removal (N-P-K) in 20 million bushels of wheat and mixed grains produced annually would require 84,000 tons of nitrate of soda, 33,000 tons of 16 per cent superphosphate, and 6,000 tons of muriate of potash, a total of 123,000 tons or more than 10 times the fertilizer used on all the crops produced and representing a value of nearly $3,500,000. This makes no allowance for fertility removal in the straw.

We are not asking that fertilizer practice should be based upon replacement. To replace the entire fertility removal is neither necessary nor profitable. Fertilizer practice is a problem in economics. No doubt more fertilizer could be used profitably than has been used. Any reasonable attempt to draw a balance sheet, however crude, aids one's perspective, and helps to impress the reality of the problem.

In spite of better machinery, improved seed varieties, and better tillage, yields are not always maintained at former high levels, partly because the fertility balance has been given too little consideration.

Sale of crops is not the only cause for loss of fertility. Even when crops are fed, there is ample opportunity for fertility losses. According to estimates, Oregon livestock produce about $25,000,000 worth of manure annually, based upon fertilizer values. The careless methods of handling and unpreventable causes result in losses of one-fourth or more of the fertility. A conservative estimate would place $6,000,000 as the loss of fertility value of the animal manures. This is more than the removal of fertility in grain sold, and would require 200,000 tons of commercial fertilizer to replace.

Unavoidable Losses

There would be some loss of fertility on the stock farm, even if all the fertility of the manure could be saved. Sale of animals and animal products, such as milk, removes fertility. The usual figure is 10 to 20 per cent of the fertility value of the feed consumed retained by the animal. This would represent perhaps $2,500,000 worth of fertility, or an amount several times the fertilizer purchased.

Still other fertility losses are not made good. According to estimates by Lipman, the average crop removal loss is about one-third the total. A nearly equal amount of fertility is lost by leaching of soluble plant food and by erosion of the rich topsoil. Oregon has approximately 4,000,000 acres of crop

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Everett Troyer of Laotto, Indiana, State Champion in 1937, grew the Katahdin variety of potato.

Quality Potatoes From Muck Soils

By N. Kent Ellis

Department of Horticulture, Purdue University, Lafayette, Indiana

WITHOUT question, the greatest amount of high-quality, well-packed, Indiana-grown potatoes reaching the markets today is grown on muck soil. The acreage of muck-grown potatoes in Indiana has increased in the last 10 years, and with the present favorable outlook, as far as production is concerned, it is likely to continue.

With increased knowledge in fertilizer practices, and still more recent the introduction of newer varieties, the grower no longer is ashamed to say "certainly these are muck grown." The old prejudices against potatoes grown on muck soils are rapidly being broken down.

In Indiana the term "muck" is used broadly to denote all organic soils, from those containing a high percentage of mineral to the very raw and fibrous peats. Potatoes do well over a wide range of different soils, provided the reaction of the soil is suitable to potato production. High yields are not possible under alkaline conditions, that is with the pH at 7.5 or above, although scab is not likely to be present. With the soil reaction at about the neutral point (pH 7), potato production is not advisable due to frequency of scab in these soils, even though the yields are satisfactory. The mucks best suited to potato production are those having a pH of about 5.2. Excellent crops of potatoes are grown on very acid mucks with pH down to 4.4. At this reaction the yields are decreased, but the tubers are likely to be free from disease. As the numerical pH value approaches 7, the probability is greater that the percentage of No. 1 potatoes will be less. On these soils the alkaline (or sweet) condition can be corrected by the application of sulfur flour. The application will range from 500-2,000 pounds per acre, depending on the alkalinity. On soils which are too acid (or sour) limestone can be applied to sweeten the soil, but potatoes should not be grown on the field immediately following the lime application. The grower should have soil tests made and have his county agent or State experiment station make suitable recommendations.

Field Preparation

The best potato soils are those on which the water level can be maintained at 30-36 inches below the surface. Soils which are too wet, and particularly very acid soils which are wet, will not produce good yields. It is essential, however, that the soil remain moist throughout the season, thus helping to prevent scab and protect the field from frost.

Plowing may be done either in the fall or spring, depending on whether or not a green manure crop is being used, and on the age of the muck area. In either case the plowing should be deep, 8-12 inches. This will afford a deep seed bed. For soils which have been in production for many years, it is recommended that rye be drilled in as early as possible in the fall and left standing over winter to protect the land from blowing. It can then be turned under in the spring when it has reached a height of about 10-12 inches. This will cause the soil to be loose, and unless there is much rain, the land should be well packed by means of a cultipacker or heavy concrete roller. Areas which are well protected from wind can be plowed in the fall, which will allow the field to be worked earlier in the spring and will require less packing. Where soils are raw and it is desirable to weather them more rapidly, fall plowing is recommended. This affords a finer seed bed for the crop.

The proper fertilization of a potato crop on muck ranks in equal importance to the selection of good seed. The fertilizer element most essential for producing a good crop is potassium. In the fertilizer mixture, the second greatest need is phosphate. Nitrogen seldom pays for itself when added to the fertilizer for potatoes, except under abnormally cold and wet conditions in the spring or on very acid soils.

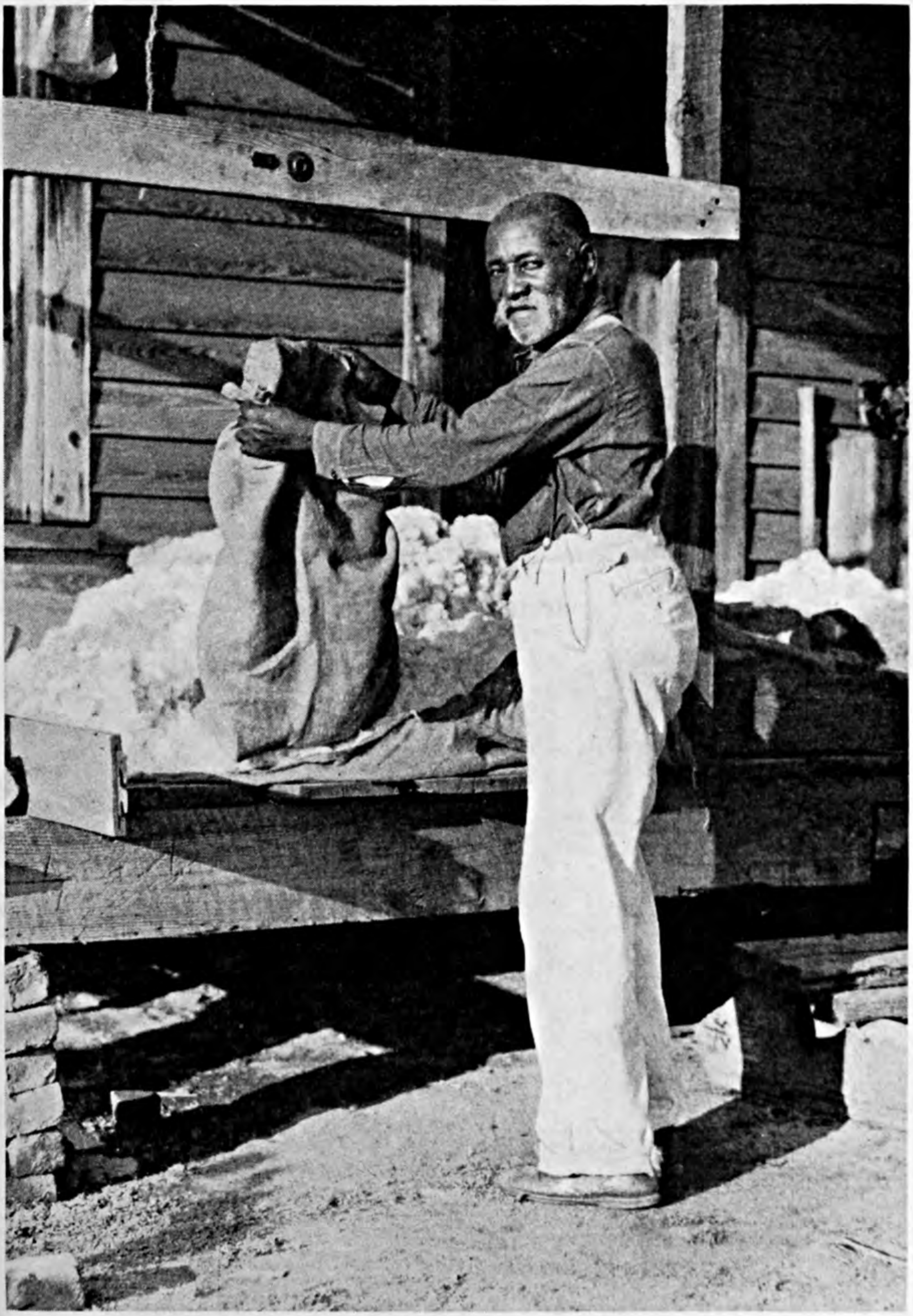
The following table is a progress report on the 1937 yields of Cobbler potatoes from Purdue's Northern Indiana Muck Crops Experimental Farm. The data are averages of duplicate plots, except the check and the 0-8-24 controls which are each replicated six times. Fertilizer was used at the rate of 1,000 pounds per acre on each plot.

From these data it is seen that potash gives the greatest return on the investment. The equivalent of 480 pounds of muriate of potash returned 121 bushels of potatoes per acre over the unfertilized plot. Eight per cent phosphate returned 48 bushels over the untreated plot. The combination of the above two treatments increased the yield 151 bushels over the unfertilized. Greater potash applications increased the yield, but increases above 480 pounds of muriate of potash were not profitable to the grower, unless the price of potatoes was above $1 per bushel. Also, to pay for increases in the application of phosphate above 80 pounds of phosphoric acid as in 0-24-24 over 0-8-24, the price of potatoes must remain above $1 per bushel.

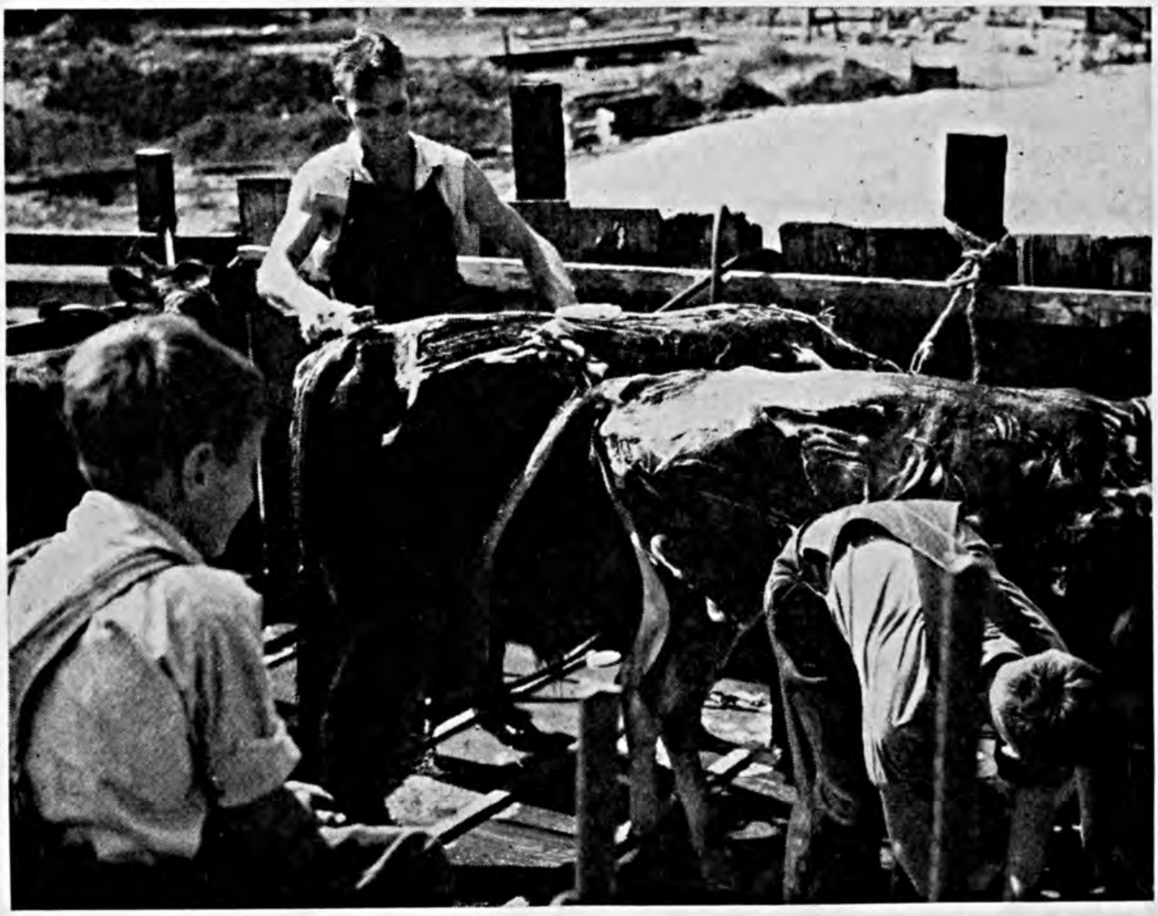
From the standpoint of economy, the proper placement of fertilizer is especially important. Data from the 1937 fertilizer placement plots at the Northern Indiana Muck Crops Experimental Farm bear this out. During 1937 the yields from the 500- and 1,000-pound broadcast applications were the same. The 250-pound treatment beside the seed in bands, and 500 pounds below

(*Turn to page* 44)

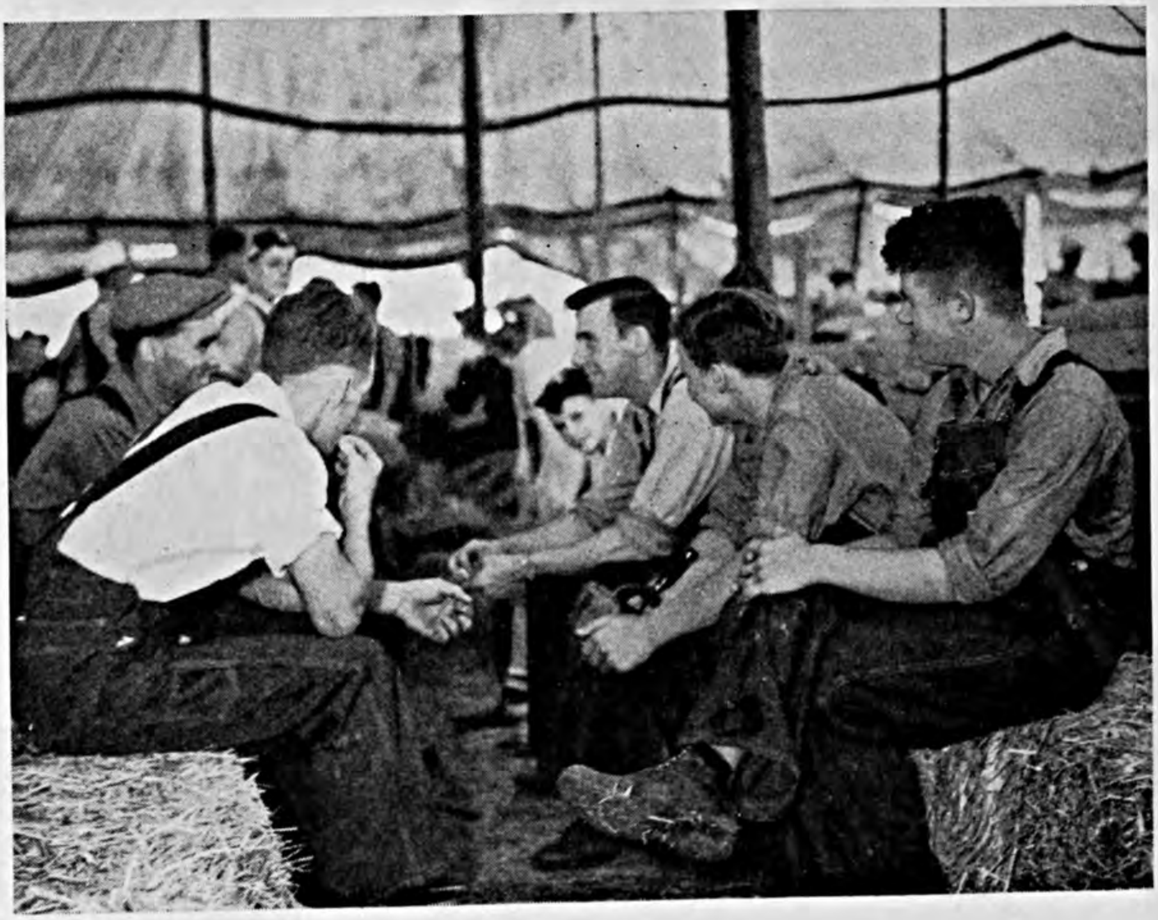
PICTORIAL



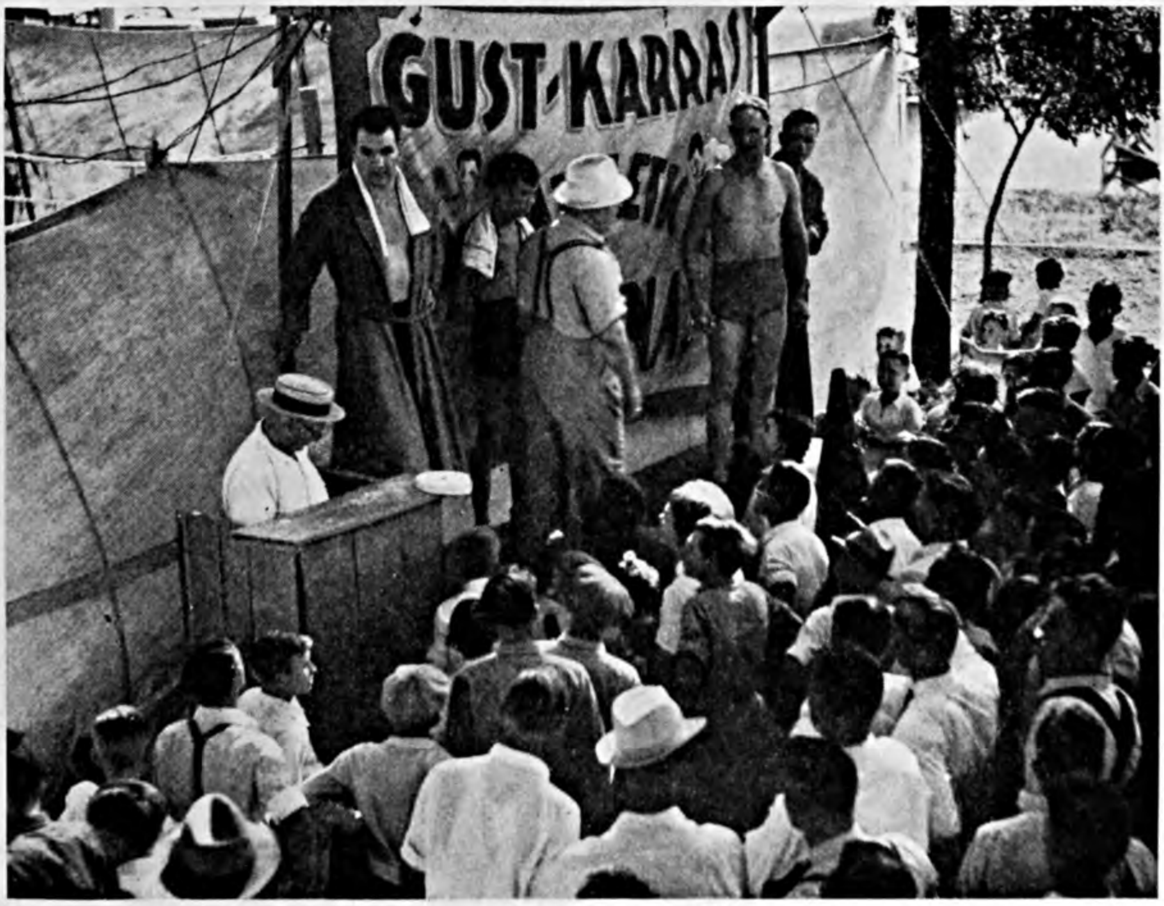
Pleased with his pickin's



Behind the Scenes



On the Midway]



Left: He's still sitting pretty, but the real thrill for the audience comes when . . . .

Below: Three shorthorns born on the farm of John Petrie, Grafton, N. S., Canada, were the second known set of triplet calves in North America.

The Editors Talk

Fertilizers Go West

Usually we think of the West as the country of the great open spaces, mountains, grazing ranges, and cattle. But, as in other regions, changes in agriculture are taking place. In the 11 western States 11,412,789 acres of farm land are now irrigated which, according to the U. S. census for 1934, comprise 87.6% of the irrigated area of the United States.

On some of this acreage in each of the western States, fertilizers are now used. This is a marked change to even a few years ago, when in some States little if any plant food was applied. It is estimated that the total of all fertilizer usage in this area and British Columbia in 1937 was 307,935 tons, which contained some 10,580 tons of actual potash. About 78% of this total tonnage was used in California, but it is significant that fertilizers are now used in the other States to some extent and that the interest in fertilizers is growing, as in Idaho for instance, where a fertilizer mixing and distributing system is being established.

In addition to the irrigated acreage there are, of course, large acreages of crops where irrigation is not practiced. Rainfall varies over a very wide range. Vast areas are in cattle ranges; some crops are produced by dry-land farming; and in other regions, as in the western part of Washington, the rainfall is sufficient for the successful use of fertilizers without irrigation. But taken as a whole the water supply "on tap" for crop production is the life stream that produces much of the more important specialized farm crops, such as fruits, both citrus and deciduous, vegetables, and sugar beets.

Research on soil and fertilization problems is an increasing activity of the State agricultural colleges and experiment stations of the region. Each has its own special problems to contend with in relation to its particular types of soil, climate, and crop production. Fundamental, however, to much other work on soils and fertilizers is the determination of how much plant food is available in the more important agricultural soil types. In such determinations biological and chemical methods are used. In addition to field work, representative samples of the chief types are taken from the field for more intensive studies under controlled conditions at research centers. Thus an inventory of present soil fertility levels and the location of areas of possible nutrient deficiencies in soils are being obtained. Such information is basic to efficient fertilizer use and to the prevention of soil nutrient depletion.

The West is also a region of large crop and fertilizer distributing organizations that in many cases maintain trained agricultural staffs which are contributing their share to the work on plant food. Among such units are the fruit and vegetable canning and packing companies, growers cooperatives, the large sugar beet companies, fertilizer materials companies and the fertilizer trade which maintain an active and organized interest in the solution of soil fertility problems.

Because of the mountainous nature of the country the distance between commercial crop producing areas is often great. Under such conditions to spread the load and reduce the time lag, understanding and cooperation between such agricultural organizations and the State agricultural authorities are highly desirable and increasingly the tendency. While the use of fertilizers in many parts of the West is quite new, because plant food is being removed by specialized crops in large quantities, it is inevitable that fertilizer consumption in the commercial crop producing areas will ultimately increase. Efficient fertilizer use and crop production in the future depend upon the soil fertility work being done today and upon the cooperation of all concerned.

"Ask the Plant"

In July the Plant Food Research Committee of the fertilizer industry made a tour of Indiana and Illinois to study the results of experimental work with fertilizers in these States. As noted in an excellent account of the tour by Joe Bumgarner in the *Prairie Farmer,* the soil scientists came to ask the plant how it was faring.

"We are asking the plant: 'What are you getting from the soil?'" said one of the hosts of the party. "Plant breeders are developing better soil mining machinery every year. Farming is a chemical operation. Fertilizer treatments must be planned to take advantage of the better mining machinery in hybrid corn and new varieties of other grains."

As an aid to determining plant-food deficiencies, rapid chemical tests have been developed. The testing kit originally designed by Professor S. F. Thornton at Purdue has been offered to agricultural teachers, county agents, and other competent workers in Indiana. About 1,000 kits have been distributed and more than 100,000 soil samples tested. As these tests for plants are perfected and agricultural workers become conversant with the technique, then such tests will doubtless be of great value.

The effect of fertilizers on the Hopkins Poorland Farm, Marion County, Illinois, was noted with much interest. It will be recalled that Dr. Cyril G. Hopkins selected the poorest farm on a soil type common to south-central Illinois. The original system of farming on this land featured liming, legume rotation, application of organic matter, and the use of rock phosphate. Within recent years symptoms of potash deficiency have appeared on many of the crops grown in southern Illinois. At the present time at Poorland farm, applications of commercial fertilizers containing phosphorus and potash (analyzing 0-8-24) double the yields. On the soils of this farm, Dr. E. E. DeTurk of the University of Illinois pointed out, the plants are unable to draw on the relatively unsoluble feldspar for enough available potash to meet plant needs even though the total of the potash in the soil is high. "We recognize throughout this region a definite deficiency of potassium and phosphorus," said Dr. DeTurk. "Flat prairie soils of southern Illinois need lime, legumes, organic matter, phosphate, and potash."

At other farms, in order to find the effect of fertilizers in large quantities, heavy applications of fertilizers have been made up to 6,800 pounds per acre as an initial treatment. This is purely an experiment to determine the effect of available plant food in the rotation of the crop that follows. Initial results show that relatively poor soil can be changed into land that yields 3.6 tons of red clover from the first cutting.

The tour emphasized that as efficiency in crop production develops, so must efficiency in the use of fertilizers keep pace with it. Many problems yet remain to be solved. Probably we shall be asking the hungry plant for years to come.

REVIEWS

This section contains a short review of some of the most practical and important bulletins, and lists all recent publications of the United States Department of Agriculture and the State Experiment Stations relating to Fertilizers, Soils, Crops, and Economics. A file of this department of BETTER CROPS WITH PLANT FOOD would provide a complete index covering all publications from these sources on the particular subjects named.

Fertilizer

¶ "Fertilizers, What They Are and How to Use Them," Michigan Agricultural Experiment Station Special Bulletin 133 (Revised in March, 1938), by C. E. Millar and L. M. Turk, is a most comprehensive publication dealing with the basic principles concerning fertilizer usage in the maintenance of soil productivity and in building up depleted soils. As in the original bulletin issued in 1924, the authors present pertinent information on the plant-food requirements of plants, the quantity of nutrients contained in different crops, the sources of fertilizer materials, time, rate, and method of application, and the effects of fertilizers on soils and crops. Based on the newer concepts of commercial fertilizer gained from more extensive research, a much broader treatment of the above subjects is given in the revised edition.

Because of the many factors other than soluble plant nutrients which affect plant growth, such as rainfall, drainage, temperature, rotation, and previous soil treatment, the problem of determining in the laboratory the kind of fertilizer best suited for the soil is difficult. In selecting the fertilizer reference to the results of field experiments should be made. The rapid chemical tests serve as a useful guide in determining fertilizer needs of soils, but the authors state that sole reliance should not be placed on them.

After many years of experimental research, the Soils Department of this Station has determined that 16 fertilizer grades in addition to potash and nitrogen materials will meet the requirements of all crops in Michigan. Fertilizers containing less than 20% plant food are not recommended because of higher cost per pound of plant food. The authors advise that a high analysis fertilizer which meets the individual soil and crop requirements is the most economical, since a greater portion of the purchase price goes to pay for plant food. In this connection it is interesting to note from a table in the bulletin, giving the sales of fertilizer in Michigan in recent years, that the formerly popular low-grade analyses are steadily decreasing in sales, being replaced by the recommended grades. An outstanding example of this is the 2-12-2, containing only 14 per cent plant food, which constituted 16.9 per cent of total sales in 1928 as compared with 7.5 per cent in 1937. This grade is being supplanted largely by the 2-12-6 analysis, which showed an increase in total sales of from 13 per cent in 1928 to 44.9 per cent in 1937. This trend shows the value of scientific investigations carried on by experiment stations on the more efficient use of fertilizers and elimination of unnecessary grades that add considerably to fertilizer production costs. The contents of this bulletin will be of interest to all desiring general information on commercial fertilizers.

"Fertilizers for Potatoes (Third Report)," Agr. Exp. Sta., Storrs, Conn., Bul. 223, Apr. 1938, B. A. Brown.

"Information Sheets, 1935 to 1938," Agr. Exp. Sta., State College, Miss., Vol. 111, 101-150.

"What Fertilizer for Wheat," Cornell Univ. Agr. Ext. Serv., Ithaca, N. Y., Mimeo. 460, June 8, 1938, E. L. Worthon.

"Fertilizers Recommended for Field Crops," Agr. Exp. Sta., State College, Penna., Oct. 1937.

"Fertilizers for Tennessee Soils," Agr. Exp. Sta., Knoxville, Tenn., Cir. 60, Apr. 1938, C. A. Mooers.

"Suggested Fertilizers for West Virginia Farms," Agr. Ext. Serv., Morgantown, W. Va.

"Influence of Farm Manure on Yields and Sucrose of Sugar Beets," U. S. D. A., Washington, D. C., Tech. Bul. 614, Mar. 1938, Stephen H. Hastings, S. B. Nuckols, Lionel Harris.

Soils

¶ Supported by a volume of data obtained from 28 years of experimentation to determine crop responses under varying systems of soil treatment, G. L. Schuster and C. E. Phillips in Delaware Agricultural Experiment Station Bulletin 209, entitled "Fertility Experiments on Sassafras Silt Loam," draw numerous important conclusions as to the fertilization of crops grown on this major soil type. The experiments were laid out in 1907 and carried through the 1935 crop season, but the authors interpret the data on the basis of two periods.

The first 15 years' results were reported in 1924 in Station Bulletin 137, the conclusions from which are quoted in the current publication. Summarizing these results, the authors state that potassium was the limiting factor in the production of corn and soybeans under the condition of these experiments. The limiting factor in the production of wheat and hay was phosphoric acid. It was determined that phosphoric acid-potash combination was almost equally as good as a complete fertilizer for all crops. Applications of manure for corn production were equally as good, if not better than a complete fertilizer. Corn or soybean yields were not increased by lime, except where potash was applied. Favorable results were obtained from lime on the hay crop; however, the greatest gains were made when lime was used in connection with phosphoric acid.

While the rotation of (1) corn followed by a cover crop of rye and vetch, (2) soybeans, (3) wheat and, (4) timothy and clover was continued throughout the studies, the soil treatment was modified somewhat at the beginning of the second period. It was believed that a larger quantity of plant nutrients had been supplied in the initial experiment than the plants could economically utilize. The quantity applied during the latter period was reduced from 50 to 75 per cent of that used at first.

A comparison of the yield trends portrayed graphically in the several charts given in this bulletin shows that the liberal use of plant nutrients was necessary to produce and maintain maximum yields. Furthermore, any marked decrease in the amount of plant nutrients was inevitably followed by a marked decline in yields.

"Relation of Soil Reaction to Strawberry Production in Central Florida," Agr. Exp. Sta., Gainesville, Fla., Press Bul. 513, June 1938, A. N. Brooks.

"Subirrigation," Agr. Ext. Serv., Gainesville, Fla., Bul. 99 (Revision of Bul. 5), June 1938, A. P. Spencer.

"Soil Conservation in Indiana," Agr. Ext. Serv., Lafayette, Ind., Ext. Bul. 228, June 1938, R. O. Cole.

"Soil Fertility Investigations Brown Limestone Land of Southwestern Missouri," Agr. Exp. Sta., Columbia, Mo., Bul. 395, June 1938, H. H. Krusekopf.

"Soil Fertility Investigations Rolling Prairie Land of Southwestern Missouri," Agr. Exp. Sta., Columbia, Mo., Bul. 396, June 1938, H. H. Krusekopf.

"The Effect of the Degree of Slope and Rainfall Characteristics on Runoff and Soil Erosion," Agr. Exp. Sta., Columbia, Mo., Res. Bul. 280, Apr. 1938, Jesse H. Neal.

"A Proposed Method for Classifying and Evaluating Soils on the Basis of Productivity and Use Suitabilities," Agr. Exp. Sta., Lincoln, Nebr., Res. Bul. 98, May 1938, Arthur Anderson, A. P. Nelson, F. A. Hayes, and I. D. Wood.

"The Chemical Content of Oklahoma Rainfall," Agr. Exp. Sta., Stillwater, Okla., Tech. Bul. No. 1, May 1938, V. G. Heller.

"Progress in Soil Conservation Research," Agr. Exp. Sta., College Station, Brazos County, Tex., Prog. Report 498, Jan. 12, 1938, P. R. Johnson.

"No Farmer Is Richer Than His Soil," (How to Build Your Soil Wealth With the Nation's Aid), Agr. Ext. Serv., Morgantown, W. Va., J. O. Knapp, Director.

"Erosion and Its Control in Oklahoma Territory," U. S. D. A., Washington, D. C., Misc. Pub. 301, Mar. 1938, Angus McDonald.

"Soil Conservation: Who Gains By It?", U. S. D. A., AAA, Washington, D. C., DS-11, Oct. 1937.

Crops

¶ A timely publication giving valuable information on growing Indiana's leading cash crop is Purdue Agricultural Experiment Station Circular 237, "Wheat Production in Indiana," by A. T. Wiancko and C. E. Skiver. Not only is wheat important for its cash return, but it lends itself to the seeding of clover and grass crops desired to round out the rotation. With a good variety, good seed, proper attention to cultural requirements, and appropriate fertilization, profitable yields can be raised in all parts of the State, the authors reveal.

The "soft red winter" type is ideally suited to the climatic conditions that prevail in Indiana. Purdue No. 1, Fultz, Trumbull, and Michigan Amber varieties are among those most extensively grown. Seed wheat should be carefully selected, cleaned, and graded. The seed bed for wheat should be fine but firm, with about 2 inches of loose soil on top to cover the seed. The authors recommend the seeding of 6 pecks per acre for normal conditions, and somewhat larger amounts for very late seeding. They state, however, that wheat should be sown as soon as possible, when freedom from Hessian Fly infestation is reasonably assured. The control of certain weeds is very essential. Weeds, such as cockle, vetch, and wild garlic, particularly injure quality of the flour produced.

In fertilizing wheat, special consideration to the phosphate and potash requirements of the clover or hay crop following it in the rotation is advised. From 200 to 400 pounds of 2-12-6 or similar analyses are recommended. A top-dressing with a soluble nitrogen fertilizer in early spring has been found profitable on soils that contain insufficient nitrates.

"Forty-ninth Annual Report, Fiscal Year Ending June 30, 1937," Agr. Exp. Sta., Fayetteville, Ark., Bul. 351, Mar. 1938, C. O. Brannen.

"Annual Report of Extension Service, Fiscal Year July 1, 1936 to June 30, 1937, With Report of Field Activities December 1, 1936 to November 30, 1937," Agr. Ext. Serv., Little Rock, Ark., Ext. Cir. 405, Feb. 1938.

"Accomplishments of the Colorado Experiment Station," Agr. Exp. Sta., Fort Collins, Colo., Jan. 1, 1937.

"Planting and Maintaining Colorado Lawns," Agr. Exp. Sta., Fort Collins, Colo., Bul. 442, Mar. 1938, George Beach.

"Strawberry Culture in Connecticut," Agr. Ext. Serv., Storrs, Conn., Bul. 263, Revision of 167, Apr. 1938, H. A. Rollins.

"Report of the Director for the Year Ending June 30, 1937," Agr. Exp. Sta., Storrs, Conn., Bul. 221, Nov. 1937, William L. Slate, Director.

"Report of the Director for the Year Ending October 31, 1937," Agr. Exp. Sta., New Haven, Conn., Bul. 409, Apr. 1938, William L. Slate, Director.

"Tobacco Substation at Windsor, Report for 1937," Agr. Exp. Sta., New Haven, Conn., Bul. 410, Apr. 1938, P. J. Anderson, T. R. Swanback, and O. E. Street.

"Catalog of the Official Publications of the Florida Agricultural Experiment Station and Florida Agricultural Extension Service 1888-1937," Agr. Exp. Sta., Gainesville, Fla., May 1938, Ida Keeling Cresap.

"1937 Report Cooperative Extension Work in Agriculture and Home Economics, Report of General Activities for 1937 with Financial Statement for the Fiscal Year Ended June 30, 1937," Agr. Ext. Serv., Gainesville, Fla., Wilmon Newell, Director.

"Ornamental Trees," Agr. Ext. Serv., Gainesville, Fla., Bul. 95, Apr. 1938, Harold Mowry.

"Citrus Propagation," Agr. Ext. Serv., Gainesville, Fla., Bul. 96, May 1938, A. F. Camp.

"Seventeenth Annual Report 1936-1937, Crop Yields Shown for Calendar Year 1936," Ga. Coastal Plain Exp. Sta., Tifton, Ga., Bul. 28, S. H. Starr, Director.

"A Study of Soybean Varieties With Reference to Their Use As Food," Agr. Exp. Sta., Urbana, Ill., Bul. 443, May 1938, Sybil Woodruff and Helen Klaas.

"Combating Corn Diseases," Agr. Ext. Serv., Urbana, Ill., Cir. 484, Mar. 1938, Benjamin Koehler and James R. Holbert.

"Report of the Director for the Year Ending June 30, 1937," Agr. Exp. Sta., Lafayette, Ind., J. H. Skinner, Director.

"Pasture Improvement in Indiana," Agr. Ext. Serv., Lafayette, Ind., Ext. Bul. (Revised) 205, May 1938, K. E. Beeson and M. O. Pence.

"Tree Windbreaks for Indiana Farms," Agr. Ext. Serv., Lafayette, Ind., Ext. Bul. 226, Feb. 1938, Daniel DenUyl.

"Soybeans in Indiana," Agr. Ext. Serv., Lafayette, Ind., Ext. Bul 231, May 1938, K. E. Beeson.

"Fiftieth Annual Report of the Agricultural Experiment Station of the University of Kentucky, Part II, Bulletins 368-377, Circulars 46-48," Agr. Exp. Sta., Lexington, Ky., Bul. 368, Mar. 1937.

"Fifty-third Annual Report of the Maine Agricultural Experiment Station, 1936-1937," Agr. Exp. Sta., Orono, Maine.

"Maine Fruit Notes," Agr. Ext. Serv., Orono, Maine, Vol. 12, No. 2, Apr. 1938, A. K. Gardner and O. L. Wyman.

"Forty-ninth Annual Report of the University of Maryland Agricultural Experiment Station," Agr. Exp. Sta., College Park, Prince George's County, Md., Vol. 49, 1935-1936.

"Fiftieth Annual Report of the University of Maryland Agricultural Experiment Station," Agr. Exp. Sta., College Park, Prince George's County, Md., Vol. 50, 1936-1937.

"Annual Report for the Fiscal Year Ending November 30, 1937," Agr. Exp. Sta., Amherst, Mass., Bul. 347, Mar. 1938.

"The Massachusetts Commercial Vegetable Grower," Agr. Ext. Service, Amherst, Mass., No. 12, June 1938.

"Fruit Notes," Agr. Ext. Serv., Amherst, Mass., Apr. 1938, W. H. Thies.

"Seventy-sixth Annual Report of the Secretary of the State Board of Agriculture of the State of Michigan and Fiftieth Annual Report of the Experiment Station from July 1, 1936 to June 30, 1937," Agr. Exp. Sta., Lansing, Mich., 1937.

"Alfalfa Management With Special Reference to Fall Treatment," Agr. Exp. Sta., East Lansing, Mich., Sp. Bul. 292, May 1938, H. C. Rather and C. M. Harrison.

"The Quarterly Bulletin," Agr. Exp. Sta., East Lansing, Mich, Vol. 20, No. 4 and Supplement to No. 4, May 1938.

"Growing Strawberries in Missouri," Agr. Exp. Sta., Columbia, Mo., Cir. 198, May 1938, T. J. Talbert.

"Fifty-first Annual Report of the Agricultural Experiment Station of Nebraska," Agr. Exp. Sta., Lincoln, Nebr., Feb. 1, 1938.

"Grain and Forage Sorghums in Nebraska," Agr. Exp. Sta., Lincoln, Nebr., Bul 316, April 1938, T. A. Kiesselbach, R. L. Cushing, and E. F. Frolik.

"Seeding and Management of Nebraska Pastures," Agr. Ext. Serv., Lincoln, Nebr., Ext. Cir. 138, Mar. 1938, A. L. Frolik and E. F. Frolik.

"Winter Wheat Production Costs, Nebraska, 1937, Six Counties, Cass, Douglas, Saunders, Fillmore, Perkins, Cheyenne," Agr. Ext. Serv., Lincoln, Nebr., Ext. Cir. 839, Jan. 1938, Arthur G. George.

"Corn Production Costs Nebraska 1937, Nine Counties, Cass, Douglas, Saunders, Fillmore, Phelps, Thurston, Cuming, Washington, Burt," Agr. Ext. Serv., Lincoln, Nebr., Ext. Cir. 840, Feb. 1938, Arthur G. George.

"Twenty-second Annual Report of the New Jersey State Department of Agriculture, July 1, 1936-June 30, 1937," Dept. of Agr., Trenton, N. J., William B. Duryee, Sec.

"Potato Diseases and Their Control," Cornell Agr. Ext. Serv., Ithaca, N. Y., Bul. 135 (Revised June 1937), Mar. 1926, M. F. Barrus and Charles Chupp.

"The Home Garden," Cornell Agr. Ext. Serv., Ithaca, N. Y., Bul. 344 (Revised Dec. 1937), Mar. 1936, Arthur J. Pratt.

"Progress of Agricultural Research in Ohio, 1936-1937," Agr. Exp. Sta., Wooster, Ohio, Bul. 592, May 1938.

"The Bimonthly Bulletin," Agr. Exp. Sta., Wooster, Ohio, Vol. XXIII, No. 192, May-June 1938.

"Clovers and Grasses for Hay and Pasture," Agr. Exp. Sta., Knoxville, Tenn., Bul. 165, Mar. 1938, C. A. Mooers.

"Maturity Studies of Marsh Seedless Grapefruit in the Lower Rio Grande Valley," Agr. Exp. Sta., College Station, Brazos County, Tex., Bul. 562, May 1938, J. F. Wood and Harold M. Reed.

"Recent Developments in Agronomy," Agr. Exp. Sta., College Station, Brazos County, Tex., Prog. Report 494, Jan. 11, 1938, E. B. Reynolds, Chief.

"Agricultural Research Aids Industrial Development," Agr. Exp. Sta., College Station, Brazos County, Tex., Prog. Report 495, Mar. 18, 1938, A. D. Jackson, Chief.

"Texas Research on Pasture Development," Agr. Exp. Sta., College Station, Brazos County, Tex., Prog. Report 499, Jan. 12, 1938, R. L. Hensel.

"1937 Results of Sugar Cane Studies Conducted at Lufkin," Agr. Exp. Sta., College Station, Brazos County, Tex., Prog. Report 504, Feb. 16, 1938, E. K. Grouch.

"Annual Report of the John Tarleton Agricultural College for the Fiscal Year 1936-1937," John Tarleton Agr. Col. Bul., Stephenville, Tex., Vol. XXI, No. 3, Nov. 15, 1937.

"Four Pasture Clovers," Agr. Exp. Sta., Burlington, Vt., Bul. 431, Mar. 1938, A. R. Midgley.

"Department of Agriculture-Immigration of Virginia," Richmond, Va., Bul. 359, May 1938, Bul. 360, June 1938, Bul. 361, July 1938.

"Western Washington Pastures," Agr. Ext. Serv., Pullman, Wash., Ext. Bul. 155 (Revised), Mar. 1938, Leonard Hegnauer.

"The Home Garden," Agr. Ext. Serv., Morgantown, W. Va., Cir. 317, Mar. 1937, A. L. Keller and K. C. Westover.

"Ginning Cotton," U. S. D. A., Washington, D. C., Farmers' Bul. 1748, Aug. 1935, Charles A. Bennett and F. L. Gerdes.

"Forest Farming," U. S. D. A., Washington, D. C., Farmers' Bul. 1794, Apr. 1938.

"List of Bulletins of the Agricultural Experiment Stations for the Calendar Years 1935 and 1936," U. S. D. A., Washington, D. C., Misc. Pub. 294, Mar. 1938, Catherine E. Pennington.

"Production of Water Cress," U. S. D. A., Washington, D. C., Leaf. 134, Feb. 1938, J. H. Beattie.

"Production of Radishes," U. S. D. A., Washington, D. C., Leaf. 157, Mar. 1938, J. H. Beattie and W. R. Beattie.

"Rules and Recommendations for Testing Seeds," U. S. D. A., Washington, D. C., Cir. 480, July 1938.

"Plans Versus Projects," U. S. D. A., Washington, D. C., Ext. Serv. Cir. 268, July 1937, H. W. Hochbaum.

Economics

¶ The interesting fertilizer report, "Tonnages of Different Grades of Fertilizers Sold in Michigan, 1937," compiled by the Soils Department of Michigan State College is an example of what can be accomplished through cooperation of colleges and experiment stations with the fertilizer industry. Since Michigan has no compulsory law requiring tonnage reports from the companies doing business in the State, the compilation is wholly from voluntary reports submitted by the fertilizer companies. The report is in detail sufficient for a rather comprehensive analysis. In 1937 the total tonnage sold in the State was 144,500 tons, of which, 121,739 tons were mixed goods and the balance was made up largely of superphosphate and nitrogenous materials. Fall sales accounted for 51,925 tons, and 92,574 tons were sold in the spring. The leading single analysis was 2-12-6, representing practically 45% of all sales. About 81% of the total sales were composed of grades or ratios recommended by the Soils Department of the State College. Approximately 86% of the total sales of mixed goods contained 20% or more of plant food. In 1934, 73% contained over 20% plant food; in 1935, 78%; and in 1936, 81%, thus showing the gradual trend toward higher analysis fertilizers. The increase in sales over 1936 was 15%. About 80% of the total sales was made up of 10 grades. The only change in the 10 leading grades in 1937 was the replacement of sulfate of ammonia and 0-16-0 by 5-10-5 and 0-8-24. The 10 leading grades in the order of their importance were 2-12-6, 0-20-0, 2-12-2, 2-8-16, 4-16-4, 2-16-8, 4-8-6, 5-10-5, 0-8-24, and 0-10-10. The 2-12-6 registered an increase of 24.6% in sales over 1936 as compared to 21% for 0-20-0, 23.6% for 0-8-24, and 19% for 5-10-5, whereas there was practically no change in sales of 2-8-16 and 2-16-8. The 2-12-2 decreased 15% and 0-16-0 lost 67.7%.

¶ According to the report of State Chemist H. R. Kraybill in Purdue Agricultural Experiment Station Circular 235 "Commercial Fertilizers," 1937 was a banner year for fertilizer business in Indiana. The only year in which all fertilizers sold were higher was in 1929 when 291,000 tons were consumed by Indiana farmers. In 1937 the consumption figure based on sales was 274,640 tons. The leading single analysis sold in the State was 2-12-6 of which 123,332 tons were sold, and is followed by 0-20-0 representing 15,297 tons. Next in importance is 2-12-2 with 14,769 tons, and in fourth place is 0-12-12 with 12,219 tons. Plant food contained in the fertilizer sold in Indiana was 5,837 tons of N, 36,530 tons of available phosphoric acid, and 23,534 tons of K_20. These tonnages compare to the other peak year, 1929, of 5,979 tons of N, 39,853 tons of available phosphoric acid, and 18,360 tons of K_20.

¶ According to the fertilizer report of the California State Department of Agriculture, a total of 231,570 tons of commercial fertilizers were sold in that State in 1937, an increase of 104,272 tons from the 1932 tonnage of 127,298. Mixed goods represented 79,266 tons of the 1937 total, showing an increase of 45,731 tons over the 33,535 tons sold in 1932. A detailed analysis of the grades of mixed fertilizers sold is not reported, thus it is impossible to estimate the relative importance of the different grades.

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Both City and Farm Folk Study Soil Conservation

Farmers are not the only ones interested in soil conservation. The butcher, the baker, the family doctor, and the banker, on the corner are all keeping an eye on this new trend in agriculture.

Approximately 740,000 persons—from all walks of life—have visited demonstration projects and C. C. C. camp areas in various parts of the country to inspect and study scientific erosion control measures being used by farmers cooperating with the Soil Conservation Service in its demonstration program.

Of this total, about 500,000 have been farmers who wanted specific information about soil-saving measures and practices, says the Department of Agriculture. Others have inspected the demonstration areas because of public interest in the erosion control program.

Collecting the Price

(*From page* 17)

but he would have been saved trouble and delay if the contract had been absolutely clear.

When a farmer is entirely in the right and has the papers to prove it, he is paid interest on this delay. A New York grower, for instance, sold a carload of tomatoes as U. S. No. 1 f.o.b. and got a shipping-point inspection certificate. The buyer rejected the shipment on arrival. The grower called for a destination inspection and it upheld the shipping-point certificate of grade. He filed complaint with the Department of Agriculture which held that the buyer had rejected without reasonable cause and that he should pay the shipper $253.11, this sum being the difference between the original contract price and the resale price that was realized on the tomatoes, plus interest. A check for this amount was mailed to the grower by the dealer.

The Department of Agriculture settles these cases under the Perishable Agricultural Commodities Act. The purpose of this act is to suppress certain unfair and fraudulent practices in the marketing of fresh fruits and vegetables in interstate commerce. It provides that those who enter into contracts shall not repudiate them without good cause and that agents must tell the truth about their transactions. It is made unlawful for a commission merchant to dump or destroy products received by him for sale unless they are without commercial value, to fail or refuse to account correctly and to do it promptly, or to make fraudulent charges. Moreover, it is made unlawful for any licensed dealer to make false or misleading statements regarding a market or regarding the condition of produce.

The settling of cases under this Act is comparatively simple when there is a definite contract and when the contract is based on U. S. grades. These grades permit an easy interpretation of contracts and a ready decision as to whether the goods supplied agreed with the contract. A shipping-point inspection certificate also helps in a quick settling. But though the law was passed several years ago, a surprising number of farmers do not know how to use it or do not have the right papers when they do invoke it.

Sometimes a lawsuit must be brought in order to settle a case, but an encouraging number of cases are settled amicably out of court, with this help from the Department. For instance, a buyer who bought a car of peaches f.o.b. shipping point for $583.98 claimed, when the car arrived, that the pack was slack and that some of the peaches showed soft bruises. The broker who negotiated the sale confirmed the buyer's inspection. When the case was referred to the Department of Agriculture the buyer agreed to accept the car but at a discount of $63, and the shipper agreed to accept the $520.98. This case also illustrates the fact that the act protects dealers as well as shippers and makes for fair play all along the line.

In fact its mere existence, and the cases that have been settled under it, now prevent many disputes and rejections that would have occurred before.

That the law works for the benefit of all—farmers, dealers, and consumers—is well illustrated in one concrete case.

A dealer in a large eastern city was reported so often and had so many cases decided against him that the Department of Agriculture placed him "on probation." He knew he was in danger of losing his dealer's license. He began to watch his step. A leading broker now tells the Department that previously he would not deal with this man, but that now this dealer has developed such a reputation for careful business, under the watchful eye of the inspectors, that he goes to this dealer first of all when he has a shipment of offer.

Improved Relations

Thus farmer-shippers are benefiting in this case, for they no longer have trouble when they ship to this dealer. Even though they got final justice before, by appealing to the Department, it was bothersome and their confidence in distance sales was weakened. Then they find that other dealers in that city are now more careful about their rejections. Brokers and other middlemen are benefiting because they is now one more reliable outlet for the produce they have to sell, and the new attitude of the other dealers also helps them. Consumers are benefiting because of the reduction of time and extra cost in handling these food products without disputes. The dealer himself decidedly benefits, through a better reputation and through an actual increase in good business. The case offers a practical example of the maxim that society as a whole loses when good crops are subjected to unscrupulous practices and gains when good crops are handled fairly under good business practices.

How I Control Black-Spot

(*From page* 11)

ties, there are also numerous weaklings.

Having experimented with ammonium phosphate (a chemical fertilizer containing 20 per cent of nitrogen and 50 per cent of phosphate), I have added to it enough muriate of potash to maintain the proportion of the atomic weights of the three substances, that is, so as to give about 3.5 times as much potash (and 2.5 times as much phosphate) as nitrogen.

This fertilizer affords an excellent quality of both foliage and wood. Obviously the three substances do not interact, strictly speaking, and thus justify their combination according to atomic weight. On the contrary, they react with lime; but the high potash content in comparison with the usual formula has a scientific justification. The assimilation of nitrogen and phosphate can take place to the maximum extent only in the presence of an excess of potash, the assimilation of the latter being likewise at the maximum. Thus the perfect balance of this fertilizer, with a proportion of 1 of nitrogen, 2.5 of phosphate, and 3.5 of potash (or a formula of 4-10-14) is justified.

Quantity of Fertilizer

Of particular importance is the *quantity of* fertilizer. An acre should receive 36 pounds of available nitrogen, 90 pounds of available phosphate, and 126 pounds of available potash as a maximum dose; half this amount is adequate in rose nurseries. Keep strictly within these limits.*

Inasmuch as it is while plants are young that the maximum of nourishment is needed, and since my plants are always young because of hard pruning every year, it is necessary to give them the three principal elements of fertilizer for a maximum assimilation, without going to the extreme of overfeeding.

After solving my problems of soil and fertilizers, I found that the usual fungicides became fully effective. There was no more black-spot and no more mildew.

I here outline the fungicidal preventives I employ.

Experience has taught me that the first spraying is the most important; the prevention of diseases is very much better than cure. I begin when the first bloom opens (at the end of May), thus avoiding discoloration of the flowers at the height of their glory. The spray consists of bordeaux mixture made as follows: 4 pounds of copper sulphate and 2 pounds of flowers of lime in 25 gallons of water. Always pour the copper sulphate solution into the lime solution, never the reverse. For subsequent sprayings I use 6 pounds of copper sulphate to 3 pounds of lime. Two pounds of lime may be sufficient, but use enough to prevent the spray from being acid, as shown by a test with litmus paper. To this mixture one may add a solution of pentasulphur of potash at a dilution of 5 parts in a thousand, or a solution of lime-sulphur at the rate of 1½ pounds to 25 gallons, which gives 6 pounds of copper sulphate, 3 pounds of lime, and 1½ pounds of lime-sulphur in 25 gallons of water, the last stirred into the bordeaux mixture.

The greatest inconvenience of the complete spray is that the foliage is left with a tenacious black stain. In addition to its own reaction and to the catalytic effect upon the bordeaux mixture, lime-sulphur is a good fixing agent. During the time that I was struggling against black-spot, I always observed a certain therapeutic power in this complete fungicide. One may reduce the discoloration by waiting a day or two after the bordeaux mixture is applied before spraying with the lime-sulphur solution. I do this in order to stain my labels as little as possible.

I follow the spraying with this complete fungicide at the beginning of the first blooming period by three similar applications, that is, one each month until the first of September. After the second application I spray with the lime-sulphur solution every 15 days. This solution reacts against black-spot perhaps as effectively as bordeaux mixture.

Formerly I used colloidal sulphur against all rose diseases with success, but I can find it no longer. That sold today, I believe, is *colloidal* in name only. It is a product rendered very fine mechanically rather than through a chemical process. The future lies there, I believe, for the quantity required to be effective is infinitesimal and does not injure the foliage.

* The application of available ingredients recommended by M. Mallerin is equivalent to 900 pounds of fertilizer with a formula of 4-10-14 per acre. At this rate a bed of 100 square feet should be given about 2 pounds. On January 3, 1938, M. Mallerin wrote the translator that he applies potash in the fall and ammonium phosphate in March. The A. Meilland Nursery, which uses M. Mallerin's formula, fertilizes in January, but the nitrogen is applied in an organic form. This nursery has also reported in late January that the use of the Mallerin methods has given it almost perfect control of black-spot.—Editors.

A spraying of the utmost importance is that given in the winter. The material that I prefer above all others that I have tried is L'Elgétol, a product of the Truffaut firm at Versailles. It is an organic dye (colorant) that reacts powerfully as an insecticide and fungicide. In America there must be similar products. If they are lacking, one may fall back on the chemicals used on fruit trees. Sprays applied in the summer, such as L'Hélione of the Truffaut firm, will arrest black-spot; that is, if the infected portions of leaves are reached, an application of the complete fungicide the next day will immunize the foliage.

During wet periods it is obviously necessary to wait for fair weather to spray. The fungicide applied while the foliage is dry will remain effective during a long rainy period.

Strike a Balance of Soil Fertility

(*From page* 20)

land, much of which is subject to considerable leaching and some erosion. A $10,000,000 loss would probably be conservative for leaching and erosion. There is of course no adequate means for checking such estimates.

On the basis of the above estimate, more than $22,000,000 worth of fertility is lost from Oregon farms annually. On the basis of replacement needs, therefore, Oregon could use something over half a million tons of fertilizer annually instead of 12,000 tons. A few States use half a million tons or more yearly. Oregon probably never will use such a quantity, but the amount no doubt will increase considerably. Fortunately for the farmer, nature provides a certain amount of nitrogen replacement through micro-organisms, both symbiotic and non-symbiotic, which are active in the soil. This method of replacement may be utilized to minimize the nitrogen problem.

Improved farm methods might reduce losses materially, and thus reduce the need for purchased fertilizers. At present we are convinced that far too few farmers use any fertilizers, and most users apply inadequate amounts. Most of the fertilizer that is purchased goes for vegetable crops, small fruits, and orchards. This is because returns for such crops are higher, and appreciation of the importance of fertility is greater.

In one section beans grown for the cannery bring $500 an acre or more, but the acreage is limited. The use of 1,000 pounds or more of complete fertilizer on beans is justifiable and sometimes practiced. In a few cases a ton or more of complete fertilizer to the acre has been used on vegetable and fruit crops. Grain and forage crops are seldom fertilized and then only at moderate rates.

Interest in the use of commercial fertilizer is probably greater now than ever before. We wish to encourage this interest. We believe that it is a sound practice to rotate crops with frequent use of legumes on the general farm, and that the legume may supply most of the nitrogen necessary for general cropping. Humus renewal needs much emphasis in every type of farming and should precede or accompany the use of fertilizer. On acid, western Oregon soils liming is likewise necessary to grow legumes and make commercial fertilizers most effective.

Where erosion does not occur, 1 year of legume sod may about balance 1 year of clean cultivation for humus maintenance. Sod crops should occupy the land about 50 per cent of the time to provide humus renewal to offset losses caused by cultivated crops grown the other half of the time. Stable manure is excellent humus material, but considering the quantity available on the average farm, manure is of minor significance either for renewing humus or as a fertilizer.

The kind and the amount is only a small part of the fertilizer problem on most farms. How and when to fertilize for best results are equally important. Fertilizers cannot be used successfully without adequate soil moisture. In western Oregon there are few summer rains and only a limited amount of irrigation. The irrigator has every advantage for working out a satisfactory fertilizer program. Where there is no irrigation, fertilizers must be used either in the fall or very early in the spring before moist weather ceases. Fertilizer applied in dry soil that remains dry through the season is not used by the crop, and fertilizer applied to a moist soil that later dries may cause burning.

Abundance of humus in the soil reduces the danger of burning, partly because humus improves soil moisture, and partly because the fertilizer is held by the humus and by the micro-organisms active in decomposing humus in a form that does not cause burning, but does feed the plant through the growing season. Nutrition of crops whether fertilized or unfertilized is better in the presence of abundance of active humus. Rotting organic matter stimulates the development of feeder roots on the crops and provides the conditions necessary for a crop well-fed.

For these and other reasons, fertilizing the cover crop grown for green manuring in orchards or truck gardens is a sound practice. Live roots penetrating and permeating the soil have a helpful effect even before rotting occurs. Crops such as clover and alfalfa that develop deep root systems improve the soil most. Shallow-rooted crops improve the surface soil, but are not as good as the deep subsoilers. The legumes make heavy demands upon the minerals, lime, phosphate, and potash. Legumes on good soils take care of their own nitrogen needs. In fact, the use of nitrogen fertilizer often only stimulates the grasses until the legumes are crowded out.

Successful fertilization is both a science and an art. The producer of highly specialized crops has the best opportunity to learn fertilization. Crops may be fed and watched for responses just as is true of animals, only the response is not always as soon or as easily detected. The trained eye of the plant feeder, as of the animal feeder, reads the signs and cuts down this or increases that according to needs. Perhaps the signs on the plant call for nitrogen, then a nitrogen fertilizer should be given. The response may show in a week or two.

The practice of side-dressing in growing garden crops is recently increasing. A liberal fertilization may be made at planting time, followed by three or four side-dressings through the fruiting season. A soluble nitrogen fertilizer is most commonly used for side-dressing, though a complete mixture can be used successfully.

Fertilizing for Best Results

There is much yet to learn in regard to the time and method of fertilizing. Too liberal use of fertilizer before planting may delay germination and retard the early growth period. Proper fertilizer placement does much to overcome this difficulty. Saving a portion of the fertilizer for a later date when the plant has become established may prove helpful. Plants absorb an enormous amount of nutrient when in the prime of their growth period. Probably the greatest need for nutrient is during the period of fruiting. Part of the nutrient for setting and maturing fruit must be previously stored ready for use, and part is absorbed or elaborated and used during the fruiting season.

The intensified production program of the market gardener demands, not replacement of nutrients removed by the crop, but a much more liberal fertilization of some elements. He may use two to four times as much nutrient as his crops remove. Such liberal fertilization is necessary and justified, because a little improvement in yield or sometimes only an improved quality is necessary to pay for the extra fertilizer. One of the best orchardists in Oregon uses $40 to $50 worth of manure and fertilizer an acre. He has obtained acre-yields of 1,400 boxes of pears, and incidentally realized a long-nurtured dream of the finest orchard in his section.

Liberal and complete fertilization, rather than plant-food replacement, naturally goes with intensified and specialized farming. No longer is the old formula, N-P-K, considered a complete fertilizer. In different sections of the country the necessity of using calcium, magnesium, sulfur, copper, manganese, zinc, and boron carriers has become apparent. Probably other elements may be found deficient. Long cropping and removal, together with erosion and leaching, constantly bring out new deficiencies.

In the future, therefore, the fertility balance sheet may carry more items, for some of which partial replacement is necessary, while for others much more than replacement may be needed. Some elements for a long time to come may receive little consideration. The feeder of plants like the feeder of animals must be always alert for signs of inadequate nutrition. Perhaps it is a quantitatively insignificant vitamin-like substance that is deficient. If so, a few micro-grams may be as important to health and vigor in the plant, as several pounds of the more familiar and abundant nutrients. Plants grown in soil kept productive by adequate fertilization and humus renewal are usually both better for the consumer and more profitable to the producer.

Permanent Clovers for Permanent Pastures

(*From page 9*)

latter does not respond to additional nitrogen.

The high rate of potash and phosphorus was very much better than the low and shows the desirability of applying a heavy initial application on potentially good clover land. Merely plowing and reseeding without adding sufficient fertilizers are usually a waste of time and seed, and on heavy soils a

TABLE 2—YIELD OF HERBAGE PRODUCED ON DIFFERENT CLOVER PLOTS WITH VARIOUS FERTILIZERS. (WOODBRIDGE CLAY LOAM)[1]

Fertilizers Used[1]	Pounds of Dry Matter per Acre							
	1934	1935	1936	Total	1934	1935	1936	Total
	(Native Wild White Clover)				(Ladino Clover)			
L Only	418	1,351	1,287	3,056	59	1,490	1,777	3,326
$L+P_1+K_1$	581	1,894	1,691	4,166	696	2,871	2,103	5,670
$L+P_2+K_2$	808	2,669	2,370	5,847	1,447	3,530	2,346	7,323
$L+P_2+K_2+N$	1,565	3,324	2,961	7,850	1,645	3,654	2,798	8,097
$L+P_2+M$	1,272	2,932	3,072	7,276	1,603	2,368	2,075	6,046
	(Kent English Wild White)				(Common White Dutch Clover)			
L Only	.....	1,587	1,441	3,028	35	1,522	1,232	2,789
$L+P_1+K_1$	39	2,543	1,766	4,348	649	2,253	1,638	4,540
$L+P_2+K_2$	813	3,696	2,623	7,132	1,445	3,475	2,340	7,260
$L+P_2+K_2+N$	855	4,175	3,061	8,091	1,543	3,713	3,230	8,486
$L+P_2+M$	475	2,403	2,298	5,176	1,070	2,325	1,982	5,377

[1] For explanation of fertilizers used see bottom of table 1

poor turf is obtained which allows the soils to bake.

Plowing is usually unnecessary in establishing a good pasture high in natural wild white clover, because under proper conditions it usually "comes in." In fact, plowing is usually detrimental, since it turns under the surface layer of organic matter and places it in a position where most of the feeding roots cannot reach it. In addition to the ordinary physical and chemical properties attributed to organic matter, it seems to supply food and proper conditions for the clover organisms. A small application of farm manure on clover pastures seems to be much more beneficial than an equivalent amount of mineral fertilizer. Some of the best clover pastures in England are never plowed, and they realize that it takes a long time for good pastures to develop, during which time a surface layer of dark humus is produced.

Keep in Permanent Pasture

Since it is quite difficult, if not impossible, to purchase natural wild white clover seed, the land should not be plowed, but kept in permanent pasture so that these plants might develop. It is quite difficult to understand where the seed comes from, but it is known that white clover produces a large number of "hard seed" which do not absorb water and thus remain dormant for a long time. That a large number of seed are transferred about the grazing stock is also known, which is evident by the large number of clover seedlings which germinate in the dung deposited by cattle on pastures.

Pasture clovers require plenty of available phosphorus and potash for adequate growth, and since most pastures are low in these minerals they must be applied in the fertilizer. While natural wild white clover will tolerate rather acid soils, some lime is very desirable, as it helps to keep the minerals more available.

Most dairymen make the mistake of not applying sufficient phosphorus and perhaps potash as an initial application, particularly on run-down lands that are potentially good clover soils. It should be remembered that myriads of soil organisms are stimulated by the use of fertilizers, and these organisms must first have their wants supplied before any are available for crop plants. Repeated observations, as well as some experimental data, indicate that 1,000 pounds of 16% superphosphate (800 lb. 20%) together with 150 pounds of muriate of potash may well be used as an initial application on potentially good permanent pastures to establish and maintain wild white clover. Less potash may be used on heavy soils, but on sandy loams more potash and less phosphorus may be desirable.

Close grazing is very important in establishing and maintaining wild white clover. This is especially true in early spring, since most grasses make their maximum growth sooner than clovers and thereby shade and crowd out the latter. A clover-dominant or grass-dominant pasture may be secured by changing grazing methods, the former by close grazing which checks the growth of grass, the latter by allowing the grass to grow up and check the clover.

The common white Dutch clover (left) is more erect but less compact than the natural wild white clover (right).

On clover-dominant pastures, stock should be turned out as soon as the ground is dry enough to carry them. In spite of this early grazing, some grasses will reach the heading-out stage and should be cut with a mowing machine. At times more than one mowing is necessary, but this is a good practice, as waste is reduced and more pasturage made available. In a partially withered condition, freshly cut herbage is readily eaten by stock, and a splendid new growth replaces it. Animals usually avoid vegetation around their droppings, but since the mower cuts and carries the herbage a short distance away, it is readily consumed.

Considerable care should be exercised in the use of nitrogen on permanent pastures where wild white clover is to be maintained. A small amount with minerals usually aids this clover in getting established, especially on run-down soils, but after a good stand is obtained, additional nitrogen should not be used because it tends to crowd out the clover. Improper use of nitrogen with its accompanying increase in growth of grasses often accounts for failure to maintain a good clover sod. However, an initial application of complete fertilizer containing nitrogen is often advantageous on run-down permanent pastures, because it increases yields and gives a quick visible response while the natural clover is getting established.

Rather large amounts of nitrogen may be advantageously used on semi-permanent or meadow pastures, when this type of pasture is used in conjunction with a permanent one. Tall-growing hay-type grasses respond readily to this treatment and will give extra grass for early-cut hay or grass silage. This allows an aftermath to follow which is used when most needed in late summer.

Most dairy farmers, especially in New England where wild white clover can be grown, should consider the possibility of having these two types of pastures—permanent pastures where wild white clover supplies the needed nitrogen and semi-permanent or rotational pastures where nitrogenous fertilizers are used to supply the taller-growing grasses. Both fertilization and management of these two types are very different and must be understood for successful results.

Dixie—Land of Cotton and Forests

(*From page* 19)

this raw material upward. A large number of mills have located mostly along the Atlantic seaboard, the Gulf of Mexico, and northern Louisiana, and by the end of 1938 there will likely be 37 or more of these mills operating in this region. Thirty of them will use pine as their main source of raw material. Suffice it to say that this region now has over 40 per cent of the potential raw material in the nation available for wood pulp manufacture.

A number of factors combine to make the gulf coast region ideal for sawmilling and paper mill operation. Chief of these are large areas growing raw materials, long growing season and abundant rainfall to give high per-acre production, mild winters for continuous woods operation, abundant materials and labor for converting raw products into the manufactured articles, and accessibility of the principal markets.

One branch of forest activity not touched by any other section of the United States is that of naval stores (turpentine and rosin). In this territory is produced two-thirds of the world's supply of these products, coming from the longleaf and rapid-growing slash pines, which, after being worked several years for crude gum, may be utilized for pulpwood or other purposes.

The southern farmers, who own 30

per cent of all timber land in these 11 States, are large recipients of much of the income derived from forestry and are in the best position of all woodland owners to practice forestry. Their home demands for woods products are large and mostly supplied from their own holdings. The average family of five requires 12 cords of wood for fuel annually, and to this may be added lumber and other products for buildings and repairs and posts for fences. The 59 million acres of farmer-owned timberland will, with reasonable care, mean a steady cash income of more than a hundred million dollars in raw products while demanding very little outlay of capital.

Cooked Potatoes Blacken Because . . .

(*From page* 14)

the element did seriously depress plant productivity.

The use of large proportions of potassium salts has tended to overcome, in part, the deficiency of boron. Of course, this may be due to traces of boron carried by such salts. It is possible, also, that this beneficial effect sometimes accompanies the liberal use of potash in commercial fertilizers.

No vegetative disturbances were noticed when either copper or manganese was omitted from the sand cultures. Potato plants grown on low potassium mixtures to which copper and boron had been added did not show the typical boron response and resembled more closely a healthy plant. Those grown on low potassium soil to which manganese and boron had been added showed the same reaction. Because in both of these cases the potatoes were of ordinary size, here again the effect of boron in promoting plant productivity was noticed.

Only the large potatoes grown in the soil lacking boron, copper, or manganese were examined after cooking. No distinct effect on the blackening was noticed. Before any definite statements are made about the effect of rare minerals on blackening, the problem must be subjected to further research.

Rural New Yorkers grown on a plat which had not been fertilized for 6 years turned very black upon cooking. This supports the foundation theory that a lack of available minerals in the soil has a direct effect on the darkening.

It has been found, also, that the moisture in the soil influences the amount of potato blackening. The condition was much more pronounced in years of drought or in dry, unirrigated areas. In limited observations where irrigation was practiced, not only did the potato crop improve, but if a reasonable amount of fertilizer was used, there was little darkening of the tubers on cooking. In 1936 plants grown on irrigated plots in Madison produced potatoes that remained entirely white upon cooking. Apparently, the higher soil moisture made the potash and other elements in the soil more available.

Heat may be more critical in producing the darkening than some other factors of climate, believes Dr. Tottingham. This is, however, subject to experiments in which the heat, as well as the amount of moisture, is controlled.

Research has also proven that neither the immaturity of the potato vines at the time of harvesting nor storage in warm, poorly ventilated places influences the blackening of potatoes to any great extent.

Since personal judgment enters into the direct observation of the amount of darkening of potatoes, a photometric instrument is being used in England to measure the color of cooked potatoes. A series of colored cards is used as a standard for judging the color of the mashed tissue, the colors being reflected by mirrors and then adjusted so they match. The final judgment of discoloration is thus made independent of the natural pigments of the tuber. Research workers at the University of Wisconsin hope to develop a similar instrument to be used in their studies.

The experiments on potato blackening at the University of Wisconsin have led to the following conclusions:

1. The blackening is caused by the reaction of certain free amino acids in the potato and oxygen.

2. The condition is physiological and not pathological.

3. Providing the rainfall or soil moisture is sufficient, an increase in the amount of potassium in the soil is associated with a decrease in the amount of potato blackening.

4. The supply of rare soil elements, including zinc, copper, manganese, and boron, may also affect the amount of potato blackening.

5. The sustained growth of a potato plant is dependent, in part, on boron. Soils with none or very little of this mineral produce a plant that tends to vegetative breakdown and poor tuber production. There are grounds for suggesting that the liberal use of potash in fertilizers may, at least, delay the unfavorable responses of the plant to a lack of boron.

6. The moisture in the soil seems to influence blackening. Potatoes grown on dry areas or during dry years, have generally shown more darkening than the limited number of samples observed from moist or irrigated regions.

7. Heat may be more critical than some other factors of climate in its effect on potato blackening.

8. Neither the immaturity of the potato vines at the time of harvesting nor storage in warm, poorly ventilated places greatly influences the blackening process.

Quality Potatoes from Muck Soils

(From page 22)

FERTILIZER PLOTS, 1937, NORTHERN INDIANA MUCK CROPS EXPERIMENTAL FARM, WALKERTON, INDIANA

Fertilizer Analysis*	Bushel per Acre Cobbler Potatoes	Increase in Bushels per Acre Over No Treatment
0-0-0	142	0
0-8-0	190	48
0-0-24	263	121
0-8-8	264	122
0-8-16	280	138
0-8-24	293	151
0-8-32	298	156
0-8-40	306	164
0-24-24	302	160

* Rate of broadcast fertilizer applied per acre, 1,000 pounds.

the seed, gave results equal to those obtained from 500 and 1,000 pounds broadcast. With 500 pounds per acre applied in bands beside and below the seed, an increase of 15 bushels per acre over the broadcast treatment was obtained. With the 1,000-pound application in bands, the yield was further increased to 27 bushels over the broadcast treatment, but this means that the farmer must sell the extra 12 bushels of potatoes at about $1 per bushel to pay for the extra 500 pounds of this fertilizer.

Except under a few unusual conditions, potatoes do not respond to applications of minor elements on Indiana mucks. On a muck of pH 5.2, no response has been obtained from soil applications of copper sulphate, manganese sulphate, magnesium sulphate, zinc sulphate, borax, or sodium chloride. In the case of some other mucks, usually more acid than pH 6, on which onions have responded to applications of copper sulphate, there is a possibility that

The 1935 state champion, Perry Ort of Huntington, Indiana, grew the Cobbler variety.

potatoes would benefit also. If, however, the foliage is well sprayed or dusted with Bordeaux mixture, any deficiency of copper in the soil is likely to be taken care of.

If a soil approaches the neutral to alkaline condition, yellow spots may show up in fields of potatoes. The condition resulting from the yellowing of the leaves between the veins may be controlled by applying 50-100 pounds of manganese sulphate per acre in bands along the row. This condition is common on fields which have received too heavy applications of lime.

Use New Varieties

One of the factors contributing heavily to an increased acreage of muck potatoes is the introduction of new varieties and the use of a so-called early variety for a main crop.

The Cobbler has been used more extensively in recent years, because it is white and produces good yields. It has the disadvantage of having deep eyes, which makes it difficult to clean.

Two newer varieties which are producing good yields are the Katahdin and Chippewa. These white-skinned varieties are of good quality when grown on well-fertilized muck and are easy to clean and pack. The Katahdin, and, to a lesser extent, the Chippewa set the tubers close to the surface, so that sunburn is one factor to be overcome. Hilling of these varieties is recommended on the last cultivation and, if necessary, an extra hilling operation may be given them just before the vines are mature, unless the potatoes are to be dug immediately.

Both the Russet Rural and White Rural are still grown throughout the State. These varieties yield well but are more difficult to market. Two characteristics which cut down the percentage of No. 1 potatoes from these varieties are growth cracks and hollow heart. Hollow heart can be controlled to a limited extent by close planting. The fact that these varieties make a good total yield in spite of adverse conditions will probably keep them on the market for many years.

A new variety which showed promise on muck in 1937 is the Houma. It is similar in shape and type to Katahdin.

Other varieties which are not consistently good yielders on muck are: Green Mountain, Warba, Triumph, White Gold, and Golden.

The date of planting is very important in influencing the yield. This is especially true with Cobblers. The earliest plantings have given the highest yields over the past few years. These plantings in Indiana were possible from the fifth to the fifteenth of May. There is more hazard from late spring frosts with this planting than with plantings made later. The yield of plantings made one month later was materially less. Plantings made after June 15 to July 1 outyielded those plantings which begin to mature during the period when temperatures approach 90°-100° F. The later plantings are usually caught by the first fall frost, which in northern Indiana is likely to occur about September 10-15. A general rule is to plant as early as is possible, taking into consideration the frost-free date in each local section.

Close Spacing Increases Yield

Close spacing of seed pieces on muck tends to increase yield, improve the quality of the packed product, and in case of frost may protect plants from complete freezing.

The rows should be planted as close together as the equipment used in planting, cultivating, and digging will permit. Most equipment can be adjusted to work 36-inch rows, while some growers plant down to 28 inches and 32 inches. When planting in 28-inch rows, the seed pieces should be spaced 12 inches apart in the row. This space can be decreased where the rows are further apart. For 36-inch rows the spacing between seed pieces can be 8-10 inches. The quantity of seed used per acre varies with the variety. Rurals and other varieties which have many eyes, thus cutting to advantage, require from 20-35 bushels per acre. Some of the smoother varieties, having fewer eyes, require 30-40 bushels of cut seed per acre.

Close planting tends to keep down the size of the tubers, eliminating much of the hollow heart which shows up in the wider spacing. This results in a higher percentage of No. 1 potatoes for packing.

The sooner the vines cover the soil, the less danger of loss from light frosts. If the plant stands individually, even a light freeze will kill it; while if the vines blanket the soil, less heat will be lost from the soil, damage will occur only on the upper leaves, and the vines will rapidly recover.

The planting depth best suited to most mucks is 3½-4 inches. If Rhizoctonia or black scurf is present on old fields, the covering disks on the planter may be set to throw only 1½-2 inches of soil over the seed pieces, thus allowing the sprout to come through before the rest of the soil is worked in. This may help to control the disease.

Frequency and depth of cultivation on muck depends on (1) weed control and (2) weather. Under ordinary conditions shallow cultivation is most practical. Control of weeds is of primary importance. With some varieties, hilling is recommended on the last cultivation. In case of extremely wet weather, deeper cultivation is required to insure proper growth. The aeration of the soil encourages the production of nitrogen, which is essential to high yields.

The expected yield of potatoes on muck soil is naturally dependent on weather conditions in addition to all other factors within control of the grower. Assuming no severe drought or prolonged period of rain, the grower may expect average yields of 200 bushels per acre, and with ideal weather conditions, yields of 400 bushels are not uncommon if the following rules are observed:

1. Select the proper soil.
2. Use at least 500 pounds of fertilizer, 0-8-24 or similar analysis high in potash, applied in bands beside and below the seed pieces.
3. Use good seed, certified or equivalent.
4. Plant close and at proper depth.
5. Use good cultural practices.
6. Treat seed and spray or dust according to recommendation of your county agent or State experiment station.

Which, and if so, Why?

(*From page* 5)

Similarly I have known whole communities of a rather small bore educational status to flock into the mass movements where leadership is dynamic and dramatic rather than logical or conservative. Likewise I have seen them drift away and become surly and disillusioned in just as quick formation.

Thus we have the trained, thinking individualist on the one hand, and the enthusiastic, volatile, rough and ready joiner on the other; and they all make up the great body of folks we call farmers in the United States census.

AND now, besides this effect of individual character on the result, we also have the matter of psychology or popular feeling to put in its oar. We can't consider either education or organization without talking psychology. It's as old as the hills but somewhat late in being recognized for what it's worth.

We have just passed through the threshing-machine beaters of an economic upheaval, and maybe we haven't got to the straw stack yet. It left an indelible impress on hosts of farm folks in every section of America. Now witness that along with this distress we had more cause for united action, and today we boast 3,200,000 farmers enrolled in all forms and fashions of cooperation, allowing for duplication. This study by the Farm Credit Administration shows clearly that stiff economic pressure drives men into herds to huddle like sheep for warmth and protection. Yes, and I reckon a few of those old "lone eagles" are glad to seek some degree of shelter along with the rest.

We might claim that a sort of education in the school of hard knocks forced these fellows to cooperate; but we have grave doubts that any formal education had much to do with the rise of the cooperatives in the past decade. Likewise it is too early to point out the achievements of these same hustling new cooperatives with their new financial plans and say they have beaten education to the high dollar.

If we take the other kind of cooperation, that of plant and animal breeding, as a rule we find these groups limping and lamenting a dearth of membership during the depression periods. These units have largely been fostered by professors or graduates of institutions. I have sometimes called them cow-operators to distinguish them from the regular co-operators. But I do not claim that there is the least relationship between their origin in academies and their relative lack of popularity in hard times.

"A-ha," I hear you exclaim at this moment, "there is a huge hole in your thesis big enough to let Doug Corrigan drive his plane through. You forget that many volumes have been written on cooperation in marketing by the college lads."

QUITE true, but the organizers are the ones who get the signatures and keep the boilers hot; and few there are among the rank and file who really know what it's all about. The bulletins are too long, you know, and time is fleeting when economic devils have the whip hand. And we all know it's just in recent years that the colleges left the breed clubs to jump aboard the marketing band-wagon.

All I am aiming at is this: that we have individualistic persons and gregarious people to deal with in agriculture; and we have examples of how economic organizations gained fast while purely educative organizations languished during the terms of stress. It doesn't blame the result on education or lack of education, but it points the way to a new manner of getting our education and using it where it counts most.

We want more trained, highly intense minds to join farm organizations because it will do them both good. We must seek a way to stabilize and increase the growth of bona fide serviceable farm organizations, both cooperatives and breed clubs. To get this ideal we should insist on more trained leadership. Such leadership will command more respect from those who formerly stayed away from the rallies and the super co-ops. Such leadership will also set up policies and programs to instil confidence among the everyday joiners, who do not have the inclination to visit ag libraries every week to catch up in their thinking.

Some of my friends in the hinterlands get skeptical sometimes and holler that despite all the colleges and the laboratories and the many mass movements and overall alliances we have had, our farmers are sinking deeper into debt and acquire less than ever of the total national mazuma.

They even claim that new inventions have been the cause of farmers reaching out too far beyond their means for comforts and conveniences, and that proficiency has not made plenty safe or desirable.

I listen to these clamorous voices with rectitude. They are entitled to their say-so, and maybe they give us a jolt in the breeches when we need it most.

YET I remain adamant in my own conceit. I reply that all such criticism is folly at bottom. Human nature will always be restless for new facts and new horizons. They will want bigger and better ways of plowing and planting and harvesting, and remain just as eager to unite en masse to secure a strangle hold on the fruits of their toil. Any doctrine that steps us backward is doomed, except that which anchors us to the scriptures and the essence of ethical conduct. That alone will live to serve us, while all the residue of the past age of farm mechanics and farm economics is dead and buried. As far as I am concerned, you can't dig a hole deep enough to hold most of it.

No, we haven't done with education yet, because it means more to the future of organization than any of our elders dreamed. So too, we cling to organization, but insist it must come out and have its face washed and get a little brain exercise. Unless these two arms of the ancient art of agriculture are muscular and adept, we are due for a tremendous licking.

ASSETS we have a-plenty to start this dual formation. Illiterate farmers are rapidly disappearing. The splendid work of the junior organizations in 4-H clubs and the Future Farmer chapters blends organization with forceful kinds of applied education. In a few high spots we have new departures in agricultural college short courses which transplant the Danish folk school to our land and weave its ideals into the American pattern.

But my final hunch in this treatise is that what we shall stumble upon in the near future is a totally new sort of school system. If I do not mistake the signs of the times in class rivalry, we are going to be forced sooner or later into a scheme of schooling for leadership which differs from any we have enjoyed hitherto.

I vision a school for these leaders which will bring together the best thinkers and most energetic minds in farming, in industry, in labor, in commerce, and in capital. They will study the common interlocking problems facing us, and which today are a barrier to genuine national progress.

They will not wear any party label or any man's brass collar. Maybe they will arrange to exchange leaderships each season or two, just as the churches used to do in revival sessions. We have simply fixed up too many closed closets for each group to pray in, and the good Lord has been deaf to this clatter for a good reason. I think if we do less praying separately and more fighting unitedly we are going to quit worrying whether education or organization has won the race.

A Few Whinnies

EXPLANATION

"Sambo, Ah'd lak yo'-all to expatiate on de way de radio works. Ah can't understand dat yet."

"Dat's easy, Rastus. Take de telegraphy. Ef dey was a dog big enough so his head could be in Washington and his tail in Chicago, den ef yo' was to tromp on his tail in Chicago he'd bark in Washington."

"Ah understands dat, but what's dat got to do wiff radio?"

"It's jes' presac'ly de same, Rastus, wid de exception dat de dog am imaginary."

She: "I want a man who doesn't drink, smoke, swear or philander."

He: "What for?"

A woman found a fly in her soup and said crossly, "Waiter, what is that?"

The waiter said, "That, Madame, is a Vitamin Bee."

Advice to Co-eds: "If you are looking for a real thrill, try kissing a man with hiccoughs."

And then there is the girl who climbs the ladder of success wrong by wrong.

Jim: "Mother, that little girl keeps staring at me all the time."

Mother: "I didn't notice. Which little girl was it?"

Jim: "That little girl in the seat behind us."

Flink: "Quite a stir was caused by an old maid in the seed store yesterday."

Wink: "How come?"

Flink: "She walked in and asked how to sow wild oats."

Young Mother: "What makes you think our boy is going to be a politician?"

Young Father: "He says more things that sound well and mean nothing than any other human being I ever saw."

She: "I weighed myself this morning and I weighed just 110—stripped."

He: "Yes, but you can't trust those drugstore scales."

QUIET PLEASE

A deaf but pious English lady, visiting a small country town in Scotland, went to church, armed with an ear trumpet. The elders had never seen one and eyed it with suspicion and uneasiness.

After a short consultation, one of them went up to the old lady just before the opening of the service and wagging his finger at her warningly, whispered, "One toot and ye're oot."

A shoulder strap is what keeps an attraction from becoming a sensation.

1st Rah Rah: "She's pretty as a picture."

2nd Rah Rah: "Yeah, nice frame, too."

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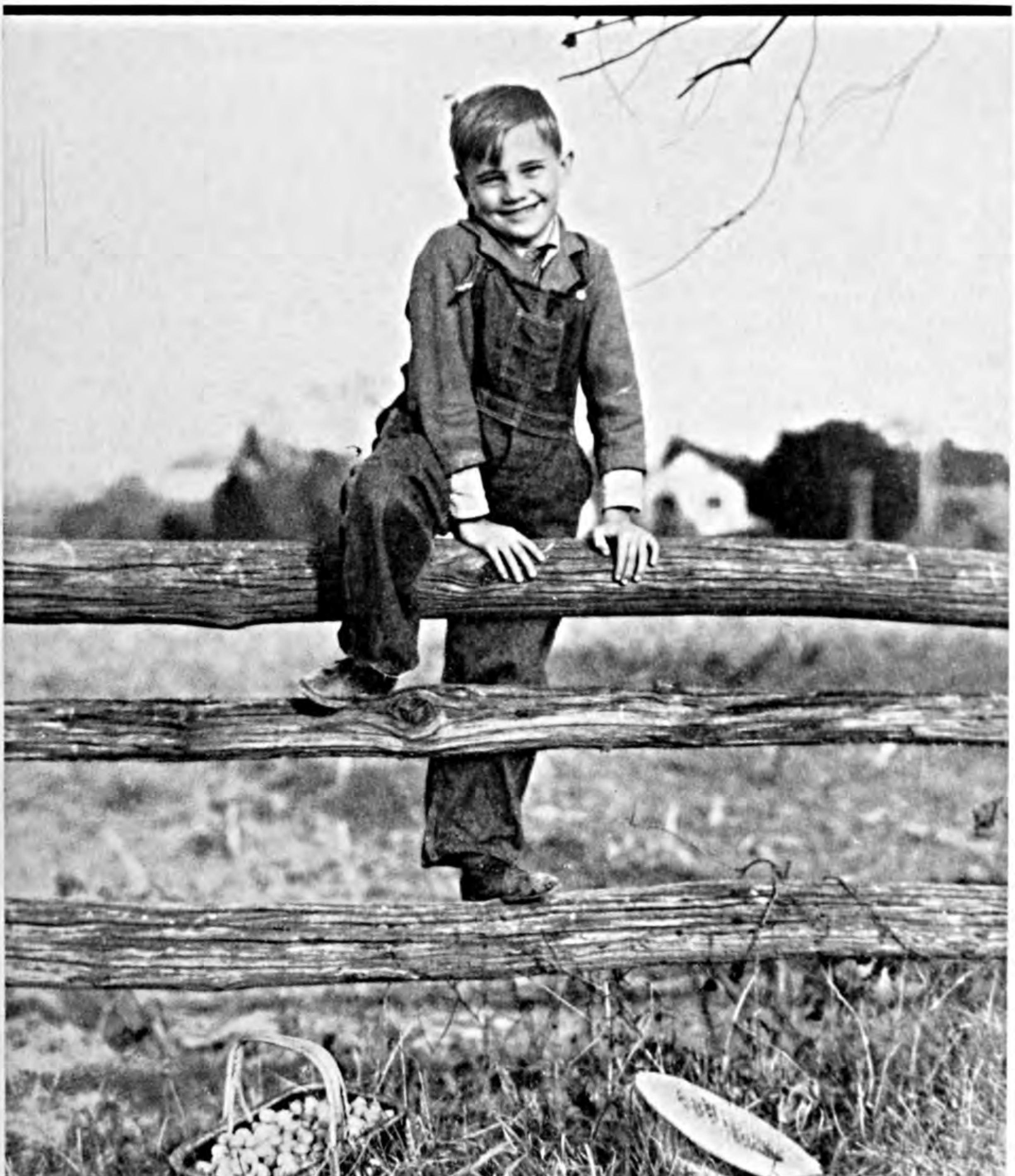
October 1938 10 Cents



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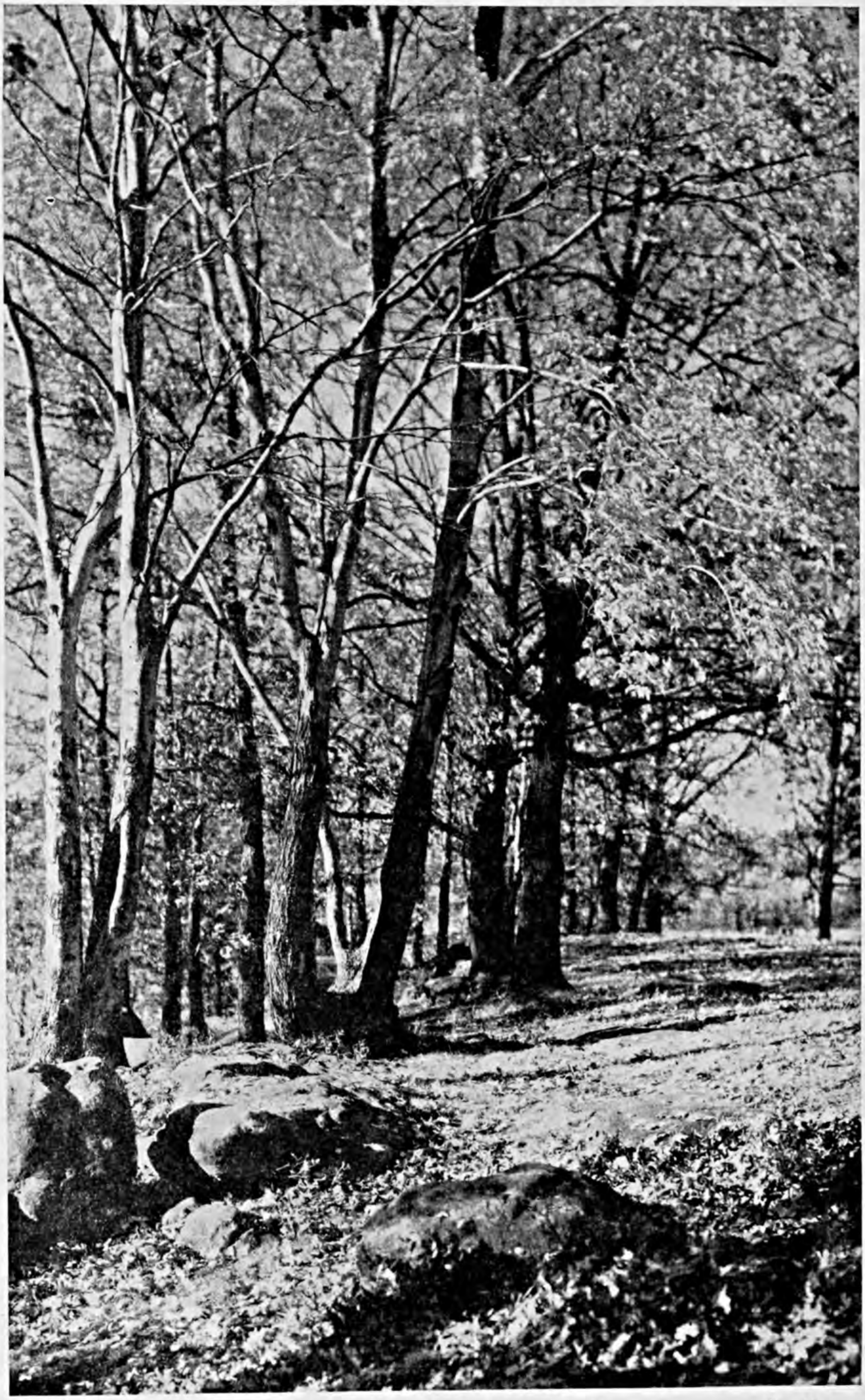

"There is a harmony in autumn, and a lustre in its sky."

—*Shelley*

Better Crops with PLANT FOOD

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Better Schools Need You—

Present for Roll Call

By Jeff McDermid

THEY say a layman always knows more about running a school than the county superintendent, and I'm here to prove it! After all, most recent improvements in our rural schools have been planned by the PTA, financed by the PWA, and erected by the WPA, and all the teachers had to do was build the fires every morning and lick the dust out of the bullies. And so I approached my subject with all the ardor of a tyro, in blissful disdain of pedagogical libraries crammed full of the accumulated experience which nobody reads.

In the course of my bucolic travels I pass by hundreds of schoolhouses. I have seen the time when "passing" them would have been a treat, and I recall several times when I was blocked in my vain attempts to do so by stern parental discipline. Nowadays I sort of hanker to hunt up a few old dog-eared tomes and edge into a back seat, especially when a comely-looking girl has secured the contract. Strange how one changes his attitude toward such ordinary things, so that objects of former hatred turn into coveted goals, usually when it's rather too late to begin over again.

My choice of this topic does not lie in very intimate experience with rural schools as a board member or a textbook salesman. Sometimes, however, I have found mighty human stories tucked away in one of these outposts of liberty. Most writers stay away from them because most successful writers were not able to use their imagination in lieu of grades in their student days, no matter how well they fooled the public subsequently.

SO when I was told by a county agent to stop at a certain school and meet the teacher, it sounded like a very alluring date. And so it proved to be. The teacher was a man. That up our way is in itself a week's wonderment. Men teachers have faded out of the picture in the open country. Moreover, this teacher was decidedly well-trained and qualified. Fellow students at normal with him were college profs and county supers. Not lack of ambition or "oomph" either. Even though this fellow had taught in this same district for thirty-five years straight, you couldn't pin a fault on his personality or ability. Just a queer, natural choice he had to stay right in the home school where his father and mother, himself and his brothers, and two of his children had "graduated."

Two hours of watching this chap handle the routine, a little close observation of the means and methods, and a quiet chat with him as he helped the kids with their noon-day hot lunch kit —that's all it needed to convince me. He is a farmer himself, lives two miles distant, milks his cows and does his own farm work when vacation comes —and ever and always his keynote runs to making that school spell rural character and community training, to retain tradition, and to teach civics with reference to town elections and town questions, as well as to what Congress promises to do for the farmer. Lean, spare, wiry, and gray, this fatherly old scout is probably going to mean more to several hundred farm folks in this generation than Henry Wallace or the ever-normal granary. He has not run away from his birthright and sought some glittering opportunity that didn't stay gilded. When his job is done I'll bet that district will miss him worse than the rain.

In some quarters it has become common to regard the task of teaching country schools as sissified. I know no young men, Future Farms or 4-H leaders, least of all agricultural college students, who would consent to teach their own district school or even one like it. They would hunt up a wild-eyed job with the NYA before subjecting themselves to sly sarcasm. I often wonder whose fault this is. It should not be tolerated. Perhaps one reason lies in the preponderance of young women who hold dominion over the destiny of graded rural schools. Everybody has come to think of it as a girlish avocation—but why sissified at that? Women hold several world records in athletics and aircraft operation, and see if you can find a nervier climber than Miss Bourke-White, photographer, or a better judge than Florence Ellinwood Allen.

MANIFESTLY, that is not the chief reason. The real reason is that too many of our school systems have degenerated teachers, regardless of sex, into petty disciplinarians and dogmatic text-book followers, kindergarten nurses, and narrow pluggers.

We are coming into an era, thank heaven, when the folks who support school districts are certain that education does not end when one grabs an important looking eighth grade certificate. The new idea of schooling insists that educational advantages set up at public expense belong to the entire community and not just to the immature pupils, the teacher, and the county super.

My second objection to past principals in secondary schools lies in their general inclination to prepare all pupils for a higher educational career or for professional services in cities. I have no bone to pluck with academic studies or cultural branches as such, but when the whole effort of a school methodism is directed absurdly to making lawyers, doctors, preachers, and professors out of mighty fine farm timber, they are doing the world no service. We are happy to see that our new rural school curriculum is aimed more particularly at instruction, more closely related to the practical duties and everyday problems which the graduate must face and conquer.

Mind you, I realize that one can turn further in the opposite direction than

seems just and sound. That is, you can run all country pupils through a rural mold regardless of natural inclination of the individual and make as much of a mistake in that way as when you focus all attention on fitting them for thinking while dragging and planning while canning.

BUT on the whole some of those individuals will find a way of escape from an intolerable or unsatisfactory schooling, and eventually reach their professional goals; while to ram and cram the usual mine-run of country kids with dogmatic academic courses preliminary to city careers is serious malfeasance.

In the educational history of my own State we pay homage to a man who fathered the system of free education. Previous to his coming, schools were supported by tuition entirely and leaned toward super careers and professional backgrounds. But we may not have emancipated the schools merely by making them free in a monetary sense. Schools are not free completely unless they direct their energies to local community upbuilding and pride in the production of competent rural leadership. They are not free unless they can point with pleasure to men and women emerging from their domain who created a better home environment and established sounder country institutions.

Hitherto so many principals of secondary schools in strictly rural regions have congratulated themselves smugly on preparing many graduates for college entrance. They maintain rosters of successful ones who made good in metropolitan centers and shout that the country is the breeding ground for the strongest non-farm careers. I see in the newer movement a tendency to emphasize graduates who find a wholesome reward in doing worthy things at home. The country cannot be built up simply by supplying country-minded specialists to cities. True, they help us interpret farm life where there is grave mistrust and ridicule, but we insist upon keeping our farm leaders at the plow for best results.

ONE thing happened to me which stamped that point indelibly. In my duties as a writer for farmers, I once attended a rural school reunion. There were the customary handshakes and smiles; the muddle of cakes, salads, hearty meats, and condiments spread upon the outdoor tables. The oldest teacher was there, three former county supers, and some friendly townsmen out for a lark. When it came time to take the pictures, they all posed for me, including one village banker, a fine local farmer, and the erstwhile aged teacher of other days. The old lady remarked that the banker and the husky farmer were her bright pupils, and she wanted to know what each one thought of the new schoolhouse and the progress of the district.

Mr. Banker said he had loaned the board several hundred dollars to erect the new structure, and in fact, he had sort of gone into the school-loan business generally of late. Why, I asked. His answer was that it was profitable

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Potash Saves Alfalfa, Clover, and Soybeans

By A. W. Blair and A. L. Prince

New Jersey Agricultural Experiment Station, New Brunswick, New Jersey

CERTAIN of the plots at the New Jersey Agricultural Experiment Station have been used in a soil improvement project for about 20 years. The 5-year rotation, as planned in 1918, provided for four 1/20-acre plots designated as Section 1, with corn, oats, wheat, and 2 years of timothy as the crops, and four other 1/20-acre plots designated as Section 2, with corn, oats, wheat, and 2 years of timothy and clover (later alfalfa was included in the mixture). The plan further provided that any green manure crops grown should be, for Section 1, non-legumes, and for Section 2, legumes.

This plan was carried through for the greater portion of the 20 years, but some changes have been made during the past 5 or 6 years, due to the fact that weeds came in to such an extent that the crops were of little value. For example, timothy was seeded on the non-legume section, and a timothy-clover-alfalfa mixture on the legume section in August 1935. By the summer of 1936 the weeds were so bad that it became necessary to plow all the crops under, and in June of that year Sudan grass was seeded on the non-legume section and soybeans on the legume section.

Considering for the present only the hay crops grown during the 20 years, the crops for the non-legume section were as follows: for 1921 and 1922; 1926 and 1927; 1931 and 1932—timothy. Timothy was also seeded on this section in 1935 but, as explained above, weeds choked it out and Sudan grass was seeded in its place. Following the Sudan grass, wheat was seeded about the first of October 1936, and following the wheat, a timothy-clover-alfalfa mixture was seeded in August 1937 (this seeding should have been timothy only).

For the legume section, the crops were as follows: timothy and clover for 1921 and 1922, and 1926 and 1927. In August 1930, a timothy-clover-alfalfa mixture was seeded for the 1931 and 1932 crops. The same mixture was seeded again in August 1935, but, as explained above, this failed on account of weeds, and these plots were seeded to Wilson soybeans in June of 1936. Following the soybeans, wheat was seeded as for the non-legume section, and this was followed by alfalfa seeded in August 1937.

Fertilizer Treatment

The fertilizer treatment is shown in table 1, which also gives the yields of hay in pounds per acre on the two sections for the years mentioned. Lime has been applied at intervals to maintain the reaction of the soil at about pH 6.0—7.0.

It will be noted that half the plots have received no potash since 1918, and that the others have received only a moderate application.

The grain crops have not shown a very distinct response to the potash treatment, but the legume crops have been definitely benefited. Reference to table 1, non-legume section, shows an 8-year average of 715 pounds more of

TABLE 1.—INFLUENCE OF POTASSIUM ON LEGUME AND NON-LEGUME CROPS (POUNDS OF HAY TO THE ACRE)
Non-legume Section

Crops:	Timothy	Timothy	Timothy	Timothy	Timothy	Timothy	Sudan Grass	Timothy Clover Alfalfa	8-year Average
Fertilizer Treatment*	1921	1922	1926	1927	1931	1932	1936	1938	
N P *a*	2,070	2,440	1,772	2,953	1,676	1,154	2,062	2,691	2,102
N P K *b*	2,650	3,552	2,372	3,412	1,867	1,529	2,128	5,029	2,817
Legume Section									
Crops: Fertilizer Treatment	Timothy Clover	Timothy Clover	Timothy Clover	Timothy Clover	Timothy Clover Alfalfa	Timothy Clover Alfalfa	Soy-beans	Alfalfa	8-year Average
P *c*	1,800	3,790	1,736	1,827	1,587	2,057	2,365	1,529	2,086
P K *d*	3,551	5,260	3,105	3,811	4,234	3,842	3,045	4,375	3,903

* The figures in each case represent the average for two plots.
a Nitrogen equivalent to 160 lb. of nitrate of soda to the acre. Phosphorus equivalent to 300 lb. 16% superphosphate to the acre.
b Nitrogen and phosphorus as in "a"; potassium in the form of muriate at the rate of 50 lb. to the acre (the muriate was increased to 100 lb. to the acre in 1936).
c Phosphorus as in "a."
d Phosphorus and potassium as in "b."

Fig. 1. Left: Soybean plants from potash-treated plots. Right: Plants from potash-deficient plots.

hay for the potassium-treated plots than for those without potassium. This is a 34 per cent increase. For the legume section, there is an 8-year average increase of 1,817 pounds to the acre for the potassium-treated plot over the plot without potassium. This is an increase of 87.1 per cent. In this connection it may be pointed out that not only is the quantity of hay increased, but the nutritive value is also improved, as shown by the percentage of nitrogen in the crop (see table 2). With only two exceptions (timothy in 1921 and 1926, non-legume section), the hay from the potassium-treated plots shows a higher percentage of nitrogen than that from the no-potash plots. It is true that the differences are not great, but they are distinctly greater for the legume than for the non-legume crops, the former showing an 8-year average increase of 0.24 per cent nitrogen for the potassium-treated plots, which is equivalent to 1.6 per cent protein. The low percentage of nitrogen in the first cutting of alfalfa in 1937 is due to the fact that during the early part of the season there was an abundant growth of camomile (Anthemis Arvensisl) on these plots, and although the alfalfa outgrew this, there was enough to lower the percentage of nitrogen. The second cutting was entirely free from weeds.

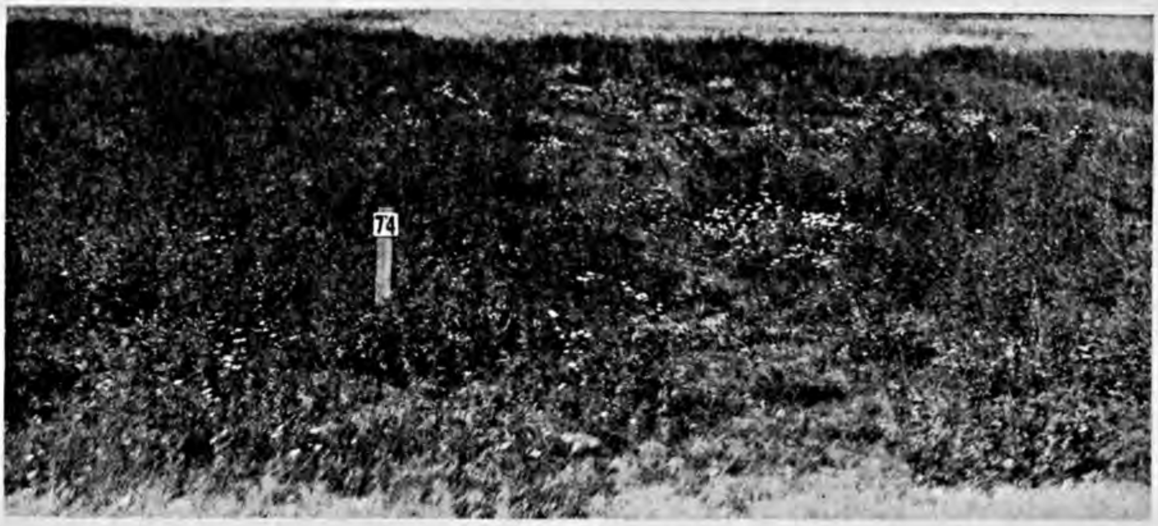

Fig. 2. Alfalfa (Plot 74) on Sassafras loam soil which has not received potash treatment since 1918. Note the short growth and abundance of weeds.

Potash Deficiency Symptoms

On the no-potash plots the alfalfa was short and stunted in growth, the leaves turned yellow early and small white spots formed around the margins, and the stand was uneven. Many weeds came in to crowd out the alfalfa. Clover was affected much the same as alfalfa. The soybean plants were short and stunted, lower leaves turned yellow before the plants blossomed, and the root system was small with only a few small nodules. Some of these symptoms

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Table 2.—Percentage of Nitrogen in Crops Grown With and Without Potash Treatment
Non-legume Section

Crops / Fertilizer Treatment*	Timothy **	Timothy ***	Timothy	Timothy	Timothy	Timothy	Sudan Grass	Timothy Clover Alfalfa	Average
	1921	1922	1926	1927	1931	1932	1936	1938	
N P	.92	1.03	.78	.79	.86	.95	.64	1.39	.92
N P K	.83	1.09	.78	.90	.89	1.05	.66	1.77	.99

Legume Section

Crops / Fertilizer Treatment*	Timothy Clover	Timothy Clover	Timothy Clover	Timothy Clover	Timothy Clover Alfalfa	Timothy Clover Alfalfa	Soybeans	Alfalfa	Average
P	1.14	1.74	.84	1.13	1.38	1.74	2.63	1.34	1.49
P K	1.17	1.90	.99	1.29	1.99	2.03	2.75	1.68	1.73

* The figures in each case represent the average of two plots. Fertilizer treatment the same as indicated in table 1.

** These figures represent percentage of nitrogen in the hay from the first cutting. The legume section gave a second cutting which averaged about 2.3% nitrogen.

*** These figures represent the percentage of nitrogen in the hay from the first cutting. All the plots gave a second cutting, largely clover, the nitrogen content of which was about 1.8%. There was much volunteer clover in the non-legume section.

Balanced Fertilizers Make Fine Oranges

By M. E. McCollam

San Jose, California

THE success of an individual grower, or of growers grouped into an industry such as the citrus industry, depends a great deal on the necessary ability to weigh the good and bad in any plan, as well as to exercise the necessary energy in somehow putting promising plans into action.

Allen Break, orange grower and shipper of Redlands, California, has sorted out many ideas and plans in his business thus far, and has chosen wisely the practices he follows. One decidedly gets the impression, too, that Mr. Break extends his wisdom in business to a fine plan for living and service in his community.

He has been associated with citrus fruit production in Southern California since 1898, when he came to Pomona from Peabody, Kansas, to manage a packing house. In 1903 he moved to Redlands to take charge of the packing house of M. F. Whittier. Redlands has been his home and the growing and shipping of oranges his business ever since. He has a packing house of his own at Bryn Mawr and a holding of 225 acres of citrus.

Mr. Break firmly believes in the power of high production and fine quality fruit to bring profits in growing oranges. Therefore, he has always considered feeding trees generously from the standpoint of a high level of production rather than the minimum requirements of an orange tree for sur-

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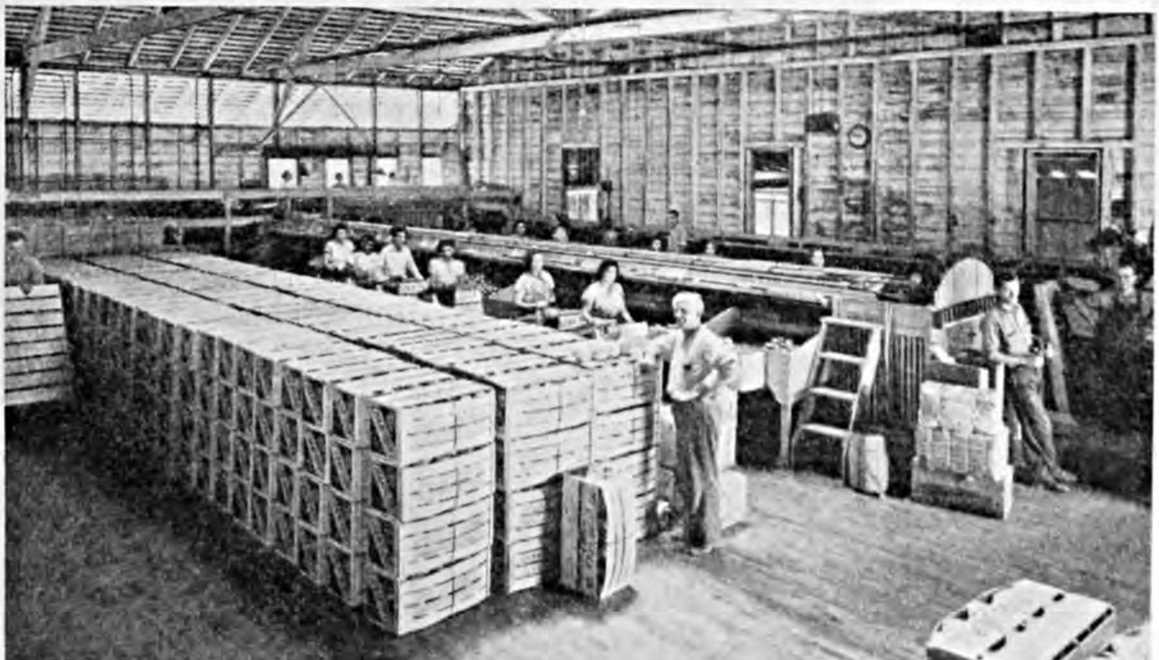

Allen Break inspects a shipment of fruit in his packing house at Bryn Mawr, California.

Soil & Fertilizer Needs of Apple Orchards

By M. A. Blake and O. W. Davidson

Agricultural Experiment Station, New Brunswick, New Jersey

THE amount and quality of growth and the amount and quality of fruit produced by an apple tree are the result of the combined influences of all factors comprising the orchard environment. To produce large, well-developed trees with heavy crops of high-grade fruit is the ideal of the fruit grower. Under the most favorable environmental conditions for apples, it is not uncommon for the trees to attain a height and spread of 40 to 50 feet.

When apples are grown under favorable climatic conditions but on very fertile soils the trees tend to make a rank growth, are rather slow in coming into bearing, and are likely to produce fruits deficient in red color and edible quality. Where environmental conditions favor a moderately free growth, apple trees do not develop as large tops but tend to bear earlier and to produce fruits of better color and quality than under the previous set of conditions. When the moisture supply is deficient and the soil is shallow, or if the temperatures are relatively low apple trees tend to be dwarfed, flat-topped, and relatively low in production. When soil and moisture conditions are extremely unfavorable, apple trees lack vigor, and are unproductive and relatively short-lived.

The first fundamental information to be secured in the analysis of any orchard is the nature and classification of the environment. For the purpose of such an analysis the environments for commercial apple orchards may be classified as follows:

1. *Excessively wet or poorly aerated soils.* Apple trees planted on soils having a high water table, or soils that are too dense and poorly aerated, may grow fairly well while they are small; but they remain shallow rooted. Such trees gradually become weak and die prematurely. In less severe cases the trees tend to be bushy, thin-twigged, produce a poor grade of

Fig. 1. An over-vegetative tree grown in environment 2.

fruit, and are uncertain in production.

2. *Liberal moisture with rich soil and favorable climate.* Where the soil is moderately heavy to heavy, deep, moist, well-drained, and fertile, and the climate is favorable, apple trees tend to make a strong active growth and develop into very large trees which are late in bearing. Under these conditions apple trees tend to produce fruits somewhat deficient in red color and in edible quality. The trees easily become over-vegetative and are likely to develop an abundance of succulent water sprouts. This condition is especially apt to develop if the soil is clean tilled, excessively fertilized with nitrogen, or if the trees are pruned improperly.

3. *Well-aerated soils medium in fertility and in moisture supply.* Apple trees planted on light loam, gravelly loam, or sandy-loam soils not especially fertile, but providing an adequate but not excessive supply of water, tend to be moderately vegetative and fruitful. Such trees attain a medium to medium-large size, and the twigs and spurs tend to be thick in diameter. The trees usually come into bearing earlier and produce more consistent crops of better color, texture, and quality than trees grown in environments 1 or 2.

4. *Open sandy and gravelly soils.* Where apple trees are planted upon very porous soils that are definitely low in nutrients and in organic matter, but the moisture and climatic conditions are fairly favorable, growth tends to be rather slow and compact. Such trees are usually somewhat flat-topped and small. If the soil is not too poor, trees under such conditions tend to come into bearing early and produce highly colored fruits. The capacity of the trees is limited and hence the crops are relatively small. In general, these trees tend to become prematurely old and do not remain in good production so long as those in environments 2 and 3.

Where light soils are deficient in moisture supply, and climatic conditions are unfavorable, the young trees grow slowly and remain small and dwarfed.

Fig. 2. A portion of a productive tree grown in environment 3.

The twigs on such trees are thin and the leaves are small. Under these conditions apple trees reach a commercial production stage very slowly, if at all, are irregular in cropping, and yield small fruits. Heavy losses of trees and abandonment of the orchard usually result under these environmental conditions.

Environmental Factors

It should be evident that any system of soil management adopted in an orchard must be based upon the nature of the environment. Three environmental factors of fundamental concern in this respect are soil moisture, organic matter, and nutrients. A few examples of the relation of soil management to environment follow:

A grass sod tends to remove water from a soil and cause it to dry out. At the same time, a grass sod tends to utilize a large portion of the nitrogen available in the surface soil. The competition of the grass for moisture and nitrogen offers an effective means of controlling an over-vegetative type of tree growth. A sod or sod mulch system of soil management, therefore, is usually required for best results under

Fig. 3. Spurs of distinctly different growth status as indicated by their leaves.

conditions similar to those of environments 2 and 3.

Alfalfa or sweet clover sods with or without partial mulching with organic material, or alternate row tillage with these crops, are practices which offer less competition for moisture in the surface soil than grass sod. At the same time, alfalfa and sweet clover offer little competition with the tree for nitrogen. A system of soil management utilizing these crops is particularly applicable in environment 3. In some situations the system may be used in environment 4.

Clean cultivation tends to stimulate vegetative activity in the trees and favors rapid nutrification in the soil. In environments 3 and 4 where competition between trees and weeds for moisture and nitrogen may be serious in early summer, this practice is economical and desirable, provided that an adequate supply of soil organic matter can be maintained and soil erosion can be controlled. This method of management, however, tends to stimulate too much growth upon trees in environment 2.

It should be evident now that the nature of the environment and the system of soil management practiced are important factors to be considered in determining the fertilizer requirements of an orchard. Before specific conclusions concerning fertilizer requirements can be reached, however, it is necessary to determine the variety or varieties grown, the ages and sizes of trees, their growth status, and the fertility of the soil.

Varietal Characteristics

In order to judge what is good or poor, normal or abnormal growth of trees in an apple orchard, it is necessary that one know the characteristics of the variety or varieties grown. Some varieties produce only light crops under the best of conditions. Most varieties are somewhat individual in their requirements and, therefore, succeed best only when favored by certain combinations of environmental conditions. No one variety is grown commercially in all apple-growing regions. Thus, if the growing season is short and cool, as for example in New England, Winesap apples will be small regardless of the fertilizer treatment. In contrast, a variety like McIntosh or Baldwin fails to develop red color and good commercial quality where the summer temperatures are high, as in the southern apple-growing States. In a fertile, moist environment varieties such as Mammoth Black Twig, Baldwin, and Northern Spy are inclined to be over-vegetative and unfruitful, particularly in a warm climate. Under similar conditions Wealthy and Duchess may fruit well.

Varieties susceptible to fire blight should be managed with extreme care. They should not be allowed to become over-vegetative nor under-vegetative.

After the variety or varieties have been determined, the following facts need to be ascertained: 1. Are the trees of bearing age? 2. If of bearing age, are they fruiting well or poorly? 3. Are the trees over or under-vegetative? 4. Are they making a weak, good, or excessive growth? 5. What is the nature of the foliage as to size, shape, color, and condition?

In general, as apple trees increase in age, they increase in size and in productive capacity. This increase in size and yield is accompanied by a greater demand for plant nutrients. The nutrient requirements of a well-grown apple tree may increase considerably after it attains an age of 15 years. This is especially true of orchards planted somewhat too closely. In fact, where trees are too crowded, light and moisture may be limiting factors, and it may not be possible to attain the desired type of tree growth until some of the trees are removed. Rule-of-thumb methods for estimating the increase in nutrient demand solely on the basis of age or trunk diameter are to be discouraged.

Fruit production by an apple tree is not determined solely by the amount of growth it has made, but by the quality of the growth or the amounts and quality of reserve foods it has accumulated. Quality of growth is indicated in a general way by the fact that trees which develop a larger number of spurs with large buds are in a favorable condition for fruit production; trees which develop a large number of twigs and shoots, and few spurs, may be termed over-vegetative; and trees which make very weak growth and develop small, yellowish-green foliage are markedly under-vegetative. More accurate methods than this for judging the growth status of certain varieties of apples have been established by the New Jersey Experiment Station. One of these is a summer standard for Delicious.

Fig. 4. (1) A vigorous productive spur with a large fruit bud. (2) A weak spur with small bud, consistently unproductive.

The application of this standard may be illustrated by figure 3. Spurs represented by the large one are almost certain to form medium-large or large buds which, under favorable conditions, will set fruit the following year. If a tree develops one or more large, well-developed spurs every 10 to 15 inches of fruiting wood, it is in a good growth status, and

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Bur Clover Is Good for Soils and Pasture

By E. B. Ferris

Superintendent, Holly Springs Branch Experiment Station, Holly Springs, Mississippi

THERE is nothing new about bur clover and its use as a soil-builder and pasture crop, especially in Mississippi. Some 50 years ago it was being advocated for both purposes in the region around Starkville and the A. & M. College, and for a number of years afterward the seed was sold in rather large quantities by growers in that territory. We recall a fine old gentleman in Starkville who, within the corporate limits of the town, produced and sold thousands of bushels of bur clover seed. He grew the crop primarily as a pasture plant, which, in combination with Bermuda grass, gave a pasture unsurpassed by any other mixture then known. Original seedings started then have persisted for all these many years, as the writer has found out by his recent intense interest in the crop.

Bur clover grows so thick in this field one has to grabble to find the ground.

But the State-wide interest in bur clover seemed to have waned and not to have been revived until within the past 10 years, when a few planters in the Mississippi Delta began to advocate its use purely as a soil-building crop to take the place of vetch, winter peas, and crimson clover. This was largely because of the better seeding qualities of bur clover and the fact that when once a field was thoroughly seeded, the necessity for annual planting was eliminated. However, a few stockmen around Starkville continued to use it all the while for early pasturage and do not hesitate now to make the statement that of all pasture crops in this region of excellent grasses and clovers, they get more valuable grazing from bur clover than from any other single pasture plant.

To illustrate the persistency of this clover when once started, we know of its having been sown on a small farm near Starkville about the time it was first advocated by the A. & M. College and distributed by the grower in Starkville. Much later the writer married a daughter of the owner of this farm and thus became interested in it because it is still owned jointly by the heirs. Recently, in seeking a combination early pasture and soil-building crop for our farm, we turned to bur clover as coming nearer to meeting the ideal than any other crop.

We were traveling out of Starkville at the time, and the thought occurred

Overlooking fields of vetch and bur clover on the Ferris plantation, Vicksburg, Mississippi.

that some bur clover seed might be had from the pasture on this Starkville farm. Rather to our surprise, it still flourished and, although many work animals and dairy cattle had been continuously grazed on a small acreage and the farm entirely tenanted by negroes for 50 years, this clover still furnished one of the best early pastures seen around Starkville and had grown so rank at the time that in the richer places it stood between knee and waist high. It only remained then to contract with this tenant to save some seed, a thing he had never done.

This was done by agreeing to pay the customary wage scale for women and children, $1.00 a day for the tenant himself, and 10 per cent of the cost of all labor for his supervision over it. During the course of 3 years we saved 2,800 bushels of seed in bur and could have saved many more if they had been needed. This was done in the crudest way, by the use of hand rakes for removing the dead stalks and wire brooms for sweeping the seed from the ground. The cost was a little under 3 cents per bushel in bulk, and the added expense of buying sacks, bagging, and delivery some 200 miles away still kept it under 10 cents per bushel.

The trouble in getting bur clover started in the past has been the difficulty in securing stands and the cost of buying seed at the prevailing price of about $1.00 per bushel. Even where 10 bushels of seed are planted per acre, one seldom gets a perfect stand the first year. This is caused by the slowness with which the burs themselves disintegrate, thus allowing the seed to come in intimate contact with the soil; also because of the hardness of many of these seed, which without scarifying, will lie dormant in the soil for several years before germinating. The difficulty of getting stands of bur clover has caused the agronomists to do a lot of work in the past, dipping them for certain lengths of time in boiling water to soften the coats, a practice that worked well in a small way, but proved too much trouble for the large grower.

Slow Germination Favorable

In recent years it has developed that this difficulty of getting all bur clover seed to germinate in a single year is really in its favor. When plenty of seed are left on the ground, even a small percentage of them germinating in a single year will give a stand, leaving enough ungerminated to continue to give stands for several years. Thus in the Mississippi Delta where the crop is now being grown on tens of thousands of acres, they are finding it possible, when once a thorough stand is obtained, to plow under the crop before seeding for as many as 4 or 5 years and continue to get stands each year from seed left ungerminated from the original sowing.

Eliminates Fall Plowing

This eliminates the necessity of plowing the land in the fall as when planting other winter legumes; practically insures a stand of clover as early as it is possible to get and maintain one; and is really an important factor in erosion control, because there is much less loss of fertility on unplowed than on plowed land, especially where, without breaking in the fall, one gets a good stand of a close-growing, winter cover crop. It has been found from actual experience that there is much less erosion on lands covered with bur clover than on similar ones growing vetch or winter peas, because the habit of growth of this bur clover makes it partake more of the nature of a sod crop and also because one does not start out in the winter with freshly plowed land.

There are many varieties of bur clover, the most common ones being California bur, Southern or spotted bur, Manganese bur, and the more recently developed Giant bur which seems to be identical with Southern bur except that it matures its seed some 2 or 3 weeks earlier and is, therefore, more valuable when grown purely as a soil builder and in rotation with summer crops, such as corn and cotton. As a pasture crop Giant bur is not believed to be any better, if as good as the Southern bur, because it dies earlier and possibly does not begin to furnish grazing any sooner.

While animals have to acquire a taste for bur clover and prefer most any other pasture crop to it, this clover grows so much earlier than any other that for weeks during the winter animals get good grazing, whereas without it they would get none at all. Thus on some 60 acres of bur clover pasture on our own farm, large numbers of cattle, horses, hogs, and sheep were largely supported this year from the middle of January through March, and with all but continuous grazing during the time, this clover stood knee-high at the end of March.

Bur clover seems a little more selec-

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This picture shows beef heifers grazing in a field of bur clover in March.

That's What They Call 'em

By Barbara Worrell

Weed Investigations, Bureau of Plant Industry, United States Department of Agriculture

YOU know, we do an awful lot of talking. As mankind goes plodding down the corridors of time, he fills the air with so many words that they drift in currents and little channels of repetition, and collect gradually about objects or ideas until in every language each set of ideas or occupations has its own little drift of words that grows with time or is snowed under and lost in the great blizzard of words that makes up a language. As man admires pleasant things and complains about traffic, head colds, mosquitoes, and weeds, he unconsciously builds for each of them a vocabulary of its own.

My work happens to deal with weeds, and every day there go across my desk some of the thousands of strange names by which weeds are known in various parts of the world. Thanks to that hard-working Swede, Linnaeus, and his followers every plant has, of course, its proper Latin name, but who bothers with a name he can't even pronounce? So you and I, and the farmers in Minnesota, South Africa, and Siberia, know the plants on our own domains by the names our fathers called them, or our neighbors and our neighbors' fathers.

My favorite weed at the moment is "herbe a mal d'estomac," an uncommon plant which, unless my French is going back on me again, must have made someone uncommonly sick around 1891. Or did it cure him? I'll never know.

Another thing that puzzles me is why farmers in one county swear at creeping Charlie, while the same plant a few miles away skulks along as creeping Jennie.

Some names have clung, like warning signs, to certain weeds: tread softly, sneezeweed, children's bane, rip-gut grass, death camas, death-of-man.

From All Sources

Religion seems to have left its mark where gardeners hoed and farmers plowed, for there are Job's tears, monk's head, priest's crown, St. John's blood, sweet life everlasting, blessed thistle, Our Lady's thistle, and Star-of-Bethlehem—as well as holy roller. Of course there are, on the other hand, cursed thistle, devil's grandmother, devil's plague, devil's claw, and devil's paintbrush; and, while we're speaking in plain words: bunk, malo mujer, hell weed, blaw-weary, and stinking Willie. Stinking Willie has cousins named Poor John, Salvation Jane, and Jack-by-the-hedge.

Apparently poets have weeded gardens too, and of course they uprooted gold-of-pleasure, moon-penny, silvery cinquefoil, doon-head clock, lalang, and silken cissy.

In Australia and South Africa the weeds must be downright cute. How would you like to wake up some drizzly Monday morning to find your garden all overrun with bidgee-widgee, bidi-bidi, roley-poley, or bindi-eye? Then, too, you'd have to watch out for piri-piri, uintjies, sprinkaanbos, and dubbeltjie doring.

On the whole, I think I'll stick to

(*Turn to page* 36)

Boron Deficiency Becomes a Problem In Michigan

By R. L. Cook

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THE possible deficiency of Michigan soils in nutrient elements other than those usually applied in commercial fertilizers has been under study for several years. These studies have indicated a deficiency of boron for certain crops on a number of soil types. A lack of boron in the soil is evidenced by certain characteristic plant symptoms, by rate of growth, and by date of maturity. In this article are presented descriptions and photographs of boron deficiency symptoms on various crops, and some results of the effect of borax on the yields of certain leguminous plants. A discussion concerning the general need of Michigan soils for applied boron is also included.

As a result of the findings of Kotila and Coons, the attention of the Soils Section of the Michigan Experiment Station was recently called to a certain disease of sugar beets known as heart rot. For several years attempts were made by European investigators to trace the cause of this disorder to some organism, but it was finally shown by Brandenburg and later by others that the injury was due to a deficiency of boron in the soil. Vilkaitis reduced heart rot infection from 51.7 to 4.4 per cent by the application in water solution of 5 kgm. of borax per hectare. Further reductions of 1.2 and 0.5 per cent were obtained by 10 and 20 kgm. applications respectively. Brandenburg reported complete prevention of heart rot in pot tests as a result of additions of 30 to 50 mg. of boric acid per plant, and similar results in the field as a result of the application of 20-25 kgm. of boric acid per hectare. He stated further that the beneficial effects persisted the year after the application. Kotila and Coons obtained the most vigorous growth of beet plants in quartz cultures as a result of the applications of 20 pounds of borax per acre. They reported also the recovery of sugar beets inflicted with heart rot as a result of placing them in soil treated with borax.

Field Plat Experiments

As a result of inquiries regarding the addition of borax to sugar beet fertilizers in Michigan, a small amount of field plat work on this problem was conducted by the Michigan Station in 1936. Experiments were completed on five farms in Gratiot and Tuscola Counties, but unfortunately the experiments were located on fields where the deficiency symptoms did not occur.

In the fall of 1936 a survey of certain of the sugar beet areas showed the presence of serious heart-rot injury in the northwestern part of Tuscola County, near Wisner, Unionville, and Akron, and in the southwestern part of Huron County, near Sebewaing. Arrangements were made at that time for 1937 field plats in those areas.

The 1937 investigations were so planned as to give information regarding the quantity of borax necessary to control heart rot and the quantity which might be added without injury to the sugar beet crop and to following crops. Again, as in 1936, the injury did not occur on the fields where the experiments were located. This was in spite of the fact that it had occurred on adjoining fields in 1936 and was found in many other portions of the sugar beet area in 1937. The experiments, however, resulted in one interesting observation. The highest application, 80 pounds of borax per acre, made broadcast before planting, was not injurious to sugar beets on either Wauseon sandy loam or Nappanee silt loam. This may have been influenced by the fact that moisture conditions were ideal on both fields at planting time and there was no serious deficiency of moisture at any time during the season.

Fig. 1. A darkened and cross checked leaf petiole is indicative of boron deficiency in sugar beets.

During the 1937 season no fields were observed where boron deficiency injury was as serious as it was on certain fields in 1936, but a survey during the harvest season showed deficiency symptoms to be definitely present in 15 out of 36 fields. Of the 21 fields not definitely classed as bearing deficiency symptoms, several were classed as being suspicious. While the survey was not sufficiently detailed to completely classify infected areas throughout the beet-growing region inspected, indications were that boron deficiency occurs in localized areas. It was found to be especially prevalent in the vicinities of Cass City, St. Louis, Mt. Pleasant, and Maple Rapids. More restricted appearances were noted around St. Johns and Unionville. An interesting observation made previously by Kotila was borne out in this survey. Wherever the deficiency was noted on rolling or hilly fields, it always occurred on the higher soils.

Fig. 2. Shortened petioles and twisted leaves suggest boron deficiency in sugar beets.

During a survey of a portion of Michigan's sugar-beet-growing area in the fall of 1937, many of the characteristic boron deficiency symptoms described by Brandenburg and Kotila and Coons were observed. As illustrated by figure 1, a darkened and cross-checked leaf petiole is indicative of boron deficiency. Likewise, a shortened petiole and twisted leaf, as shown

Fig. 3. Some sugar beets, seriously inflicted with heart rot, fail to put forth the new fall growth of leaves.

in figure 2, indicates a need for boron.

In late August or September many beets on boron-deficient soil are found to have an entirely dead heart. As the new fall growth of leaves comes on, these beets may fail to put forth new leaves or the new growth may be sufficient to entirely cover up the dead heart. Figure 3 illustrates the appearance of a beet which failed to put forth new fall growth.

Side cankers and internal discolorations are also characteristic symptoms of this disorder. The whole beet shown in figure 4 gives an idea of the appearance of the cankers, while the cut sections illustrate the discolorations. In some cases the discolorations extend to the surface, while in other cases they can only be detected by slicing the beet.

Disease Scattered

In some fields where the deficiency was not serious, injured beets were found scattered among healthy beets, while in many cases whole patches were affected. Such a patch, as it existed on a farm near Mt. Pleasant, is shown in figure 5.

As might be expected, all of the deficiency symptoms were not always found in the same field. In some fields only leaf symptoms were apparent, while in others the presence of cankers or dead hearts furnished the clue that a boron deficiency existed. In most cases beets with dead hearts showed cankers and discolorations as well.

Further work in this laboratory, the results of which will be published later, has shown definitely that the described symptoms were actually indicative of boron deficiency. This was accomplished by splitting the injured beets and planting the halves in quartz cultures with and without boron. Shoots from halves which received boron made a more rapid growth than those from corresponding halves without boron and did not put forth leaves showing the characteristic deficiency symptoms. The untreated halves, on the other hand, all produced leaves with the same symptoms noted in the field, except in one case in which the untreated half failed to grow. The differences in growth between the treated and untreated halves of three beets are shown in figure 6.

Attempts have been made by various investigators to correlate boron deficiency with certain soil conditions. In experiments with Washington Navel Orange trees, Haas found that when high concentrations of calcium were used in solutions supplied to sand cultures, it was necessary to increase the concentration of boron to prevent boron deficiency symptoms. Solunskaya ex-

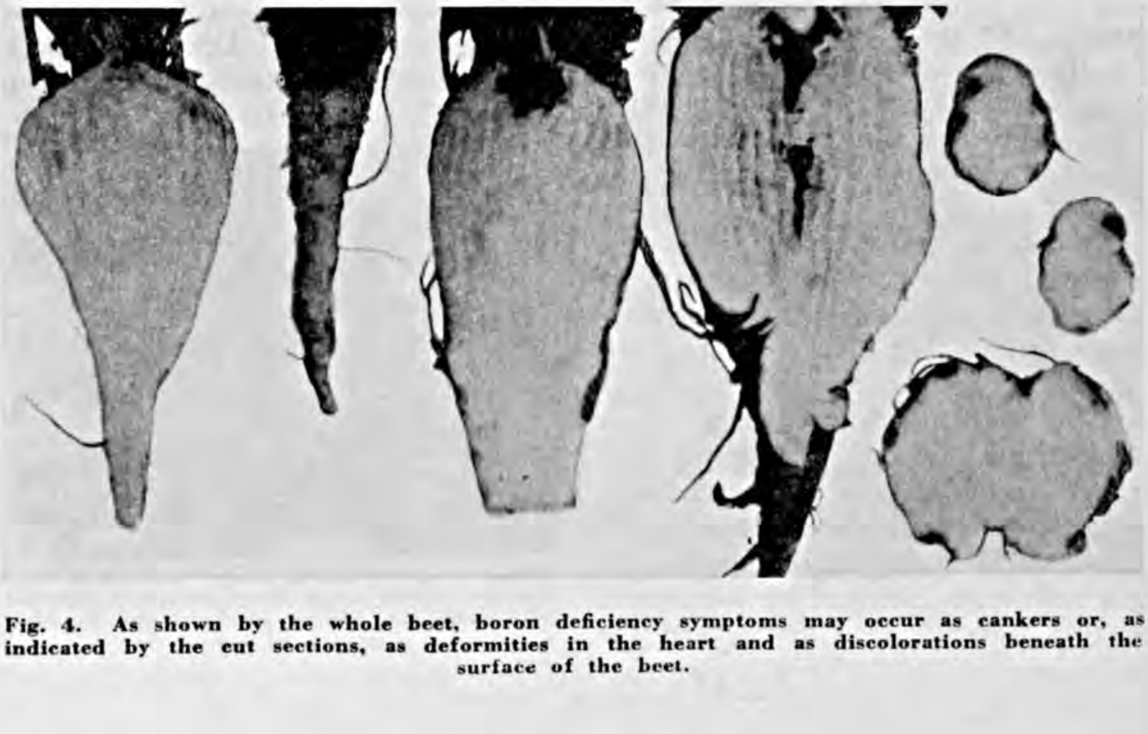


Fig. 4. As shown by the whole beet, boron deficiency symptoms may occur as cankers or, as indicated by the cut sections, as deformities in the heart and as discolorations beneath the surface of the beet.

plained the more serious infestation in sugar beets on alkaline soils as being due to the greater top growth and the corresponding greater need for boron, rather than to the fact that boron is not readily available in alkaline soils. Also working with sugar beets, Fron reported a pH of 8.0-8.5 for most of the soils where boron deficiency injury was encountered. He also reported the greatest injury on soils where the moisture content was low. Brandenburg reported that heart rot occurred on acid as well as on alkaline soils. Willis and Piland reported three cases of a definite response to borax, one with alfalfa and two with romaine. All three occurrences were on liberally limed soil.

Fig. 5. Heart rot of sugar beets occurs in patches. On Oct. 14 some of the beets in this patch were completely devoid of green leaves while some had put forth considerable new fall growth.

Experimental. In the 1937 survey mentioned above, soil samples were taken in numerous fields. An attempt was made to correlate boron deficiency, as indicated by the plants, with some condition in the soil, either reaction or boron content. As deficiency symptoms were more commonly found on Miami soils than on any other single soil series, the laboratory experiments to date have been confined to the Miami soils.

Of 24 samples obtained from this soil, 16 were from soils on which the beets showed boron deficiency, while 8 were from fields free of deficiency symptoms. Of the 16 apparently boron-deficient soils, 14 ranged in pH from 7.1 to 7.9. From this data it would seem that boron deficiency is more likely to occur on alkaline than on acid soils. When the other eight samples are considered, however, a doubt is cast on this relationship. Of the eight samples taken from areas where boron deficiency did not occur, five were alkaline with a pH from 7.0 to 7.4.

In the fall of 1936 the writer decided to undertake certain experiments which might reveal the effect of boron deficiency on other commonly grown Michigan crops. It was hoped that a knowledge of boron deficiency symptoms on several crops would make it comparatively easy to spot boron deficient soils and thus simplify the problem of making the proper borax recommendations for sugar beets.

Alfalfa, barley, beans, corn, sweet clover, red clover, and alsike clover were grown in a greenhouse in 1-gallon glazed earthenware jars, each filled with 5 kgm. of white quartz sand. Nutrient mixtures and rates of application were exactly as described by Muckenhirn of the University of Wisconsin in his boron experiments with lettuce, except that sodium tetraborate was used in place of boric acid, and the nutrients were added in four separate applications. Two additional applications of the soluble nutrients were made in the case of alfalfa. By frequent weighings the moisture content of the sand was maintained at 10 per cent. Treatments were replicated four times.

Alfalfa and alsike clover were also grown in glazed earthenware jars filled with soils from fields where previous crops had shown signs of boron deficiency. The alfalfa was treated with $Na_2B_4O_7$* at the rate of 2 pounds per acre, and the alsike clover received 3 pounds of the same material. Treated and untreated cultures were set up in replicates of four. All cultures received complete nutrients other than boron.

(*Turn to page* 42)

* Similar to ordinary borax.

Sullivan Farmers Test Their Soil

By H. N. Wells

County Agent, Sullivan County, Claremont, New Hampshire

SUPERVISORS under the Soil Conservation Program, who last spring visited farmers of Sullivan County, New Hampshire, helping them to plan their crops, took a decided interest in soil testing. The farmers wanted a test that would show soil conditions not only as to need of lime, but also need for plant foods such as nitrogen, phosphoric acid, potash, and magnesium. They also wanted to know whether there was a toxic condition because of an over-supply of aluminum. The last-named element always arouses interest, and some farmers wonder if they had better go to mining it. However, it is a deterrent rather than a help if it exists in relatively large amounts, for it creates a toxic condition under which most farm crops grow poorly or not at all. This is especially true of clovers. This condition may be easily corrected by an application of lime.

Wide-spread Need for Lime

Last year the soils from 351 fields in Sullivan County were analyzed and detailed reports were made to the farmers. Of these, 211 or about 60 per cent were found too low on lime to grow clovers readily. This was found more true on the upland soils outside the Connecticut Valley. In the valley region, especially near the river, the test showed sufficient lime, but even there, applications in some instances seemed to help the clover crop. There were 41 fields so high in lime that alfalfa could be grown readily if other conditions were right, such as ample plant food, Grimm seed inoculated, and a good seed bed.

The tests also showed a decided deficiency in phosphorus and potash. Crops and animals use large quantities of both and they must be added to the soil in some way. While a few had just a trace, 277 fields or 78 per cent were found to be low or very low on phosphorus.

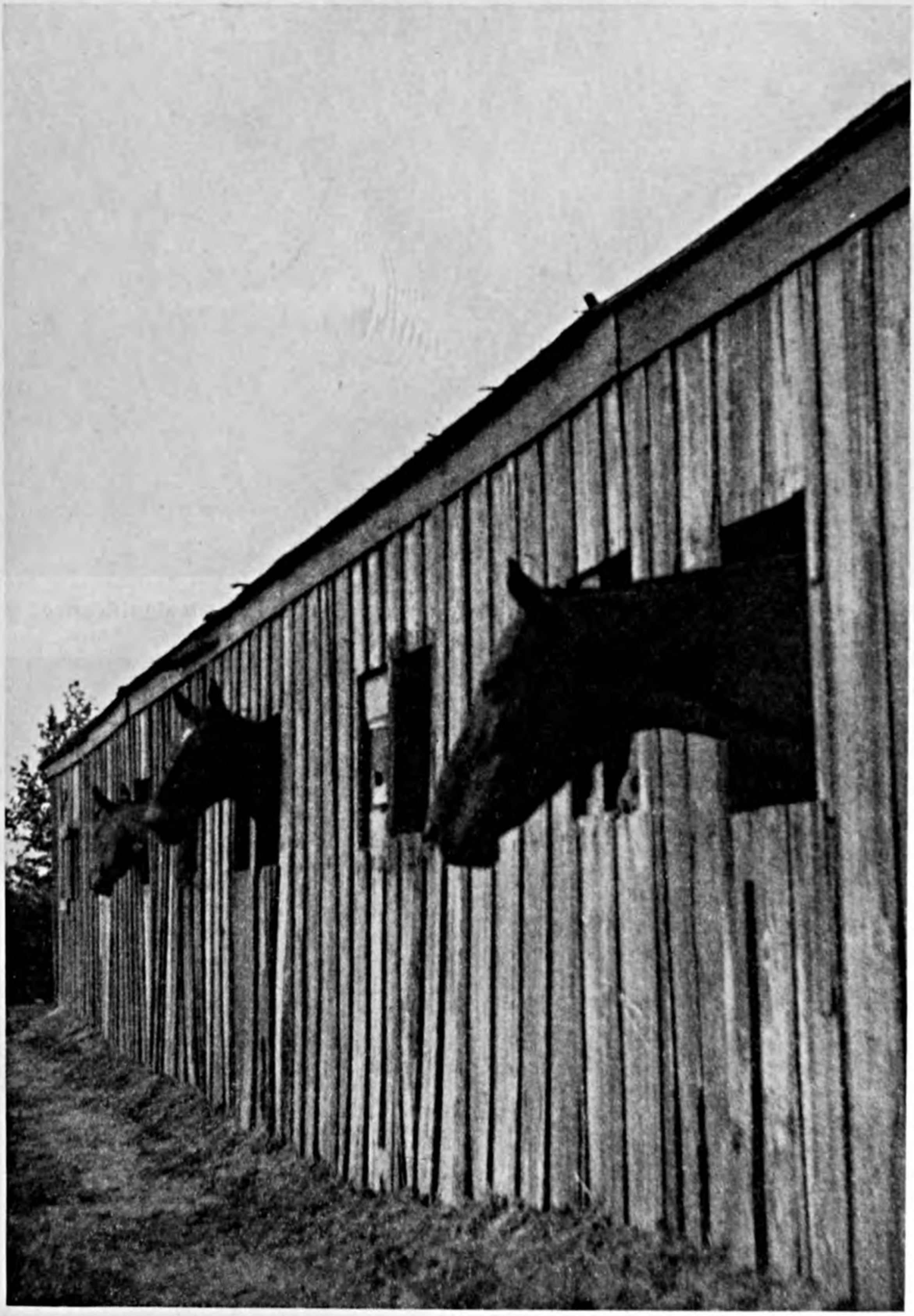
Other Deficiencies Disclosed

Of the fields tested, 65 per cent were far too low in potash to grow good crops, especially legumes, 148 fields had no potash at all, and 90 others had just a trace.

The fields found very low on ammonium nitrogen totaled 207, and 94 had either no nitrate nitrogen or just a trace. There were 246 fields either very low on or with just a trace of magnesium, a condition readily corrected by the application of lime.

These deficiencies, coupled with a very high aluminum content on nearly one-half the fields tested, probably explain why many farmers do not get the yields they should. They also indicate a lot more soil testing for farmers who want to know. With a generous government payment for lime, superphosphate, and potash, farmers are encouraged to build up the productivity of their soils as never before. Despite the unusually wet spring last year, they applied more than 41,000 pounds of available potash, more than 70,000 pounds of available phosphoric acid, and 798 tons of lime.

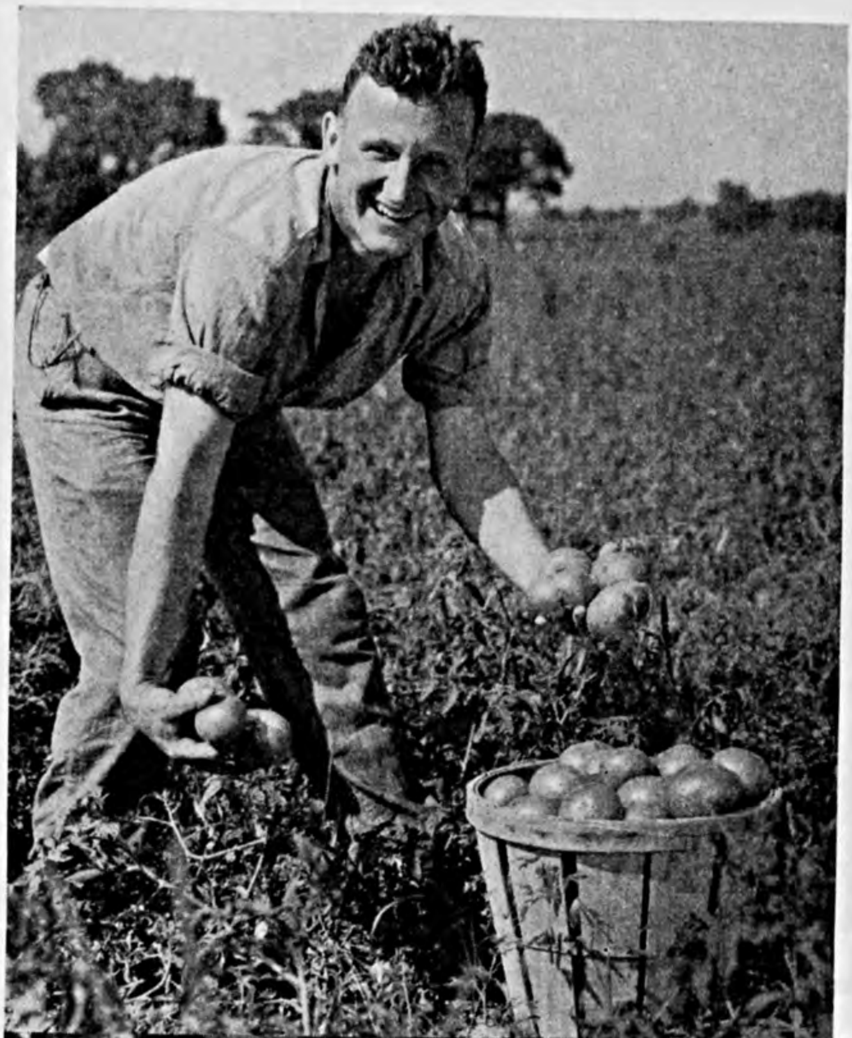
PICTORIAL



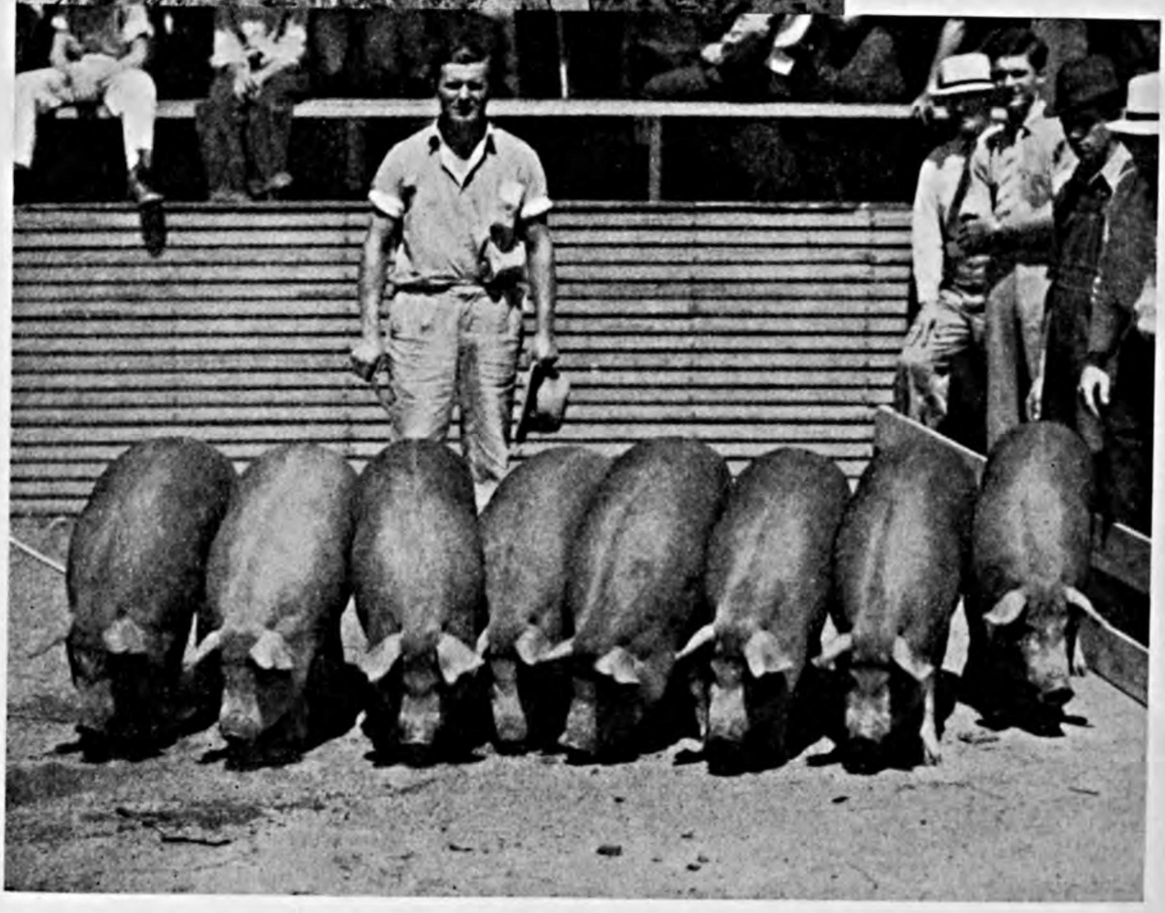
Enjoying their breathing spell.

To each section the bounty of the harvest season has its own significance.

North and South, harvest landscapes pay tribute to man's effort to achieve.



David Snyder of Franklin, Indiana, is the State's 1938 champion tomato picker. He also has been three times winner of his local corn-husking contest.



Maurice Lux, son of Indiana's well-known Corn King—Peter J. Lux of Shelbyville, won first prize at Indiana's 1938 Ton Litter Show.

The Editors Talk

Stabilized Crop Yields

Within recent years yields of several of our important crops have fluctuated widely, resulting in some years in large surpluses and in other years in such great deficiencies as to necessitate a considerable volume of imports. These conditions were naturally accompanied by great fluctuations in prices consumers had to pay and in income of the farmer and a violent disruption to what may be termed the general agricultural rhythm of the country. To those who are earnestly working for the planned stabilization of agriculture it has been a trying and disheartening period.

With the advent of crop insurance, problems of variation in yield are receiving increased attention. While insurance may reduce the effects of the variation on the individual by spreading them over many farmers, the problem as a whole is as important as ever. To those charged with the administration of the crop insurance plan the problem is an acute one, involving as it does the degree of risk, premium, necessary reserve, and other actuarial factors.

We already have had very forcibly brought to our attention the fact that while acreage of crops may be fairly well controlled this alone will not necessarily eliminate the possibilities of over or under production. Any practicable means of reducing these yield variations per acre will therefore be of interest and importance to our agriculture in all its aspects. A significant contribution to the stabilization of acre yields of crops is made by L. D. Miller and F. C. Bauer of the Illinois agricultural experiment station in their article in the August 1938 issue of the Journal of the American Society of Agronomy.

Using data accumulated over a period of years on the 17 soil experimental fields located in representative areas of the State, the authors studied the effects of various soils and management practices on variability in corn yields from year to year. This study revealed that the dark, more fertile soils produced corn with less variability than the less fertile soils. The use of adapted fertilizers and manure greatly reduced variability in yield on the less fertile soils. The most effective treatments differed on the various fields, but in most cases manure, lime, and phosphate reduced variability. On a number of fields, crop residues, lime, phosphate, and potash also were very effective. An interesting point is that while most uniform yields were usually associated with high yield levels, they were not always correlated with the highest yield.

It thus is evident that while seasonal variations cannot be entirely eliminated, corn yields can be stabilized to a much greater extent if good fertilizer and soil management practices are followed than if no or improper treatments are given. As the authors point out: "Good soil and good farming methods are in themselves very good corn crop insurance under Illinois conditions. Farmers who practice good farming methods will have few seasons of extreme surplus yields and are in a good position to predict the amount of their corn production." Such good practices fit in very well with the soil conservation program of the Government and certainly must form an important link in the program of stabilized production and supply of crops.

OOOOOO

Dr. Hugo Neubauer

Agriculturists, scientific organizations, and periodicals in many parts of the world recently have been giving well-deserved tribute to Dr. Hugo Neubauer, professor and retired director of the Saxon Agricultural Experiment Station in Dresden. The occasion was his 70th birthday on September 2, and the tributes were for his outstanding contributions to world agriculture.

It is very fitting that these many tributes should be paid to Dr. Neubauer, who is best known in most countries for his development of the plant seedling method for determining available nutrients in the soil. This seedling method, which bears his name, alone would insure his place in the field of agricultural research. Added to this is a considerable volume of work on animal and plant nutrition and general analytical chemistry, attesting to the broadness of his interests.

Dr. Neubauer first published information on his seedling method in 1923, and within a short time it was being used in many countries. For years agricultural chemists had been trying to determine the availability of nutrients in soils, and from this their fertilizer requirements. The problem had always been to find a chemical solution that would dissolve the nutrients out of the soil to the extent that they were available to the plants. Some investigators had devised solutions they thought were quite satisfactory, while others despaired of ever attaining the goal and believed only laborious and time-consuming field experiments could be used with certainty.

Since it was difficult, if not impossible, to prepare a proper extracting solution, Neubauer used the plant itself to extract the available nutrients from the soil. For this purpose he employed young rye seedlings growing under carefully controlled conditions, analyzing them chemically to see how much nutrient they absorbed from the soil. By the use of several pounds of soil and with proper treatments, it is possible by this method to carry through to completion within a month in the laboratory an experiment that would take a year to do in the field, even with favorable weather conditions.

The Neubauer method has been of inestimable value in fertilizer and soil research and is being used in ever-increasing volume in this country and Canada. Purdue University was one of the first institutions to try it, and experiment stations in Wisconsin, Ohio, Vermont, Michigan, California, Tennessee, Oregon, Washington, Ontario, and other places have done considerable work with the method. Undoubtedly it has been a factor in the development of the rapid chemical tests for determining the fertilizer needs of soil that recently have become so popular and useful. The short methods usually are correlated against Neubauer results as well as field results in order to save time.

Dr. Neubauer is respected as a scientist by all who know his work. By those fortunate enough to know him personally he is respected, admired, and esteemed as a man. His kindly personality and fine but unassuming character make an indelible impression on all who come in contact with him. We extend to Dr. Neubauer our best wishes and fervently hope we may be favored with his work, advice, and influence for many years to come.

REVIEWS

This section contains a short review of some of the most practical and important bulletins, and lists all recent publications of the United States Department of Agriculture and the State Experiment Stations relating to Fertilizers, Soils, Crops, and Economics. A file of this department of BETTER CROPS WITH PLANT FOOD would provide a complete index covering all publications from these sources on the particular subjects named.

Fertilizer

¶ The movement to lower the cost of commercial fertilizer by reducing the large number of grades manufacturers are compelled to stock under present demands is receiving added impetus by agricultural leaders of the Federal and State institutions. New Jersey Agricultural Experiment Station Circular 375, "Farmers Can Reduce Fertilizer Cost," by A. W. Blair, is very appropriate in this connection, in that it shows in simple terms how the fertilizer industry, experiment station, growers, and county agents can cooperate in reducing the number of grades and thereby save farmers many thousands of dollars.

To stock a multitude of fertilizer grades naturally means the farmer must pay the additional cost of handling, stocking specially printed bags, and support of additional State control work. Professor Blair states that "it would be well for us to face the facts and admit there is little to be gained in laying stress on fine distinctions in grades. Rather we should lay stress on the proportions of the elements (ratios) and on the amount of nutrients applied to the acre. Many grades could be eliminated because they are very rarely used. . . . Frequently one grade could be eliminated by using a little smaller amount of a slightly higher grade having the same ratio." Certainly the points given in this circular are in the right direction to help the farmer to save on his fertilizer bill.

¶ Since 1929 Dr. V. H. Young and his associates of the Arkansas Agricultural Experiment Station have devoted considerable attention to the control of cotton wilt and "rust" on potash-deficient soils in eastern and central Arkansas. Reports of their earlier studies have been made in several previous well-known publications. In his latest publication bearing on this work, "Control of Cotton Wilt and Rust, or Potash Hunger, by the Use of Potash-containing Fertilizers," Station Bulletin 358, Dr. Young presents a complete summary of these studies based on the data obtained from 1929 to 1937 at 15 different sites where cotton wilt commonly occurs.

According to these results, fertilizers containing potash gave control of rust and reduced the incidence of cotton wilt every year and at each location, except two. Heavier applications of potash were generally more efficient than low amounts in the control of wilt. Excessively high amounts of potash were, however, without correspondingly greater results. Furthermore, potash hunger, or rust was associated with cotton wilt at all but one of the experiments, the wilt here having been due to a severe attack of nematode disease. The data given and explained in the bulletin apply only to the wilt of ordinary upland cotton caused by *Fusarium vasinfectum* Atk.

Even though potash when applied alone frequently gave as good or even better results in cotton-wilt control than the same amount of potash in a mixed fertilizer, the latter usually resulted in better yields. The use of fertilizers lacking potash increased the intensity of rust and wilt on cotton growing on these soils. The author expresses the belief that field studies over a period of years in practically every section where cotton wilt is a factor are necessary to determine just what combinations of cotton varieties and fertilizer analyses will provide the most satisfactory control of cotton rust and the reduction of wilt.

"Fertilizer Problems and Analysis of Soils in California," Agr. Exp. Sta., Berkeley, Calif., Cir. 317, Revised Apr. 1938, D. R. Hoagland.

"Purchasing Lime and Fertilizer," Agr. Ext. Serv., Durham, N. H., Ext. Cir. 210, Mar. 1938, Jay L. Haddock.

"Recommendations with Reference to the Fertilization of Flue-cured, Sun-cured, and Shipping Tobacco Grown on Average Soils in Virginia, North Carolina, South Carolina, Georgia, and Florida for the Year 1939," Agr. Ext. Serv., Oxford, N. C., July 21, 1938.

Soils

¶ The United States Department of Agriculture's 1938 Yearbook of Agriculture, "Soils and Men," probably may be labeled the most complete and thorough volume of facts and interpretations ever published, insofar as the innumerable elements centering around our soil problems are concerned. The outstanding contributions of more than 100 authors who collaborated in bringing out the present status of soil research make this a valuable and almost indispensable publication to those concerned with the soil of the country. This yearbook is one of a series designed to promote common understanding of modern agriculture from the scientific, practical, social, and economic aspects.

The subject matter is divided into five sections. Part 1, under the heading of "The Nation and the Soil," has to do with the problems and causes of soil misuse from the economic and social aspect, with possible remedies. Part 2, "The Farmer and the Soil," deals with a wide range of soil-management practices that may be applied by individual farmers. This is the longest single section of the yearbook, because it covers such a wide and varied field. Among the many subjects taken up here are the deficiencies of soil organic matter, nitrogen, phosphorus, and potassium, the authors prescribing general measures as to how these deficiencies may be corrected. Several articles giving an account of modern methods of determining fertilizer needs, fertilizing and liming, tillage, and erosion control are also included in this section.

Part 3, "Soil and Plant Relationships," is concerned with the soil requirements of plants and some relations between soil and plant composition. A chapter is devoted to the less common plant-food elements, such as magnesium, boron, iron, etc. Part 4, "Fundamentals of Soil Science," discusses the physical, chemical, and biological nature of the soil, which furnishes the scientific background for dealing with practical problems. Part 5, "Soils of the United States," describes the soils of the nation, including the territories, based on the work of the Soil Survey Division. Inside the back cover is a map distinguishing the soils of the country.

The present yearbook is a worthy companion to the last several volumes, each dealing very completely with a phase of agriculture. These books are a distinct contribution to our agricultural literature and reflect great credit to those responsible for their conception and preparation.

¶ Information of practical value to tobacco growers is detailed in Kentucky Agricultural Experiment Station Bulletin 379 entitled, "Soil Management and Fertilization for Tobacco," by George Roberts, E. J. Kinney, and J. F. Freeman. The authors explain that the soil for tobacco should be productive and well-drained. High yields can usually be produced by applying large amounts of commercial fertilizer, even on thin land, but good quality tobacco is seldom produced unless the soil is productive.

Burley grown on good sod land usually responds profitably to the use of 300 or 400 pounds per acre of fertilizer analyzing 4-5 per cent nitrogen, 8-12 per cent phosphoric acid, and 6-8 per cent potash. For the less productive soils, 500 to 800 pounds of fertilizer may be used profitably. Fertilizers for the Burley type should be applied at the row.

A 3-8-6 or similar analysis applied at the rate of 200 to 300 pounds per acre is recommended for dark tobacco. The fertilizer for this type of tobacco should be used at the hills. On less productive soils, the complete fertilizer may be supplemented with a broadcast application of 200 pounds of superphosphate and 50 to 75 pounds per acre of either muriate or sulphate of potash. It is highly important that the fertilizer be placed in a manner so that the roots of the plants will not come in direct contact with it to prevent killing of the plants. Manure along with fertilizers gives very good quality tobacco of the types under discussion. Recommendations regarding the grasses and legumes for tobacco rotations, as well as many other soil management suggestions, are given in the bulletin.

"Studies on Soil Structure: Effect of Puddled Soils on Plant Growth," Agr. Exp. Sta., Tucson, Ariz., Tech. Bull. 72, June 15, 1938, W. T. McGeorge and J. F. Breazeale.

"Vermilion County Soils," Agr. Exp. Sta., Urbana, Ill., Soil Rpt. 62, June 1938, Herman Wascher, R. S. Smith, and L. H. Smith.

"St. Clair County Soils," Agr. Exp. Sta., Urbana, Ill., Soil Rpt. 63, June 1938, Guy D. Smith and L. H. Smith.

"Germination of Seeds and Damping-off and Growth of Seedlings of Ornamental Plants as Affected by Soil Treatments," Agr. Exp. Sta., Amherst, Mass., Bull. 351, May 1938, William L. Doran.

"Obtaining Soil Samples for Rapid Soil Tests," Agr. Exp. Sta., New Brunswick, N. J., Cir. 376, May 1938, Donald M. Goss.

"Liming Ohio Soils," Agr. Ext. Serv., Columbus, Ohio, No. 177, May 1938, Earl Jones.

"Distribution of Legume Bacteria in the Piedmont Soils of South Carolina," Agr. Exp. Sta., Clemson, S. C., Bul. 314, June 1938, T. C. Peele and J. K. Wilson.

"Soils of Texas," Agr. Exp. Sta., College Station, Tex., 522 Prog. Rpt., June 3, 1938, W. T. Carter.

"Soil Survey of Dallas County, Alabama," U. S. D. A., Washington, D. C., Series 1932, No. 22, April 1938, W. J. Moran, W. E. Tharp, W. J. Leighty, A. L. Gray, L. G. Brackeen, M. E. Stephens, and M. E. Swann.

"Soil Survey of Wilcox County, Alabama," U. S. D. A., Washington, D. C., Series 1932, No. 26, May 1938, G. A. Swenson, M. J. Edwards, B. H. Williams, A. L. Gray, W. J. Leighty, M. E. Stephens, M. C. Croft, and L. G. Brackeen.

"Soil Survey of the Upper Gila Valley Area, Arizona," U. S. D. A., Washington, D. C., Series 1933, No. 15, Feb. 1938, E. N. Poulson and F. O. Youngs.

"Soil Survey of the Napa Area, California," U. S. D. A., Washington, D. C., Series 1933, No. 13, Jan. 1938, E. J. Carpenter and Stanley W. Cosby.

"Soil Survey of Pike County, Indiana," U. S. D. A., Washington, D. C., Series 1930, No. 47, Jan. 1938, H. P. Ulrich, T. M. Bushnell, D. R. Kunkel, J. T. Miller, and E. G. Fitzpatrick.

"Soil Survey of Franklin County, Iowa," U. S. D. A., Washington, D. C., Series 1932, No. 23, Jan. 1938, T. H. Benton and F. R. Lesh.

"Soil Survey of Kingman County, Kansas," U. S. D. A., Washington, D. C., Series 1932, No. 24, Jan. 1938, E. W. Knobel, R. O. Lewis, and C. E. Dornberger.

"Soil Survey of Oceana County, Michigan," U. S. D. A., Washington, D. C., Series 1933, No. 12, Jan. 1938, C. H. Wonser, J. O. Veatch, and L. R. Jones.

"Soil Survey of Marion County, Mississippi," U. S. D. A., Washington, D. C., Series 1934, No. 6, May 1938, J. W. Moon, Clarence Lounsbury, Robert Wildermuth, C. S. Simmons, Arthur E. Taylor, and Z. C. Foster.

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"Soil Survey of Garfield County, Nebraska," U. S. D. A., Washington, D. C., Series 1934, No. 3, Feb. 1938, Basil Abaskin, E. A. Nieschmidt, R. H. Lovald, and F. A. Hayes.

"Soil Survey of Gosper County, Nebraska," U. S. D. A., Washington, D. C., Series 1934, No. 8, May 1938, W. J. Moran.

"Soil Survey of Wyoming County, New York," U. S. D. A., Washington, D. C., Series 1933, No. 16, Mar. 1938, C. S. Pearson, D. G. Greenleaf, H. R. Adams, and Winston Neely.

"Soil Survey of Pamlico County, North Carolina," U. S. D. A., Washington, D. C., Series 1934, No. 2, Dec. 1937, John T. Miller and Arthur E. Taylor.

"Soil Survey of Jones County, North Carolina," U. S. D. A., Washington, D. C., Series 1934, No. 4, Mar. 1938, W. A. Davis, K. V. Goodman, and Z. C. Foster.

"Soil Survey of Surry County, North Carolina," U. S. D. A., Washington, D. C., Series 1932, No. 20, Oct. 1937, W. A. Davis and E. F. Goldston.

"Soil Survey of McIntosh County, Oklahoma," U. S. D. A., Washington, D. C., Series 1933, No. 11, Jan. 1938, E. W. Knobel and O. H. Brensing.

"Soil Survey of Carter County, Oklahoma," U. S. D. A., Washington, D. C., Series 1933, No. 18, June 1938, E. G. Fitzpatrick and W. C. Boatright.

"Soil Survey of Pocahontas County, West Virginia," U. S. D. A., Washington, D. C., Series 1933, No. 14, Feb. 1938, B. H. Williams and H. M. Fridley.

Crops

¶ In Georgia Coastal Plain Experiment Station Circular 6, "Establishing Improved Pastures in the Coastal Plain of Georgia," by Director S. H. Starr, there are many helpful suggestions on improving pasture land in the coastal section of the State. With the number of beef cattle in Georgia doubled during the 5-year period from 1929-1935, Director Starr declares that it is essential to provide improved pastures to furnish cheap and abundant feed. On practically every farm there is some waste land bringing in little or no return that could be converted into an improved pasture. Bearing out this statement, reference is made to the approximately 10,000,000 acres in swamps, branch bottoms, cut-over pine woods, and marginal lands lying south of middle Georgia, much of which could be utilized for pastures in conjunction with producing timber and naval stores. Investigations have shown that introduced grasses and legumes supplementing the less desirable native grasses make satisfactory lowland pastures, provided drainage and the removal of undergrowth and worthless trees are properly handled.

Common lespedeza, carpet grass, Dallis grass, and white clover have proved a good mixture for lowlands. Experimental results have shown that from 400 to 600 pounds of a complete fertilizer analyzing 6 per cent ammonia, 12 per cent phosphoric acid, and 6 per cent potash when used in early spring more than doubles the gain in pounds of beef per acre as compared with an area receiving no fertilizer. Where pastures are fertilized over a period of years, the 6-8-6 analysis is believed a practical fertilizer. It is stated that upland pastures have not produced as favorable results as the lowland pastures due to the occurrence of droughts almost every year. A combination of Bermuda grass and common lespedeza is the best mixture for the upland pasture, though Kudzu furnishes excellent grazing on the heavier types of soil.

A number of good illustrations make clearer the main points in this instructive circular.

¶ Cornell Extension Bulletin 384, "The Planting and Early Care of the Apple Orchard," by Joseph Oskamp, contains much excellent material that should be of particular value to apple growers in New York State. According to the author, the most successful apple orchards have been profitable chiefly because of a fundamentally good set-up, which has to be largely determined at planting time, since it can not be readily changed later. A good set up includes the choice of a favorable location and soil, selection of standard varieties with provision for cross pollination, proper spacing of permanent trees, and the planting of a good sized orchard.

Under the heading of fertilization, emphasis is given to the fact that as agricultural soils grow older there is an increasing tendency for deficiencies to develop. While experiments in the main have shown that apple trees seldom respond to fertilizers other than nitrogen, this does not preclude that the other elements are never deficient. While the extensive root area and perennial nature of fruit trees make them less responsive to complete fertilizers, they are often applied in the establishment of cover crops or permanent sods in the orchard. Many other instructive topics are also outlined in some detail, among these being pertinent advice concerning soil management, the nursery stock, pruning, and spraying.

"Seasonal Changes in the Chemical Composition of Some Arizona Range Grasses," Agr. Exp. Sta., Tucson, Ariz., Tech. Bul. 73, June 15, 1938, E. B. Stanley and C. W. Hodgson.

"Vegetable Crop Rotation," Agr. Ext. Serv., Storrs, Conn., Bul. 255, Jan. 1938, Albert E. Wilkinson.

"Sweet Corn," Agr. Ext. Serv., Storrs, Conn., Bul. 257 (Revision of No. 190), Jan. 1938, Albert E. Wilkinson.

"4-H Vegetable Gardens," Agr. Ext. Serv., Storrs, Conn., Bul. 262 (Revision of No. 242), Apr. 1938, Garry A. Miles.

"Late Cabbage," Agr. Ext. Serv., Storrs, Conn. Bul. 256 (Revision of 193). Jan. 1938, Albert E. Wilkinson.

"Strawberry Production," Agr. Ext. Serv., Gainesville, Fla., Bul. 97 (Revision of 63 in Part), May 1938, A. N. Brooks and Harold Mowry.

"Crimson Clover for Fertilizer, Feed, and Soil Protection," Agr. Ext. Serv., Athens, Ga., Bul. 452, Revised June 1938, E. D. Alexander.

"Oil Variations of Tung Trees," Agr. Exp. Sta., Experiment, Ga., Cir. 115, May 1938, T. A. Pickett and W. L. Brown.

"Flax Production in Idaho," Agr. Exp. Sta., Moscow, Idaho, Bul. 224, Mar. 1938, K. H. W. Klages.

"Forty-five Years of Service to Idaho Agriculture, the Annual Report of the Agricultural Experiment Station for the Year Ending December 31, 1937," Agr. Exp. Sta., Bul. 225, May 1938.

"Fiftieth Annual Report for the Year 1937, Part 1, Report of the Director," Agr. Exp. Sta., Lexington, Ky., Jan. 1, 1938, Thomas P. Cooper, Dir.

"Lawn Management," Agr. Ext. Serv., Amherst, Mass., Leaf. 85, Revised June 1937, Lawrence S. Dickinson.

"The Quarterly Bulletin," Agr. Exp. Sta., East Lansing, Mich., Vol. 21, No. 1, Aug. 1938.

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"A Study of Wilt Resistance of Cotton in South Mississippi," Agr. Exp. Sta., State College, Miss., Cir. No. 99, Feb. 1938, D. C. Neal.

"Fifty Years in the Service of Agriculture 1888-1938," Agr. Exp. Sta., Columbia, Mo., Bul. 397, June 1938, F. B. Mumford, Dir.

"Wheat in Missouri," Agr. Exp. Sta., Columbia, Mo., Bul. 398, July 1938, W. C. Etheridge and C. A. Helm.

"Fiftieth Annual Report of the Board of Control for the Fiscal Year Ending June 30, 1937," Agr. Exp. Sta., Reno, Nev., 1938.

"Strawberry Culture," Agr. Ext. Serv., Durham, N. H., Ext. Cir. 211, Mar. 1938, L. P. Latimer.

"Agricultural Research in New Hampshire, Annual Report of the Director of New Hampshire Agricultural Experiment Station for the Year 1937," Agr. Exp. Sta., Durham, N. H., Bul. 304, Mar. 1938, J. C. Kendall, Dir.

"Legume and Grass Silage, A Survey of Methods and Results on 380 Northeastern Farms," Agr. Exp. Sta., Durham, N. H., Bul. 305, Apr. 1938.

"Experiments with Grass Hay," Agr. Exp. Sta., Durham, N. H., Sta. Bul. 306, May 1938, F. S. Prince, T. G. Phillips, P. T. Blood, and G. P. Percival.

"Cabbage," Agr. Ext. Serv., Durham, N. H., Ext. Cir. 212, May 1938, J. R. Hepler.

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"Legume and Grass Silage, A Survey of Methods and Results on 380 Northeastern Farms," Agr. Exp. Sta., New Brunswick, N. J., Bul. 643, Apr. 1938.

"Increasing the Protein Content of Timothy, Without Sacrificing Yield, by Delayed Applications of Nitrogenous Fertilizers," Agr. Exp. Sta., New Brunswick, N. J., Bul. 644, May 1938, Howard B. Sprague and Arthur Hawkins.

"Ensiling Green Crops with Molasses," Agr. Ext. Serv., New Brunswick, N. J., Ext. Bul. 198, Feb. 1938, C. B. Bender and H. H. Tucker.

"Early-cut, Nitrogen-fertilized Timothy Hay as Compared with Alfalfa Hay for Feeding Dairy Cows," Agr. Exp. Sta., Ithaca, N. Y., Bul. 694, Apr. 1938, G. W. Salisbury and F. B. Morrison.

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"Sixtieth Annual Report of the North Carolina Agricultural Experiment Station for the Fiscal Year Ending June 30, 1937, Progress Report for Year Ending December 1, 1937," Agr. Exp. Sta., Raleigh, N. C., R. Y. Winters, Dir.

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"Beautifying the Home Grounds, General Arrangements," Agr. Ext. Serv., Raleigh, N. C., Ext. Folder No. 41, June 1938, John H. Harris.

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"Garden Roses," Agr. Ext. Serv., Columbus, Ohio, Bul. 95, Revised Feb. 1938, Alex Laurie.

"Home Gardening," Agr. Ext. Serv., Columbus, Ohio, Bul. 116, Apr. 1938, E. R. Lancashire.

"Better Pastures for Ohio Livestock," Agr. Ext. Serv., Columbus, Ohio, Bul. 154, Revised Feb. 1938, D. R. Dodd and R. M. Salter.

"The Bimonthly Bulletin," Agr. Exp. Sta., Wooster, Ohio, Vol. XXIII, No. 193, July-August 1938.

"Guide to the Agricultural Experiment Station," Agr. Exp. Sta., State College, Pa., Bul. 360, May 1938.

"Fiftieth Annual Report Rhode Island State College Agricultural Experiment Station," Agr. Exp. Sta., Kingston, R. I., Contb. 520, June 1938.

"The Effect of Magnesic Versus Calcic Liming Materials on Calcium in Vegetables, Forage Crops, and on Certain Soil Properties," Agr. Exp. Sta., Kingston, R. I., Bul. 263, May 1938, Donald R. Willard and John B. Smith.

"Annual Report of the South Dakota Agricultural Experiment Station for the Fiscal Year Ending June 30, 1937," Agr. Exp. Sta., Brookings, S. D.

"Alfalfa in the Tennessee Farm Program," Agr. Ext. Serv., Knoxville, Tenn., Pub. 213, Aug. 1938, H. E. Hendricks.

"The Fruit Tree Situation in Utah," Agr. Exp. Sta., Logan, Utah, Bul. 279, Apr. 1938, A. L. Wilson and A. L. Stark.

"Digestibility of Alfalfa, Timothy, and Soybeans as Silages and as Hays," Agr. Exp. Sta., Burlington, Vt., Bul. 430, Mar. 1938, J. A. Newlander, H. B. Ellenberger, O. M. Camburn, and C. H. Jones.

"A Study in Recovery of Transplanted Apple Trees," Agr. Exp. Sta., Burlington, Vt., Bul. 432, Mar. 1938, M. B. Cummings and R. G. Dunning.

"Legume and Grass Silage," Agr. Exp. Sta., Burlington, Vt., Bul. 434, May 1938, O. M. Camburn, H. B. Ellenberger, J. A. Newlander, and C. H. Jones.

"What's New in Farm Science, Part II, Annual Report of the Director," Agr. Exp. Sta., Madison, Wis., Bul. 440, May 1938.

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"The Velvetbean," U. S. D. A., Washington, D. C., Farmers' Bul. 1276, Revised May 1938, C. V. Piper, W. J. Morse, and Revised by W. J. Morse.

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"Nitrogen-fixing Bacteria and Legumes," U. S. D. A., Washington, D. C., Farmers' Bul. 1784, Dec. 1937, Lewis T. Leonard.

"Methods of Making Silage from Grasses and Legumes," U. S. D. A., Washington, D. C., Tech. Bul. 611, Mar. 1938, T. E. Woodward and J. B. Shepherd.

"Motion Pictures of the U. S. Department of Agriculture, 1938, U. S. D. A., Washington, D. C., Misc. Pub. 288, Apr. 1938.

Economics

¶ The depression and resulting low levels of farm prices undoubtedly had considerable influence on the development of interest in cost-of-production studies. Recently, the Maine Agricultural Experiment Station at Orono published the results of its cost-of-production studies in the potato-producing areas of Aroostook County, Maine. The publication is Bulletin 390, and was written by W. E. Schrumpf. The material for the study was obtained by the survey method directly from a cross section of the potato producers. The purpose of the work was to determine the cost and returns on farms in each of three areas, the Saint John, the Presque Isle, and Houlton, and to find some clue as to the effect of such factors as size of the potato enterprise, yield rate, and labor efficiency, etc., on the cost and returns.

In general, the factors of efficiency which prevailed at the time of the survey may be considered to be in force today, although about 8 years have passed since 1930, the last year in which surveys were taken. A method of bringing the cost factors up to date is explained in the bulletin. Perhaps the most important changes that one would notice, if the study could be repeated as of the present time, would be in the use of fertilizers and the various types of machinery, particularly farm tractors. Especially interesting is the section on fertilizers. It is common knowledge that the potato-producing areas of Maine are outstanding in the intensity of the use of commercial plant food.

On the Houlton farms for instance, .99 of a ton of fertilizers was applied per acre, whereas in Presque Isle the average was .94, and on certified-seed-producing farms .94 ton was used. It was noted also that the fertilizer of 5-8-7 formula at that time was the most general, and 5-7-10 was the second in importance. Expressed in other terms, about 429 pounds of plant food (nitrogen, phosphoric acid, and potash combined) were applied per acre to potatoes on the certified-seed farm, 428 pounds on the Presque Isle farms, and 421 pounds on the Houlton farms. The proportion of nitrogen ranged about 21% in all cases, but on the Presque Isle and Houlton farms, phosphoric acid was slightly in excess of potash, while on the certified-seed groups the largest proportion was potash. Fertilizers are important because yield is one of the major factors in reducing the cost of production and of course in producing a profit on the farm. It was noted in this connection that an increase of about 93 pounds per acre in the use of plant food over the lower applications resulted in an average increase of 8 barrels of potatoes.

The bulletin contains much information about the potato enterprise in Maine. For instance, the farm capital averaged $40,184 on the certified-seed farms, $31,100 on the Presque Isle farms, and $17,896 on the Houlton farms, indicating that the potato producer in Maine operates on a fairly large scale with an average annual gross income of $15,120, $9,815, and $6,512 respectively in each group. The labor income at that time ranged from $2,134 to $689. Farms above average in the three factors, size of business, yield-rate of potatoes, and labor efficiency, had larger net returns per barrel of potatoes than the average of all the farms in each of the three groups.

"Hired Labor Requirements on Arizona Irrigated Farms," Agr. Exp. Sta., Tucson, Ariz., Bul. 160, May 1938, E. D. Tetreau.

"Head-lettuce Production in California," Agr. Ext. Serv., Berkeley, Calif., Cir. 105, Jan. 1938, A. A. Tavernetti and John B. Schneider.

"1937 Walnut Production Cost Analysis Orange County, Nine-Year Summary 1929-1937," Agr. Ext. Serv., Berkeley, Calif.

"Economic Digest for Connecticut Agriculture," Agr. Ext. Serv., Storrs, Conn., No. 71, May 1938.

"Statistical Information Pertaining to the Marketing of Agricultural Products in Connecticut 1937," State Dept. of Agr., Hartford, Conn., June 1938, Frances T. Setsky.

"Retail Marketing of Apples by a Chain Store Warehouse in Philadelphia," Agr. Exp. Sta., Newark, Del., Bul. 208, Mar. 1938, Harry S. Gabriel.

"Seventh Annual Summary Florida Citrus Costs and Returns," Agr. Ext. Serv., Gainesville, Fla., Misc. Pub. 26, July 1938, R. H. Howard.

"Illinois Farm Economics," Agr. Ext. Serv., Urbana, Ill., Nos. 38 and 39, July and Aug. 1938.

"Maine Fruit Notes," Agr. Ext. Serv., Orono, Maine, Vol. 12, No. 6, Aug. 1938, A. K. Gardner and R. N. Atherton.

"Crop Report for Michigan," Dept. of Agr., Lansing, Mich., Aug. 1938.

"Farm Business Notes," Agr. Ext. Serv., University Farm, St. Paul, Minn., Nos. 187 and 188, July and Aug. 1938.

"Rural Land Use Activities in Missouri," Agr. Exp. Sta., Columbia, Mo., Bul. 399, July 1938, Ross J. Silkett.

"Montana Farm Bankruptcies, A Study of the Number, Characteristics, and Causes of Farm Bankruptcies Over a Forty-year Period with Some Suggestions for Preventing Them in the Future," Agr. Exp. Sta., Bozeman, Mont., Bul. 360, June 1938, R. R. Renne.

"Agricultural Bulletin, Report of Analyses of Samples of Lime Materials Used for Agricultural Purposes Sold in New York State July 1, 1936 to June 30, 1937," Dept. of Agr., Albany, N. Y., Bul. 314, Jan. 1938.

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"The Membership of Farmers in New York Organizations," Cornell Univ. Agr. Exp. Sta., Ithaca, N. Y., Bul. 695, Apr. 1938, W. A. Anderson.

"Ohio Agricultural Statistics 1936," Agr. Exp. Sta., Wooster, Ohio, Bul. 593, May 1938, Glenn S. Ray, L. H. Wiland, P. P. Wallrabenstein.

"Current Farm Economics," Agr. Exp. Sta., Stillwater, Okla., Vol. II, No. 4, Series 49, Aug. 1938.

"State Fair Edition, Department of Agriculture of Oregon Bulletin, September 5 to 11," Dept. or Agr., Salem, Oreg., No. 80, Aug. 1938.

"Part-time Farming in Six Industrial Areas in Pennsylvania," Agr. Exp. Sta., State College, Pa., Bul. 361, May 1938, M. E. John.

"Year Book of the Department of Agriculture Commerce and Industries of the State of South Carolina 1936-1937," Dept. of Agr., Columbia, S. C.

"South Dakota Farm Prices, 1890-1937," Agr. Exp. Sta., Brookings, S. D., Bul. 317, Jan. 1938, T. Hillard Cox and L. M. Brown.

"Farm Business," Agr. Ext. Serv., Burlington, Vt., Vol. 5, Nos. 3 and 4, June and Aug. 1938.

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"Department of Agriculture—Immigration of Virginia," Richmond, Va., Bul. 363, Sept. 1938.

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"Foreign Cotton Production and U. S. Cotton Policies," U. S. D. A., AAA, Washington, D. C., 38-Cotton-3, July 1938.

"Better Farming in the Southeastern States Through the 1938 AAA Program (Class B Farms)," SR Leaf. 203, July 1938.

"Corn Storage in the Ever-normal Granary, Converting Surpluses into Reserves by Storing

Corn in Years of Large Crops for Use in Years when Crops are Small," U. S. D. A., AAA, Washington, D. C., 38-Corn-2, June 1938.

"Soybeans in the United States; Recent Trends and Present Economic Status," U. S. D. A., Washington, D. C., Tech. Bul. 619, June 1938, Ernest W. Grove.

That's What They Call 'em

(*From page* 17)

this country, and just worry along with traveller's joy, careless weed, impudent lawyer, and puncture vine. Then, when I'm poking around the garden I guess I'll sort of encourage Venus' looking-glass, l'amourette, and eye-bright, and maybe they'll crowd out old maid's hands, crowfoot, and old maid's nightmare. And of course, as a last resort, there's always amor platonico.

Soils and Soil Management

A NEW edition of the popular book, "Soils and Soil Management," has been prepared by C. E. Millar, head of the Soils Department of Michigan State College (Soils and Soil Management. Webb Book Publishing Company, St. Paul, Minnesota, 1937, $3.00). This edition comes 8 years after the first and brings up to date various tables and data, in addition to permitting certain revisions in the text to keep step with newer developments and findings in the field of soil science.

The book tells in a practical way how to manage the most important resource of the farm, and of the nation, the soil. It is written primarily as a text for use in teaching agricultural students in high school, although its usefulness is by no means confined to this group. Farmers, farm managers and advisers, and all dealing with the problems of managing soils so as to produce crops efficiently and still maintain or build up the fertility of the soil, will find the book of great practical help. Chapters on gardens and home ground management will appeal to the suburbanites who are frequently confronted with the perplexing problem of what to grow and how to grow it.

The first chapter considers factors important in the selection of the farm, and is followed by chapters on soil formation and classification. The next three chapters are devoted to tillage of the soil from the seed-bed preparation to the "laying by" of the crop. The problems of soil moisture are then discussed. Following a chapter on crop rotation, come five chapters dealing with fertilizers in all their practical aspects as related to the soils and crops on the farm. Two chapters cover the problem of soil erosion and its control, and two more that of organic matter and its maintenance. Following these are chapters devoted to liming, the farming of acid soils, alkali soils, the growing of legumes to add nitrogen to the soil, and the biology of the soil. The final chapters might be termed specialty chapters and are devoted to the farming of sandy soils, pasture management, gardening, and the home grounds.

Special attention should be called to the manner in which the subject matter of the book is presented. The practical aspects have constantly been kept in mind, and in order to bring out even more clearly these points, the chapters are arranged on the problem basis, considerable ingenuity in this respect having been exhibited. Exercises designed to show the application in practice of the principles discussed are given at the end of the chapter. These are followed by problems for students to work out. References are included, adding to the value of the book for those desiring further information on any particular subject. A convenient glossary of technical terms is found at the end of the book.

The book is applicable particularly to agriculture north of the Cotton Belt, but the general fundamental principles of soil management so well explained will apply anywhere. Illustrations are numerous and well chosen to accompany the text, and the printing is very clear and large enough to enable easy reading. The equally clear and readable style in which the book is written is added reason to expect that it will have a wide appeal and enjoy even greater popularity than the first edition.

Potash Saves Alfalfa, Clover, and Soybeans

(*From page* 8)

are well-brought-out in the pictures shown in figures 1, 2, and 3.

Special mention should be made of the increased yield for the 1937 first cutting of alfalfa on the potash-treated plots as compared with the yield from the plots without potash. For the legume section, the increase is 186%.

Four tons of alfalfa, which is a good acre-yield for three cuttings, will remove about 68 pounds of potash (K_2O), and 130 pounds of lime (CaO). It would require 136 pounds of 50% muriate of potash annually to meet this potash demand, not to mention the amount required to replace that lost through leaching and soil erosion. To replace the lime removed by the 4 tons of hay would require 232 pounds of pure calcium carbonate.

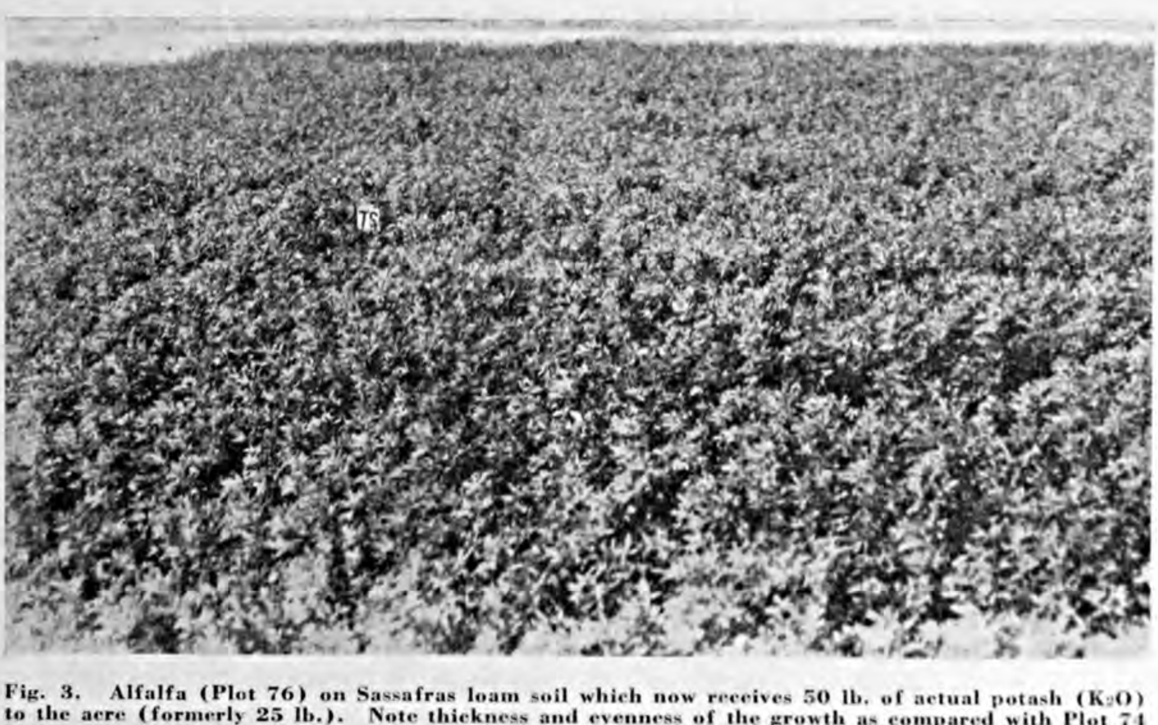

Fig. 3. Alfalfa (Plot 76) on Sassafras loam soil which now receives 50 lb. of actual potash (K_2O) to the acre (formerly 25 lb.). Note thickness and evenness of the growth as compared with Plot 74 (the same stake was used for the number in each case).

There are thousands of acres of alfalfa in New Jersey which could be distinctly improved by the use of lime to correct soil acidity, and potash to balance the annual losses.

When the conditions are made *right*, this crop and also clover and soybeans do not give weeds a *chance* to grow. Furthermore, the life of the fields would thus be prolonged.

Bur Clover Is Good for Soils and Pasture

(*From page* 16)

tive in its soil requirements than vetch or winter peas, and for this reason it would be well in the beginning to plant only on the best acres, using lime, phosphorus, and potash to supply the plant food in which the soil may be deficient. Thus at Holly Springs, where in the past bur clover had never grown so well as vetch, winter peas, or crimson clover, we have several acres this year just as good as any ever seen anywhere —but after fertilizing the land before planting with good applications of superphosphate and muriate of potash. In fact, this is why we think the Delta has made so much more progress than the hills in growing winter legumes of all kinds, the soils in the Delta having, as a rule, good supplies of the minerals, whereas most soils in the hills need phosphates and potash, and many of them lime.

Bur clover is entirely too expensive a crop to plant over large acreages where the seed have to be bought on the regular markets and freighted to their destination. Many county agents and soil erosion specialists are encouraging their cooperators to plant small seed patches to bur clover, fertilize these well, sow at least 10 bushels of seed per acre in early September on the tops of the cotton beds, leave to be covered by succeeding rains, and nothing else done until the foliage dies in the spring and the seed are ready to be harvested. Ordinary garden rakes for removing the vines and trash, followed by wire or even house-brooms for sweeping up the seed, are about as cheap as any more complicated method, though some large growers use specially constructed suction machines for gathering up the burs. Two hundred to four hundred bushels of seed in burs are not uncommon yields per acre, especially on the well-fertilized seed patches.

It is doubtful if bur clover as a soil builder has any advantages over vetch, winter peas, or crimson clover, but it does have considerable advantage in its ability to make seed, in the ease with which the seed may be saved, and particularly in the persistence with which these seed remain dormant in the soil and continue to give stands for years after. Crimson clover seeds about as freely, but these seeds have to be saved with expensive machinery and during very short periods of time, and if turned into the soil, all usually will germinate with the first rain and be killed during the hot summer.

As a further illustration of the value of bur clover, during the recent fall Delta farmers who used it in 1937 found themselves at a considerable advantage over others who had used vetch or peas. Summer rains caused the cotton to grow exceptionally tall, to fruit heavily, and when winds which came later blew over and tangled these cotton stalks, they were never able to straighten so that vetch or peas could be planted and covered in the usual way. The consequence was that many of these planters, being under contract with the government to sow winter legumes, had to resort to the use of aeroplanes and sow their vetch or peas much as they had dusted their cotton from the air in fighting the boll-weevil. Even where a good distribution of the seed was obtained, they had a tendency to drift to the bottoms of the rows where they germinated, but were damaged much more by wet weather than if they had germinated on the tops or sides of the beds. On the other hand, growers who had used bur clover had this already seeded. The seed worked to the sides and tops of the rows and suffered no ill effects from lack of fall plowing of the land. As a consequence, bur clover has gained added prestige in a section where already it had made many friends.

Soil and Fertilizer Needs of Apple Orchards

(*From page* 13)

a satisfactory crop is fairly certain. In contrast, spurs similar to the two others illustrated do not have sufficient vigor to develop good fruit buds. Even if such spurs do bloom, they are low in reserve foods, weak, and consequently seldom set fruit.

The growth status of trees can be estimated during the dormant season by noting the number and vigor of fruit spurs and the amount and vigor of twig growth. Thus, figure 4, #1 illustrates a strong, well-developed fruit bud. The swollen, scar-like formations on the spur indicate that it has been fruitful in past years. In contrast, figure 4, #2 illustrates a spur which is several years old, as indicated by the annual growth rings. This spur is terminated by a small, slender bud which will not bloom. The fact that this spur is straight and shows no fruiting scars indicates that it has always been unproductive. Trees which possess one or more medium-large or large spur buds on every 10 to 15 inches of fruiting wood are considered to be in a good, productive growth status. On the other hand, if a majority of the spur buds are small and very few medium-sized buds are present, the trees are obviously unproductive. Such trees will not become productive until the growth status of the spurs has been improved considerably.

Sod and cover crop plants, and weeds may be used as valuable indicators of orchard soil conditions. The plants usually grow rapidly but possess relatively small reserves of nutrients and, therefore, they respond more quickly to changes in the soil environment than do the trees. Because of this the fruit grower should make frequent and careful observations of the sod, cover crop, or weed growths in his orchards and use them as one means of studying his soil conditions.

Where only a poor growth of sorrel, crab grass, or Erigeron predominates, the soil is rather low in fertility. Where sedges are common, soil moisture is plentiful and drainage and aeration may be unsatisfactory for apple trees. Where fairly thick stands of vigorous plants of lambs quarter, red root, wild turnip, white and red clover, dandelions, and plantain are found, the soil is in a good state of fertility. The relative size of the weeds also is a valuable index of soil fertility. Some plants, such as the wild mustards, dandelions, plantain, and orchard grass, may be two or three times as large on fertile soils supplied with adequate moisture as they are on poor soils.

Since soils vary widely in fertility, one must estimate this factor before an intelligent beginning can be made upon a soil management or fertilizer program. Good farmers can judge the fertility of most farm land by observing the appearance of the soil itself and the way cultivated plants and weeds grow upon it. Fertilizer demands are apt to be greatest in orchards located on the light, sandy, and gravelly-sandy classes of soils. These soils in general are not naturally well supplied with nutrients, and those present become available too slowly to permit satisfactory growth without the use of fertilizers. Furthermore, these soils are low in organic matter and in colloids; consequently, they do not hold nutrients well when subject to leaching. Many of the coarse-textured soils derived from granitic material in mountainous regions also belong to this group.

Soils that are very acid are likely to become deficient in plant nutrients. A high degree of acidity is not uncommonly found in orchards where large quantities of sulphur sprays are used. An acid soil condition favors a rapid loss of calcium and magnesium, and renders potassium and phosphorus less available to plants. This condition may also result from the continued use of acid-forming fertilizers, if lime is not applied periodically.

More Accurate Diagnosis

Within recent years, there has been developed rapid chemical soil tests which, although not yet perfected, constitute a definite addition to our system of soil diagnosis. In many cases, these tests have been very helpful in indicating the supplies of available potassium, phosphorus, calcium, and magnesium in orchard soils. They have proven particularly advantageous in diagnosing or verifying conditions indicated by the trees or by the cover crop or sod growth. In general, the readings obtained for nitrogen by the rapid soil tests should not serve as a guide for fruit growers. The nitrogen requirements of orchard soils should be determined by the trees and cover crop or sod growth.

As indicated earlier in this discussion, there are environmental conditions in which apple trees make a liberal to excessive growth. Under such conditions they may show little or no beneficial response to applications of fertilizer. In general, however, orchards planted upon coastal plain soils or other sandy or gravelly-sandy soils will be benefited by annual applications of a complete fertilizer. The repeated application of a single nutrient, nitrogen, combined with clean tillage, in recent years, has resulted in some instances in serious "mining" of soil resources.

It has been established that the fertilizer requirements of bearing apple orchards will vary somewhat according to the environment, varieties, growth status of the trees, fertility of the soil, and system of soil management. As a guide, the following suggestions may be given:

1. In apple orchard environments, such as 3 and 4, it is highly important to promote a good growth of cover crops as well as of the trees. In order to insure such development, particularly with legumes, it is advisable to maintain a favorable soil reaction (pH) and provide an adequate supply of available phosphate and potash, calcium, and magnesium.

2. On soils derived from acid materials, lime should be applied periodically in order to maintain a favorable reaction (above pH 5.5 or 6.0) and an adequate supply of available calcium and magnesium.

3. Soils which are deficient in nutrients, particularly nitrogen, and where neither cover crops, weeds, nor trees are making enough growth, should receive an annual application of 600 to 800 pounds per acre of a 5-10-5 fertilizer applied broadcast.

4. Soils which are moderately fertile and which support a good growth of cover crops, weeds, and trees should receive a basic application of 500 to 1,000 pounds per acre of a 3-12-6 fertilizer.

5. The trees should be examined carefully during early June, and additional nitrogen supplied if needed.

6. In moist seasons and in orchards containing varieties susceptible to blight, this application should be reduced somewhat or only the lower amount used.

7. Where a heavy crop of sweet clover or alfalfa has been grown for a year or more, it may be advisable to reduce the amounts of fertilizer.

8. Orchards that are mulched freely generally require a different fertilizer treatment than others. Straw, hay, and other material used for mulching purposes in orchards contain appreciable quantities of plant nutrients. If the mulch is maintained over a period of years, these materials gradually enrich the soil and reduce the need for fertilizers, particularly nitrogen.

Balanced Fertilizers Make Fine Oranges

(*From page* 9)

vival. To get fine fruit along with production, he is further convinced that balanced fertilization is of the greatest importance.

In this plan of balanced feeding, potash fertilizer is given due credit for its favorable influence on fruit quality. Mr. Break uses potash regularly and believes in it, because his fruit has won not only many prizes at the National Orange Shows at San Bernardino, but the best prize of all—a fine reputation on the market. No questions are asked when his brand is up for sale. Buyers know it is "tops" in juice, weight, flavor, and keeping quality. It is a fact that even the workers who truck the boxes of these oranges notice the difference in weight per box and often remark that they are much heavier than average.

As an example of the fruit production being obtained, one portion of the grove can be cited, which is on very old stock, in fact some of the original stock was brought in from Florida 50 years ago. The average production for the past few years on this part has been 500 boxes of navels per acre, which is quite remarkable for trees of this kind.

The fact that Mr. Break was chosen recently as one of the agricultural representatives from this country on an important international commission is a

Wesley Break admiring one of the large trees for which the grove of Allen Break and Sons is famous.

fine tribute to his ability and influence in the citrus industry. While in Europe, he naturally studied the intensive agriculture of the Continent and was especially interested in the systematic use of fertilizer. He returned with his belief in the value of potash and a balanced fertilizer program more firmly implanted than ever. He believes that his former application of about 1 pound of commercial potash per tree may not be enough to fully bring out the good effects of this plant food. To observe its effects, this year he will start a program of about 3 pounds of commercial potash per tree in the form of mixed fertilizer on part of this grove.

While the soils in some groves in Southern California have enough available potash for a high level of citrus production, many soils have only enough for limited crops. If the trees are stimulated without the use of potash fertilizer, the balance for the combination of high production, vigorous trees, and quality fruit is upset. Under these circumstances, which become more common as one important plant food is used to the exclusion of another, potash can be used profitably. Mr. Break has proven this, and evidence of a like nature, that potash increases weight, juice volume, and all-around fruit quality, is rapidly appearing in many groves.

Boron Deficiency Becomes a Problem in Michigan

(*From page* 21)

As the experiments were conducted, considerable variation was noted in the response of the different crops to applications of boron in the form of $Na_2B_4O_7$.

Alfalfa. Planted on April 1, this crop first showed definite symptoms of boron deficiency during the first few days in June, just about the time the first blossoms appeared. A reddening of some of the leaves was first noticed. The red or bronze color first appeared near the tips of the leaves and on the under side between the more prominent veins. From there the color spread until it included almost the entire surface and was noticeable on the top as well as the under side. After the leaves had been red for several days they turned yellow and died. While this work was in progress, similar observations in the case of alfalfa were reported by McLarty, Wilcox, and Woodbridge.

The pot cultures showed very distinctly that the red or bronze coloration was almost entirely eliminated and much greater yields obtained by a total application of 0.003 gms. $Na_2B_4O_7$ per pot. Furthermore, this control lasted through three cuttings with distinct differences in growth still apparent in the early growth of the fourth crop. The data presented in table 1 show the effect of the treatment on the yields of alfalfa.

Table 1.—The Effect of Boron on the Yield of Alfalfa Grown in Quartz Sand Cultures

Treatment	Yield in grams (Average of 4 Pots)		
	July 8	Aug. 12	Oct. 30
$Na_2B_4O_7$—0.003 gms. per pot....	5.15	3.95	2.80
No boron.........	3.63	2.28	1.70

On July 8 alfalfa was planted in 2-gallon jars filled with soil from two fields where in 1936 sugar beets had been seriously injured by heart rot. Four jars of each soil received no boron, while four received 2 pounds of $Na_2B_4O_7$ per acre. The results, presented in table 2, show that 4.3 and 18.4 per cent increases in yield of alfalfa were obtained on the dates indicated as a result of the boron application to the Gilford soil, while the increases in yield on the Nappanee soil on the same dates amounted to 14.4 and 14.1 per cent.

TABLE 2.—THE EFFECT OF BORON ON THE YIELD OF ALFALFA GROWN ON TWO BORON DEFICIENT SOILS* IN POT CULTURES

Treatment	Yield in Grams (Average of 4 Pots)			
	Nappanee Soil		Gilford Soil	
	Nov. 16	Jan. 17	Nov. 16	Jan. 17
$Na_2B_4O_7$—2 lb. per acre	9.5	6.4	7.3	4.5
No boron....	8.3	5.6	7.0	3.8

* The soils were considered to be deficient in boron because they had produced sugar beets afflicted with heart rot.

Red and Alsike Clover. As a result of certain observations in the field during the latter part of July, the possibility became apparent that a deficiency of boron might produce symptoms in red and alsike clovers very similar to those produced in alfalfa. To test this possibility, both of these crops were planted in quartz cultures on July 28 and August 18. For some reason, not surely known, the red clover died before yields or pictures were taken, but in the early stages it showed differences in growth in favor of applied boron, and the deficiency symptoms were very similar to those occurring on alfalfa. Only one difference was noticeable. The reddening of the red clover leaves started in the veins of some of the leaves, while in the case of other leaves the first indications of red were between the veins as in alfalfa.

Alsike clover showed a very definite response to application of boron. When planted in quartz cultures the plants not treated with boron made very little growth and soon turned red. After a short time in this condition the leaves turned yellow, and the plants would soon have died had they not been harvested. The differences in yield, shown by the data in table 3, were more pronounced than in the case of alfalfa. Figure 7 shows appearance of the plants 90 days after planting.

TABLE 3.—THE EFFECT OF BORON ON THE YIELD OF ALSIKE CLOVER GROWN IN QUARTZ SAND CULTURE

Treatment	Yield in Grams (Average of 4 Pots)
	Nov. 16
$Na_2B_4O_7$—0.002 gms. per pot..............	2.22
No boron..............	0.80

As a further check on the boron deficiency symptoms in alsike clover, sandy loam soil was gathered from a place on the college farm where the symptoms occurred. On August 18 the clover was planted in pots filled with this soil. The only treatment was an application of 3 pounds of $Na_2B_4O_7$ per acre on one-half of the jars. There appeared at first to be a slight injury, evidenced by slower growth, as a result of the boron application, but the evidence of this soon disappeared, and slight deficiency symptoms in the nature of reddened leaves appeared on the untreated plants. As evidenced by figure 8, the plants treated with boron matured earlier than did those not treated.

Sweet Clover. Experiments with sweet clover produced results somewhat similar to those obtained with the common clovers and alfalfa. Differences in yield as a result of boron applications were not so great as in the other crops, and the red and bronze coloration in the leaves was not as pronounced. It is believed that in the case of this crop there is more of a tendency for the leaves to turn yellow without passing through the red and bronze stage.

Barley, Beans, Buckwheat, Corn, Oats, and Rape. In the 1937 experiments barley, beans, and corn were raised in quartz sand cultures by planting the seeds in the usual manner. None of the crops showed indications of a need for boron. It was thought that perhaps there was enough boron in the seeds to supply the needs of the plants. To determine whether or not this was true, new cultures were prepared during the spring of 1938, and barley, beans, corn, and oats were transplanted into the cultures after the seeds had been removed from the transplants. Thus the plants could have obtained only a very small quantity of boron from the seeds.

After the first crops of beans, buckwheat, and corn were harvested, a second crop was immediately planted. One crop of rape was also grown.

Despite all the precaution to eliminate boron from the culture, none of these crops showed symptoms of boron deficiency. This is, no doubt, due to the small quantity of boron which is needed by these crops. According to Bertrand and Silberstein certain members of the Gramineae contain only 2.3 to 5 mg. of boron per kg. of dry matter, while the legumes are relatively high in boron, with red clover, for example, containing 36.2 mg. per kg. of dry matter.

While the boron deficiency symptoms were being checked in the greenhouse, the writer made several interesting observations in the field. At the time of the first cutting of alfalfa a search was made for symptoms of boron deficiency in the alfalfa fields of various sections of the State. At this time the symptoms were most pronounced in the area around Unionville and Sebewaing where heart rot of sugar beets was most serious in 1936.

Fig. 6. The effect of boron on the recovery of sugar beets grown in the field and inflicted with heart rot. 1 and 2 represent halves of one beet, 3 and 4 of a second beet, and 5 and 6 of a third beet. The odd numbered jars (1, 3, and 5) received complete nutrients, minus boron, while the even jars received 0.002 gms. $Na_2B_4O_7$ per pot in addition to complete nutrients.

In the second crop of alfalfa it was again noticed that deficiency symptoms occurred at about the time the first blossoms appeared, in late July and early August. At this time plants on many fields showed the symptoms where they had not been found in the first crop. This would seem to indicate that as the season progressed the supply of available boron in the soil became depleted to the point where the amount was insufficient for the needs of the second crop.

One field observation which seemed to lend proof to the fact that the symptoms in question were actually caused by boron deficiency was the tendency for the symptoms to appear in patches, sometimes so prominent that they could be observed for several rods as one passed along the road. This tendency to occur in patches was also noticed in the case of heart rot of sugar beets.

It was repeatedly noticed in cases where mixed clovers and alfalfa were growing together that where boron deficiency symptoms occurred on one plant they occurred on the others as well.

Mention has already been made of a short survey conducted in late October to ascertain the extent of boron deficiency injury in sugar beets. An attempt was made to examine a field of alfalfa in the vicinity of each field of sugar beets. It was very evident from the survey that the red and bronze markings on the alfalfa were especially plentiful in those areas where the sugar beets gave evidence that boron was lacking in the soil.

If it is true that the discussed symptoms are indications of boron deficiency, and it would seem that the greenhouse pot tests are sufficient proof, there is a large aggregate area of the upland soils of Michigan which is sufficiently lacking in boron to produce the characteristic symptoms. The task still remains to show by field experiments that such deficiencies are economically injurious. It seems logical for the present, however, to assume that any agency which results in the death of alfalfa and clover leaves before harvest time, and in such serious disorders in the sugar beet, must surely affect quality and lower yields. Even though the growth of beets was not depressed, a considerable loss would result from the necessity of closer topping to remove the injured tissue. Further reference to figure 4 shows why this would be true.

A word of caution is advisable regarding the chance for confusion between the boron deficiency symptoms occurring on alfalfa and clover and other discolorations which may occur. There are other conditions which may lead to red markings on the leaves of these plants, and in many cases it will be necessary to resort to other methods of checking the boron content of the soil before it is definitely classed as being deficient in this element. Perhaps a chemical test of the soil or plants is the best answer to this problem.

Summary

During 1936 and 1937 field plat experiments were conducted to determine the efficiency of borax as a control for heart rot of sugar beets. During the course of these experiments it was observed that heart rot is quite common in certain sections of Michigan, and that certain characteristic symptoms indicate the presence of this disorder and consequently the lack of boron in the soil.

As a result of certain experiments with several crops grown in quartz cultures in the greenhouse, characteristic boron deficiency symptoms were also established for alfalfa, red clover, alsike clover, and sweet clover. From these investigations certain conclusions and observations follow:

1. Where heart rot of sugar beets did not occur, no increases in yields resulted from applications of borax. Broadcast applications as large as 80 pounds of borax per acre were not toxic to sugar beets in 1937.

2. It was shown that certain physiological disorders observed in sugar beets were the same as those described by Brandenburg and Kotila and Coons as heart rot caused by boron deficiency. A brief survey furnished indications that boron-deficient soils occur in localized areas in Michigan and in patches in the fields.

3. Increased yields of alfalfa resulted from applications of small quantities of sodium tetraborate. Some of the leaves of plants growing on boron-deficient soils turned red and bronze at the blossom stage. Within a few days after becoming red, the leaves turned yellow and soon died.

Fig. 7. The effect of boron on the growth of alsike clover in quartz cultures. Left, no boron; right, 0.002 gms. $Na_2B_4O_7$.

4. Boron deficiency symptoms in red and alsike clover were very similar to those on alfalfa. Greatly increased yields of alsike clover as a result of applications of sodium tetraborate were obtained. Earlier maturity resulted from such applications.

5. Sweet clover also responded to boron treatment. Pronounced yellowing occurred in sweet clover growing on boron-deficient sand, but the reddening of the leaves was less prominent than in the case of alfalfa and the common clovers.

6. No response was obtained from applications of sodium tetraborate to sand cultures planted to barley, beans, buckwheat, corn, oats, and rape.

7. In the field, boron deficiency in alfalfa occurred in patches and was particularly prevalent in the areas where heart rot of sugar beets was serious.

8. Where boron deficiency symptoms occurred in fields of mixed alfalfa and clover they invariably occurred on both crops.

Fig. 8. The effect of boron on the maturity of alsike clover in sandy loam soil cultures. 1. No boron. 2. Three lb. $Na_2B_4O_7$.

9. A considerable aggregate area of Michigan soils is apparently deficient in boron for sugar beets and the leguminous hay crops. A more detailed survey, accompanied by soil tests, will give more information regarding the extent of the area, and field research will be necessary before the economic seriousness of the deficiency can be determined.

Present for Roll Call

(*From page* 5)

for him. Land values rise in such districts, he said, and this protected his extensive private loans to farmers. Then we asked the sturdy and modest farmer what he saw in it. His reply was that he had donated much time in school affairs and wanted to donate more, that he could not brag about cash profits to his farming because of the school (having no children himself), but that he imagined life was sweeter and nobler on the whole because the rural school was attractive to pupils and taught them simple things of agricultural value. Both of these chaps grew up in the same district, and yet their viewpoints had come to opposite extremes.

Now it appears that one cause of the decadence of objectives in rural schools has come from emphasis everywhere in public affairs and legislatures upon support for institutions of research and higher education, with far less thought for country districts than their influence deserves. A few purposeful farm folks have always had to bear the brunt of improvements out there, and only a relatively few legislators have taken up the drive in an effective way. Instead of their shouting for lower taxes, it would have been stronger for them to have campaigned on the issue of giving farm taxpayers more return for their money. You won't hear so much cussing about taxes when our schools deliver the goods.

There's a heap of joy in seeing a farm leader do a good job defending and supporting the ideals of rural life, especially when he is educated *toward* and not *away* from home. I heard a debate lately beween a hard-boiled, university and law-trained labor boss and a discerning farmer with an educational background of leadership experience. There was "nothing to it," my friends. The labor agent avoided each pointed issue wherein farm and labor are at odds and railed against fancied enemies and vague bogies. Straight as a die the farmer took the labor leader into camp and stripped the sophistry from his thesis. Tax money wasn't misused when they educated that farm lad, and so let's spend more in the same way.

ONE cannot avoid recalling the ancient high school of my teens and of yours. It was the cross-roads just beyond the weedy yard wherein the one-room rural school languished in neglect. Of course in those days high schools were not within geographic reach of many country towns. Travel was slow, and the children had to board a week at a time, buy books and new clothes, and take what pickings they might find of value to their traditional lives. Farm parents sent their kids to nearby cities or county seats to absorb a smattering of imaginary gloss which passed for small-town culture.

No township tuition was paid then as it often is today. Every man for himself, and the teachers for nobody! Many of these rather bashful "freshmen" emerged as scholastic champions, and got the best grades and positions in subsequent teachers' institutes or normals. Others merely used their big shoulders and muscular biceps to become outstanding backfield performers in the autumnal gridiron struggles, and were much sought after for that reason alone. Individually some of them got a lot out of high school, but their home communities got little.

If anyone had suggested bringing a pig into the school or identifying common weeds and field seeds, talking crop rotations or "manure," the faculty would have resigned. Our old principal delighted to lecture on physics and harass us at rhetorical inquisitions, post debates on woman suffrage and immigration, but he would have fainted at giving country pupils a work-out in a milk-testing lab.

Since then we have come a long ways ahead. That same high school is chiefly noted for its winning teams in stock judging, its hybrid corn plots, and the ability of the farm class to build a shop annex and operate a dairy herd improvement association. A girl from that school won the State sewing championship, and maintained double-A grades in the old-style cultural courses meanwhile. Yes, and I presume a few of the huskier ag lads still make their mark in football (or make it on somebody else) with as much eclat as of yore. I have always felt that there is nothing wrong in sticking to useful knowledge, and it needn't crowd out the literature and classics either, or stop a man from making a touchdown.

Of course things *had* to pan out that way in the relation of country towns and rural zones. Hard-surfaced roads and instant communication, radio and electricity—all these and other modern mutual conveniences throw farms and city wards into a huddle unknown to my rising generation. Indeed we have experienced such a change that quite often we see city-bred boys absorbing the culture of agriculture at high school—and what is stranger yet, farmers actually hiring them in summertime!

NATURALLY, with the first flush of enthusiasm over these additions to the sanity of rural education, our leaders sometimes overshoot the target. In my State we are devoted to agricultural cooperative marketing and dairy farming. Consequently, a number of zealots in both ranks like to use the school system to put over theories and percepts. If they may do so without getting a touch of religious partisanship or crude propaganda into the system all goes well. However, in some cases the insistence upon certain standard formulas of cooperative marketing or nationistic dairy viewpoints hampers the individual freedom of thought which free schools should foster.

Carried to senseless extremes it not only burdens the youthful teacher with more subjects beyond her ken, but it contributes to a state of mind bordering on instability in public affairs. For example, along with these compulsory subjects we have had State laws which made it a crime to criticise cooperatives vigorously or to serve a meal in a restaurant minus cheese. Is that an open invitation to grave abuse in cooperative management, and does it really encourage the production of good cheese?

Far be it from one so observant as I pretend to be to claim that country schools should avoid economics or sociology. These topics are to agricultural education as butter is to bread. Dedicated as we seem to be to a system of commercial farming, one cannot neglect the underlying facts of the situation. But it is hard not to inject opinion and prejudice into any treatise on this subject. The border line between history and hysteria is too close for comfort when teachers tackle them.

At home we are passing through the dense fog of another violent campaign to elect a set of State and local officers. They must have forgotten a lot they learned in common schools. Many of them detour around the bad spots in the road to progress and vaporize in thunderous platitudes about conditions and circumstances far beyond the realm of their fellow citizens. Is it a too frequent American trait to lambast somebody too far off to fight back, rather than to risk your political hide in fencing with adjacent abuses?

ONE remedy for that I believe would be for our normals and universities to arrange somehow for a greater exchange of teachers between different geographical sections of this country. By this I do not mean to keep these teachers strictly in the upper class rostrums, but to find ways to sift them right out in the open country, to the one-room schools, the graded schools, and the rural high schools too.

Despite the continental journeys taken by families in motor cars back and forth, we still lack a realistic approach to fundamental varieties of tradition and thought now animating let us say, the North and South. Hurried glimpses never educate, and gas stations and tourist cabins are not good places to learn these things well.

Neither do we find a ready answer by conning over the congressional record or scanning the vapid opinions of newspaper columnists. Association in the class room—if all narrow bitterness be avoided—would to my mind reduce much of the hazard we face today in a country united by land and laws but misguided by prejudice and sectional misunderstanding.

WHEN I was a youngster we often had an exchange of ministers in the pulpits of sectarian denominations. In time we grew to forget the isms and oddities of the other man's church in a high regard for the decency and culture of their parsons or priests. May this not also work to some degree in the improvement of Americanism at a time when we ought to train school pupils in broad outlooks and faith in democracy?

I admit it has its dangers, if we allow the same forces to butt into the school business that have obstructed so much progress in the past. We can't let the politicos pick the exchange teachers, or let any pressure groups dominate the scholastic field when this is attempted. It would be hard to engineer at first, and only a few experiments would be possible. But it is in this direction we must go eventually or we will kill our educational aims with a gas blast of provincialism worse than we ever had in the McGuffey reader days.

Yet, despite overcrowding and a sense of futility and drifting, I am one who points with pride to the quality of our common schools. If I could shake off some laxity, laziness, inertia, and about two score years to boot, you could count on me to occupy the front seat and holler "Here" every morning! And most of my readers would pity the teacher!

LINED UP

Little Algernon (to the old lady who has just arrived, and whom he has never seen before): "So you're my grandmother, are you?"

Old Lady: "Yes, on your father's side."

Algernon: "Well, you're on the wrong side; I'll tell you that right now."

Mose—"Ah sho' is glad Ah wasn't King Solomon."

Rastus—"Whaffer yo' has dat 'pinion?"

Mose—"Huh, huntin' up washin's foh one wife keeps me plenty busy."

He: "You are always wishing for what you haven't got."

She: "Well, what else can one wish for?"

FARM SENSE

Teacher—"Johnny, if five sheep were in a field and one jumped out how many would be left?"

Johnny—"There wouldn't be any left. You know arithmetic, but you don't know sheep."

When the average man argues with a woman, the final result usually is: "He came, he saw, he concurred."

She: "I hear that the chief of police is going to try to stop necking."

He: "I should think he would—a man of his age."

DELAYED JUSTICE

Mother, "Johnny, I told you to count 50 before you did anything to your little brother. And now I find you holding him in the closet."

Johnny, "Yes, Mother, I'm counting 50. But I want to be sure I know where he is when I get through."

Middle age has compensations: Fewer things afford enough kick to make your conscience bother you.

Liza: "Dat no-count Mose tol' me las' night ah looked positively ethereal in the moonlight."

Mandy: "Whut do dat mean?"

Liza: "Ah dunno, but ah done slapped his face so's to be on the safe side."

"Dear Editor:

"After two years of married life, my husband and I find we have made a mistake. Should we separate?"

"Yes, by all means. But what are you going to do with the mistake?"

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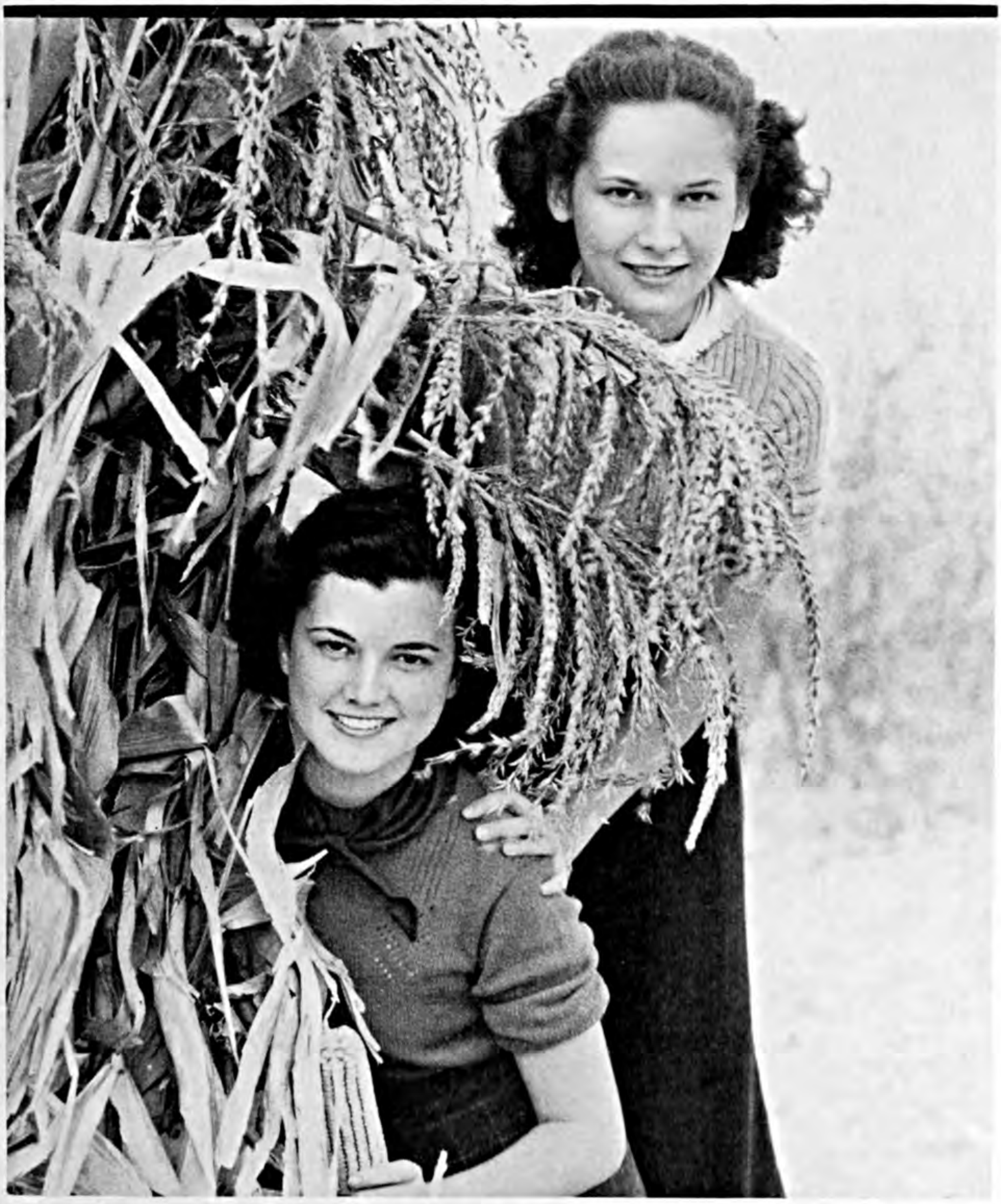
November 1938 10 Cents



The Pocket Book of Agriculture

Better Crops with PLANT FOOD

The Whole Truth—Not Selected Truth

R. H. Stinchfield, *Editor*

Editorial Office: Investment Bldg., Washington, D. C.

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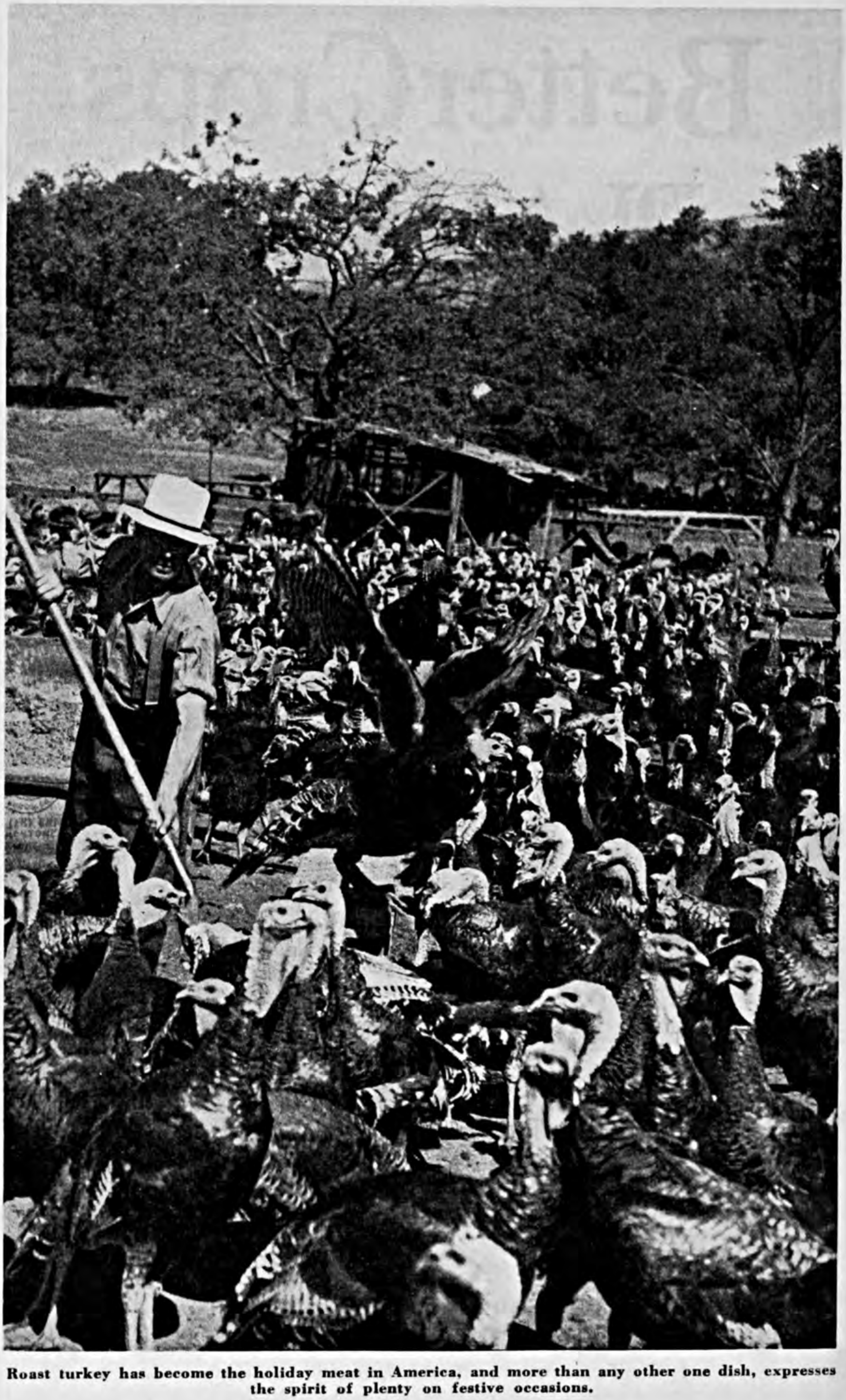
G. J. Callister, *Vice-President and Secretary*



Roast turkey has become the holiday meat in America, and more than any other one dish, expresses the spirit of plenty on festive occasions.

Better Crops with PLANT FOOD

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A new source of rural redemption

Farm Samaritans

By Jeff McDermid

WITHIN the past three years there has emerged in American agriculture a new group of extension workers entrusted with the job of improving or restoring the morale of a certain stratum of rural society, which needs more than charts and test plots to guide its destiny.

Naturally, I refer to the Farm Security Administration, which once suffered under the benumbing cognomen of "Rural Rehabilitationers"—but that was before Rex Tugwell quit bossing them to enter the molasses business. Marse Henry Wallace has coined a snappier name for them, and they are taking on a new lease of life as a result of removing that woeful handicap in nomenclature.

I am supposed to know the work of these Security people fairly well, having become a member of an advisory committee in one of their districts; but readers should not stop at this point in anticipation that I may experiment somewhat on them in my alleged capacity as a surveyor and stooge. Such a calamity would deprive me of my periodic privilege in these columns, and as my chances to publish stuff on slick paper stock are limited, I shall refrain from any advisory overact, great as the temptation or the need may be.

It occurred to me while in the throes of conjuring what next to perpetrate, that this number reaches readers about Thanksgiving time. Hence the idea of talking farm security popped up, because most of us in autumn begin to think of fuel, warm clothes, and plenty in the pantry. Or if we don't, we need rehabilitation or something else more drastic perhaps to make us fit to boss the family. And then, of course, a few of us realize we ought to be rehabilitated, but we are too debilitated in purse and pep to give a rap. And so here lies the job for the new era extensionists. So let's get down to details.

By this I do not mean "case work." The Lord forbid that I should turn this into a sociological seminar; and I am not conversant enough with the jargon of the slummers (at so much per slum). This smacks of snobbery and snoopery, and the Farm Security folks I know are too smart and too rough and ready to indulge in any such tenement tommyrot. It just doesn't jibe with their own bucolic backgrounds.

As I see it in a symbolic way only, the original agricultural extension service might be likened to John the Baptist, and the F. S. A. folks are similar to the Good Samaritan. Looking at it in this way, there is nothing to get jealous over on either side or no cause for mean comparisons. Both of these saintly gents had their particular jobs to handle. We couldn't have got very far without one or the 'tother, but we've got to differentiate. You see, John was all for preaching and teaching, and warning folks—something like old Noah in a way.

JOHN pointed out a forthcoming path of redemption for sinners and weak sisters, while the G. S. rode along on his donkey toward Jericho looking out for somebody to salvage. But the chief difference between them does not lie in their religion or their ability or zeal, but in this one startling fact as related in the scriptures, namely: John the Baptist did not own an ass on which to carry anybody.

The G. S. had an ass—a good sturdy one too, and so he was able to do a little more for ordinary mortals than to give out the text and lead the hymns. The G. S. couldn't have done any more than J. B. if he was afoot, no matter how many thumbers showed up. And believe me, that's how we reach the conclusion that the F. S. A. is like the Good Samaritan, because Congress has pledged them to use an ear-marked fund for a job that the Extension force might also do if it had the same opportunity.

NOW perhaps in between this broad generalization we might add a few related facts of difference between these two worthy organizations. The F. S. A. is a mite more inclined to utilize non-collegiate assistants in actual field work than the older staff does. It picks out upstanding fellows with farm-life backgrounds, regardless of what degree they may have framed. We should expect that of course, because one who teaches by the book ought to pass a stiffer test than one who combines the offices of a banker, a nurse, and a Dutch uncle. Anyhow, I am an admirer of their broad gauged plan of choosing assistants, because if we had to abide by the professional sociological standard we'd inherit a bunch of long-haired graduates full of prunes and prejudice. Yes, I am confident that the county supervisors of the F. S. A. as selected today are doing pretty well without courses in academic psychology. Battling depression at the plow handles is good enough tonic for anybody who wants to uplift ruralites.

Many a dogmatic devotee of individualism tells me that there is no such thing as removal of agricultural hazards by law or government paternalism. Indeed they insist that some amount of risk is good for the soul, and that we breed a race of drifting easy-comers by such methods as we use in Farm Security work. But my own concept of true individualism carries with it a fair chance and a decent opportunity, because when cards are stacked your time and skill amount to little in anybody's skin game.

I heartily agree that weather, crop damage, and price risks are not easily prevented by any act of Congress or declaration of policy. I admit concurrence in their suggestion that some folks are world-weary laggards and unfit to be redeemed at public expense. But I don't like to stand along with the doubter who laughs at soil erosion, for example, until it snakes its treacherous pathway into his own half-section. I believe there are insidious threats at universal farm prosperity which ought to be studied and stopped; and that mere teaching, charting, and lecturing won't insure us against calamity as well as a little investment and action. If we can't cure the disease maybe we can prevent its spread.

MOREOVER, the Good Book says we shall always have plenty of poor folks in our midst, and the same treatise is very charitable toward the poor in spirit as well. Manifestly the problem facing the F. S. A. is allied with the poor in spirit quite as much as with the poor in purse. In recent years we have adopted a regular "community welfare chest" in every sizeable urban area to meet such ever-present emergencies. Is it not proper to adopt a similar permanent set-up on the rural front?

Disadvantaged and underprivileged farm folks may be either renters or mortgaged owners of land. The Security plan has been directed toward both. In any case these operators of farms are stewards of our national soil resources, and the situation loses its sentimental aspects when we look at it from this angle. It may be hard sense to safeguard our soils by aiding operators without enough income or ability to do it alone. The other way would be to let prices sag to new lows, and let economic pressure drive these holdings into fewer but perhaps more capable hands—maybe! Yet we would take a chance there too, for absentee landlords or corporation managers are just as apt to lease the tracts to other operators under just as unfortunate terms and conditions, and subject to the same old price reactions. Unguided and unwarned, the rank and file would troop off into dilemma just as fast as ever. No extension system known to mankind could save them, sugar-coated or not.

Only a few weeks ago our party of "advisers" went to see a fellow off in the sticks who had obtained a subsistence loan from the F. S. A. allotment. He was under one of those unfair and impossible land contracts, given by a lumber company which had skinned the velvet off the area years ago and left stumps and slashings behind. Apparently he had tried to make a go of it and had a thrifty wife, but his cow stable was open to the sky and his barn yard a quagmire—most of the loan being used for feed and food. He was unable to make any payments on the ridiculous contract, and it seemed wasteful to sink any more funds in such a place because the terms were unfavorable to start with. This, however, was a rare combination of a poor operator and a bad real estate deal, and generally such kinds are avoided by the F. S. A.

On another place not far distant, a rehabilitation loan plus debt adjustment service by the Security people illustrated

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Earn Soil Payments *With* Winter Legumes

By B. E. Grant

County Agricultural Agent, Bertie County, North Carolina

FOR the past 15 years the Extension Service has been carrying on an educational program of soil building in Bertie County, North Carolina, through the use of summer and winter legumes. Records of actual results of demonstrations on Bertie County farms have been secured over this 15-year period, but getting farmers to generally use these crops has been a slow process.

Since the first objective of the Agricultural Conservation Program is to maintain and improve soil fertility, the opportunity is offered to cash in on this educational program. In 1936 and 1937 farmers generally did not fully understand the farm program, particularly with reference to soil-building practices, and the weak point in compliance with the program was that farmers were not growing sufficient soil-building crops and carrying out enough soil-building practices to earn maximum payment. For example, they did not seed sufficient soil-building crops, such as lespedeza, crotalaria, and winter legumes, nor were fertilizing materials generally used in connection with the seeding of these crops, although credit was allowed in the program for these practices. We are advised that North Carolina farmers earned only 48 per cent of their maximum payment in 1937.

County Agent B. E. Grant checking hairy vetch seed from the freight car.

In the 1938 Farm Program we determined that an educational program would be put on to familiarize producers with soil-building practices that would count in reaching their soil-building goal, and to stress the importance of at least carrying out sufficient practices to reach the soil-building goal for the farm.

In this educational program we made use of the following methods: Committee meetings to explain to committeemen the plan and enlist their cooperation, newspaper articles in the county and State papers, circular letters on soil-building practices, the value of winter legumes for soil building, the plan for cooperating farmers to get winter legume seed as grants of aid in cooperation with the Agricultural Conservation Program, personal letters to producers stating the amount of seed they could get if they were cooperating, community meetings at which film strips were shown on the use of legumes for soil building and the plan explained, personal contacts through field and office calls, order forms prepared and given to committeemen for them to contact the producers and get them signed.

Second-year vetch being cut down with a stalk cutter on the farm of J. H. Jeringan of Aulander, N. C. The vetch was seeded in cotton and covered with a two-horse cultivator in September 1937.

In August of 1938 a series of educational meetings was planned for each of the nine townships of the county. In the meantime the State AAA Office advised us that the Washington AAA Office was thinking of conducting an experiment with four eastern North Carolina counties in which the Government would advertise for bids for hairy vetch and Austrian winter peas to be shipped to these four counties, with the AAA buying the seed and paying the freight. Under the plan proposed, co-operating farmers who would be entitled to payment under the 1938 program might receive up to 80 per cent of their maximum soil-building payment in seed to enable them to carry out additional soil-building practices in reaching their goal.

Bertie County Included

We were advised that since some educational work had been conducted in Bertie County with winter legumes, it might be possible to get Bertie County included as one of the four counties. We were at once interested in the plan and so advised the State AAA Office, requesting full information. Under the plan Bertie County was scheduled to get 24,000 pounds of hairy vetch and 12,000 pounds of Austrian winter peas. The bid was let for 144,000 pounds of hairy vetch and 72,000 pounds of Austrian winter peas for the four counties.

We began an educational program for seeding winter legumes the latter part of August. The following mimeographed circular was prepared from the bulletin in which the soil-building practices of most interest to Bertie farmers were listed.

"The soil-building practices listed herein shall count toward the achievement of the soil-building goal to the extent indicated therein, when such practices are carried out in 1938 in workman-like manner and in accordance with good farming practices for the locality.

(A) Each of the following practices in the amounts specified shall be counted as one unit or one acre in reaching the soil-building goal:

1. In connection with the seeding of winter legumes, permanent pasture, lespedeza, or crotalaria, an application of 300 pounds of 16 per cent superphosphate or 100 pounds of triple superphosphate containing not less than 45 per cent of available phosphoric acid.

2. In connection with seeding of the above crops, an application of 200 pounds of 50 per cent muriate of potash.

3. Application of 500 pounds of basic slag in connection with the seeding of the above crops.

4. Reseeding permanent pasture with

not less than 10 pounds of adapted pasture grass or legume seed.

5. Application of ground limestone when applied at the rate of not less than 1,000 pounds per acre, 1,500 pounds to count as one unit.

(B) Seeding of permanent pastures and soil-building crops:

1. Each of the following shall count as one unit credit when seeded prior to October 31, 1938—crotalaria, carpet and dallas grass pasture, lespedeza, annual rye grass, vetch, Austrian winter peas, crimson and bur clover.

(C) Turning under certain crops for green manure:

1. Each of the following shall count as one unit credit when turned under—soybeans, cowpeas, vetch, rye, barley, wheat, oats. If these crops are left on land as a mulch and not harvested, they will count the same rate as if turned under.

(D) Each 2 acres of the following crops shall be counted as one unit:

1. Summer legumes, such as soybeans, cowpeas, and velvet beans, when interplanted or grown in combination with soil-depleting crops of which a good stand and growth are secured if plowed or disked under or left on the land.

"All of the above practices must be carried out prior to October 31 in order to count as credit on the 1938 Program, but the winter legumes, such as vetch, Austrian winter peas, and clover, should be seeded between September 1 and October 10, so a good stand and growth may be secured before cold weather.

"The rate of payment for carrying out the soil-building practices is $1.50 per unit or acre in the soil-building goal. This is enough to amount to about one-half of the cost of the seed for seeding vetch, Austrian winter peas, and clover. With this amount it is very little more expensive, if any, to seed these crops than it is rye, and since the payment of $1.50 will probably be allowed in the 1939 Program for turning them under, the total payment will amount to the approximate cost of the seed."

Following this, meetings were held in each township on the value of winter legumes for soil building. At these meetings U. S. D. A. film strips on green manuring, leguminous crops for the Southeast, and inoculation of legumes were shown. Pamphlets on winter legumes for soil improvement, which had been prepared in the County Office, were distributed. The plan for the AAA furnishing hairy vetch and Austrian winter peas to cooperating farmers was explained. We set our goal to take the orders that week for the carload of seed to be shipped to Bertie County. Others in the county thought we had bitten off a rather large order and set our goal too high, but before the end of the week we had signed orders for the carload and were not through with the educational program, so we informed the State Office we would have to have more seed and raised our goal to two cars.

Increased Seed Order

When the bids were closed on September 12, we were advised that our order could be increased to 32,000 pounds of vetch and 28,000 pounds of peas; but if we needed more, telegraphic bids would have to be gotten for the additional amount. We advised the State Office to increase our order to 60,000 pounds of vetch and 50,000 pounds of Austrian winter peas, as we had already raised our goal from two cars to three.

Following the series of educational meetings, newspaper articles explaining the program, goals established, and progress made were run in the county paper. Another circular letter explaining the plan and progress made was prepared and mailed to all work-sheet signers. Other meetings were held including committee meetings at which the cooperation of the committeemen in making the program as effective as possible was requested. Personal contacts with producers were made through field and office calls. Finally a letter was prepared and sent to producers who had not placed orders for seed, showing the amount of vetch and peas they could get and how the seeding of these crops would enable them to reach their soil-building goal.

Since compliance work had not been completed when orders were taken for the seed, to check compliance on each farm for which a seed order had been received put a lot of extra work on the office force. Quite a few orders had to be turned down after compliance was checked, some of them representing large orders, on account of overplanting soil-depleting crops so that no payment could be made to the farm.

Before the seed arrived we realized that we had orders for more seed than had been shipped to us, and we began to plan on how to take care of the situation. Finally, we found that one of the other County Agents had ordered two cars consisting of 28,000 pounds of vetch and 12,000 pounds of peas each and did not think he would be able to use this amount. Arrangements were made with him and the State and Washington AAA Offices for one of these cars to be diverted to Bertie County.

After the seed was inoculated, it was spread out to dry.

On September 30 the 60,000 pounds of vetch and 50,000 pounds of peas were received in Windsor over the Carolina Southern Railroad. This is a local railroad which serves Bertie County, leading from Ahoskie on the Atlantic Coast Line to Windsor, the County Seat. It is largely owned by Windsor Township of Bertie County. The railroad cooperated with us in rendering the best service possible. They had notified us the day before that the seed would be delivered to us on that day, and we began sending out notices to farmers on the night before the arrival of the seed. The other car containing 28,000 pounds of vetch and 12,000 pounds of peas was received on October 3.

On the day the seed were received, farmers began hauling the seed to their farms in various conveyances, some getting one bag or more in a one-horse cart or buggy, others in their cars, some in pick-up trucks, and others in large trucks. F. H. Jeter, Agricultural Editor of the State Extension Service at State College, was kind enough to come down to take note of this event, and while here made a number of pictures

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Selling Forage as Steaks and Chops

*By E. W. Sheets**

Chief of the Department of Animal Husbandry, Mississippi State College, State College, Mississippi

IT IS a strange condition that the dish which forms the backbone of most of the square meals served in America is the least understood by our housewives and cooks. Until the kind and cut of meat are chosen, the choice of vegetables is in the dark, and salad and dessert may even be a matter of conjecture.

Unless meat and other livestock products are produced on the farm for home consumption, many families will be compelled through necessity to go without them much of the time. This is especially true when such products are high in price. Some may say if they do not produce these products it is an easy matter to go to most any modern meat shop or grocery and get them. It is not as simple as that. Most folks greatly desire them because they are so palatable, so rich in desirable and essential food nutrients, and because they make any meal taste twice as good. Wanting them and being able to buy them, even though essential for health and satisfaction, are two entirely different propositions. Unless these products are produced on the farm to be utilized there, they oftentimes are not bought because the cash necessary for their purchase is not available. Substitutes in name only but not in satisfaction and food value make the problems of the homemaker all the more difficult. While the very same problem

* Dr. Sheets was formerly Chief of Animal Husbandry in the U. S. Department of Agriculture.

A good forage crop usually means the maintaining of soil fertility as well as adequate feed for farm animals.

confronts the homemaker in the city as it does on the farm, the farm has the opportunity to produce such products with a very small cash outlay. It requires largely the desire, the plan, and the effort to supply them at least for home needs throughout the year, and some to sell for others to enjoy.

Our farmers have the grass, the roughages, the fattening feeds, and sufficient numbers of well-bred foundation stock to produce great quantities of choice meats both for home needs and the general demand for it. Our meat-packing industry is equipped to collect the fattened livestock not consumed on the farm, to properly slaughter it, chill it, cure it, and distribute it to the most remote corner of the country in refrigerated cars. And it is safe to assume that the meat-loving public would never forget the flavor and toothsomeness of choice beef, pork, lamb, and mutton, once they became acquainted with it.

There was a time when the livestock industry of the South was very seriously handicapped by a shortage of pastures, of desirable roughages, and of concentrates for fattening or winter use. Our Experiment Stations have determined and demonstrated the value and use of many new feeds especially adapted to our needs. When we think of fattening cattle, the great American crop, corn, usually comes to mind. It is well that it should, for corn *is* the great American crop. It is the most valuable crop grown in the United States, and is produced by about 5 million of our farmers on 100 million acres of our land. The crop totals nearly 3 billion bushels a year.

Corn Converted to Meat

And yet, if we tried to eat all the corn which we grow we would be a nation of gormands. Each man's share would be 24 bushels a year, which would make enough corn meal to furnish him a couple hundred muffins or about 600 griddle cakes for each breakfast during the year. The fact is that our people consume right here at home about 95 per cent of this great crop. How do we do it? The answer to this riddle is to be found in the fact that our livestock eat nearly seven-eighths of the corn crop, and that we are a nation of meat consumers. We eat our corn mostly as steaks and roasts and chops. Here is how we do it: Of the 24 bushels of corn produced per year per person, we eat on the average but 2½ bushels as corn in the form of corn bread, hominy, breakfast cereals, and so on. Nearly 10 bushels

Pastures and feeds are converted into a more delectable product which brings a better price on the market.

The trench silo is an economical means of storing feed for later use.

look trivial. Let us look at the beef steer which the farmer grows and fattens and ships to market. Only a small part of him has been grown from corn. This is especially true of southern steers. He has tucked away beneath his hide in the form of beef, great quantities of grass and grain-sorghums, or soybeans, corn stalks, hay, or other similar feeds. Nearly all of these feeds are not fit for man to eat. Some

we consume as pork and lard. More than 3½ bushels of the 24 we eat as beef or drink as milk; while approximately 1 bushel of corn we consume annually in the form of chicken and eggs. We eat but a peck of corn each year as mutton and lamb.

Some people might wonder, particularly if they happened to be quite fond of corn bread and fried mush, or if they are among those who like meat so well that they are tempted to eat too much of it, why it might not be much simpler if we ate our corn as corn without going to the trouble of converting it into steaks and chops. Such a short cut would save time, as it takes, for example, 2, 3, or even 4 years to grow and fatten a steer. It would save corn, because even the hog, which is one of our most efficient meat factories, cannot grow a pound of pork from a pound of corn. It would save labor for the farmer, because he could haul his corn to market in the fall and loaf through the winter. It would save thousands of dollars of capital investment for each farmer, because he would have to build no more cattle barns, sheep sheds, and hog houses, nor spend money for livestock.

By-products Utilized

But let us look a moment at the other side of the picture. Maybe there are disadvantages that will make these advantages of dispensing with our livestock

of them are crops which enable the farmer to rotate his land favorably and profitably. Others are virtually by-products of his business. Even if they could all be marketed as cash crops, the farmer would be robbing his soil of valuable and indispensable fertility if he hauled them away. When he drives these crops away on the hoof as hogs or cattle or sheep or workstock, or when they are taken to town as milk, chicken, and eggs, the farmer is conducting his business in a business-like fashion. He is removing from the soil only the minimum of plant-food elements which may be economically returned by applying superphosphates and potash periodically as required. He is maintaining the richness of his land. He is making good use of by-products that he would otherwise have to burn or waste. He is following a system which enables him to practice modern scientific methods of crop rotation. And at the same time he is providing the Nation with some of its most substantial foods—beef, pork, lamb, and poultry meat as well as wool, leather, and other by-products of the livestock industry.

But now back to grass. It is both a blessing and a problem. Many sections of the South have excellent grass—so luxuriant that they have gone on for years unmindful of the tremendous advantage, at times, of feeding a small amount of grain supplements with this grass. Other sections can grow better grass if they will do so; and still others have yet to find pasture crops and a system of seeding and grazing management which will make the most of their conditions of soil and climate.

Well-planned Program

It is not by any means so simple as growing good grass, and the livestock will follow as fleas follow dogs. It may be a question of nicety of management of livestock and young forests and grass on the same area. It may be a question of the legitimate competition of other crops. Such considerations will naturally divide the South into rather definite regions so far as profitable livestock production goes. Regions will be found in the same State, often in the same county, which are well adapted to the production of both feeder and finished cattle, or either, depending upon the choice of the individual. Other regions will greatly excel in one, while still others may prove entirely unsuited to anything but mutton and wool production, or to swine production, or to combinations of these, due to their nearness or distance to market, their cropping possibilities, and even the training, the capability, and the inherited preferences of the farmers themselves. For, when every other condition for livestock farming has been met, we still must reckon with the matter of personal equations. We must have farmers who are sold on the idea and who are making livestock production the balance wheel of their farm program.

Having previously discussed pastures in relation to livestock production,* emphasis is given to the immediate problem in the South, which is the utilization of the hay, grain-sorghums, soybeans, sorghum silage, and similar crops produced in great abundance. It is doubtful if these feeds can be as profitably utilized in any other manner as they would be if fed to farm animals to supply home needs and cash, or for the improvement in soil fertility. The farmer who can utilize such crops to best advantage is the one who has carefully planned his farm operations with that in view.

In considering the need for making the greatest possible use of forage crops with livestock, two groups of farmers are kept in mind. One is that group which produces the pasture, feed, and forage crops necessary to properly feed the livestock required to furnish meat and other products for home use. The other is the group which seeks to provide for farm needs and in addition sup-

* See February, 1938, issue of this magazine.

There is a sense of security on a self-sustaining livestock farm.

ply the market, besides increasing the cash income for the farm family. This group has an important problem to solve. To utilize such crops to pay taxes, operating expenses, and receive a cash return for their labor and efforts is a matter of immediate concern.

Economical Production

It has been proven that the feeds produced throughout the South in such large quantities are well adapted to the economical production of meat animals, both for home use and for sale. In the hands of those who know from experience how to use them, such feed crops may be advantageously marketed in this manner. Some of those who have produced large amounts of feed crops have done so without determining in advance just how they were to be used. After the crops were produced in the farming program which they followed, many came to a realization of the fact that unless such crops were properly utilized by livestock beyond supplying home needs, their chances for a satisfactory cash return from their land were not bright.

While they could and on many farms should use them for soil-improvement purposes, yet the urgent need for a cash income in addition to supplying home needs to help meet current expenses makes it difficult if not impossible for many to forego the opportunity rather than wait for returns a year or more in the future.

As great as the feed and forage production seems to be, yet it is barely sufficient to feed properly the livestock now on our farms. It is largely a question of proper distribution in order that they be adequately and profitably fed and the feeds available marketed through them to best advantage. This desire on the part of many who have not heretofore marketed their crops through farm animals has led some to go on the markets to purchase livestock with the hope of more profitable returns. While it is possible for some farmers to jump into the livestock business and market their crops for cash to better advantage than by following any other system, it is important to emphasize the fact that those who grow into the business and plan their operations more carefully well in advance, to at least supply home needs, are the ones who are usually the most successful.

There are many farmers who fail to produce feed and forage crops to properly feed their livestock, whether they are to be used on the farm or sold on the market. As a result, their farm animals are inadequately provided for and they have instead a food and feed bill that takes most of the profits from the cash crop which they have grown.

A problem that confronts many farmers today is how to utilize most profitably the large amounts of rough feeds which have been produced. Unless he has planned to utilize this vast quantity of pasture, hay, and other roughages with livestock, he is likely to be confronted with the difficulty of selling it, plowing it under, or buying the livestock on the market to consume them, hoping that the returns will be profitable to him. In many instances the livestock purchased in this manner will cost him more than necessary and in some instances may not be especially suited for the utilization of the feeds available.

Utilize Roughages

The South is fortunate in always having an abundant supply of cottonseed meal which is available everywhere. The immediate problem then, if he is to feed livestock, may be to plan to utilize the roughages, possibly with cattle, using a maximum amount of cottonseed meal and a minimum amount of grain. The best procedure would be to turn the cattle, which have been grazing on pasture until the middle of September, on the grain-sorghum, soybean, stalk fields, or other roughages until they are harvested, then put them in the feed-lot and supply a liberal amount of cottonseed meal with silage and hay for a short feed.

The profits of the stockman in utiliz-

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A bunch of Pascal celery from each plot, after coming from the pit, December 30. Treatment, from left to right: 1-check, 2-phosphate (extra), 3-manganese, 4-magnesium, 5-lime, 6-borax, 7-borax and chemicals, 8-potash (extra), 9-check.

Extra Potash & Borax Grew Good Celery

By John C. Handy

Associate County Agricultural Agent, Middlesex County, Concord, Massachusetts

"I THINK I know how to grow some real celery next year," said Gardner Lawrence, Concord, Massachusetts, vegetable grower, following field trials of eight fertilizer materials on six vegetables in 1937. "Extra potash and a little borax—that combination is what my soil needs." The demonstration had shown that a serious boron deficiency existed. Every application of boron increased yields and quality of celery. Returns per plot ranged from $3.40 to $3.91 where borax was used on early celery.

The most surprising result of the trials was the effect of potash. In the face of boron deficiency, extra potash produced the tallest celery and a profitable yield, with a value of $3.27. Celery from the lime plot was worth only 58 cents, and from check plots, $1.91.

The extra growth and vigor of the potash plot was the first difference to appear, long before any symptom of boron deficiency was evident. At harvest time the potash plot still stood tallest, but slight stem cracking lowered the grade. Mr. Lawrence believes that a combination of potash and borax will give the best yield and quality.

Demonstration plots were started at the Lawrence farm after total failure of the 1936 celery crop in one field.

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High-quality Tomatoes Must Have Potash

By R. J. Bryden

Soil Specialist, Ontario Agricultural College, Guelph, Ontario

HIGH-QUALITY canned fruits and vegetables have been the aim of Smart Brothers ever since they began their canning operations more than thirty years ago, near the town of Collingwood, Ontario. Every effort has been put forth to turn out a fine product to meet the exacting demands of the buyers.

In addition to the canning factory, this concern operates a 500-acre orchard and truck farm producing rhubarb, spinach, beets, carrots, asparagus, string beans, cabbage, pumpkins, tomatoes, strawberries, raspberries, apples, cherries, plums, and pears. Here every step from the preparation of the soil for the growing of the crop to the careful selection and grading of the fruit is considered as essential as the proper method of processing, if satisfactory results are to be obtained.

With this idea in mind, Smart Brothers are keenly interested in keeping up the fertility of their soils.

To use the words of John L. Smart, who has charge of the farm division, "It is absolutely essential that we have a fairly definite knowledge of the productive capacity of our soils and that we maintain a fairly high level of fertility to insure quality and quantity in our products."

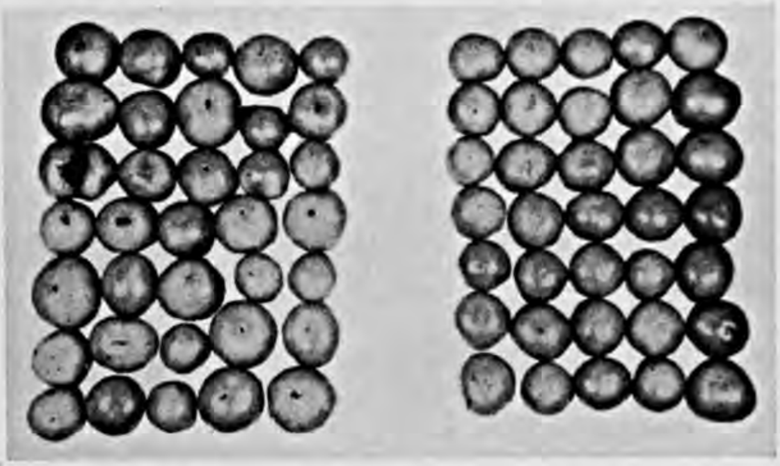
During the past 10 years they have been heavy users of commercial fertilizers and look upon the proper use and application of fertilizers as a prime necessity. They have cooperated with the Chemistry Department of the Ontario Agricultural College in the conducting of experiments on various crops with different analyses of fertilizers, and have become particularly interested in soil testing to determine existing conditions in their fields and orchards. Mr. Smart has frequently remarked that if they had not used fertilizers, they would not be able, under present conditions of low prices and high overhead, to continue in business.

One of their main canning crops is tomatoes, and for the past several years they have been canning the crops from approximately 175 acres. About 50 acres on their own farm are devoted to this particular crop, and the balance is grown by local farmers having from 2 to 8 acres each.

Soil Samples Tested

In order to secure uniformity, Smart Brothers grow the plants for these farmers, using two varieties—John Baer and Canners Red. The latter variety was obtained from the Ontario Agricultural College about 25 years ago and appears to be very suitable for the Georgian Bay District. Last Spring, well before planting season, a soil-testing day was held at the factory. On this day the growers brought in soil samples from their fields which were to be planted to tomatoes. These samples were tested by a representative from the College, and fertilizer recommendations made on the basis of the test results.

In 1937 the Brothers had one 40-acre field of Canners Red tomatoes which showed considerable leather-end. As



Picture of the blossom-end of tomatoes. Note the irregular size and shape and the prevalence of leather-end in the low-potash tomatoes on the left. The extra potash plot (right) had no leather-end at all.

any considerable quantity of leather-end results in a great deal of wastage when it comes to canning or juicing the crop, they were particularly anxious to overcome this condition. Soil samples were taken from this field and sent to the College where the soil was analyzed.

The results of the analysis were as follows:

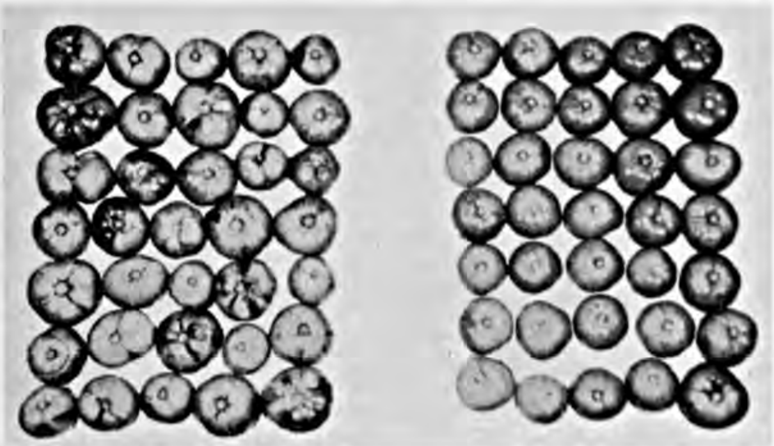
Reaction — 7.3
Nitrate N. — High
Phosphorus — Medium
Potassium — Low
Calcium — High
Magnesium — Medium

An application of 1,000 pounds of 2-12-10 fertilizer per acre was recommended. The previous year a 2-12-6 fertilizer had been used at the same rate on this soil. At the same time Smart Brothers were asked to treat one acre of this field with an additional 400 pounds of 60 per cent muriate of potash to determine whether or not under these particular conditions the potash would improve results.

On this 40-acre field in 1937 there was at least 30 per cent leather-end. This year, 1938, with a 2-12-10 fertilizer replacing the 2-12-6 analysis, the leather-end was reduced to about 15 per cent. On the acre which received the extra potash in addition to the 2-12-10 mixture, there was no leather-end whatsoever. In other words, in this instance the additional potash proved its worth in assisting in the production of high-quality tomatoes.

Smart Brothers took one day's picking from the extra potash plot and ran through some 70 cases of juice made entirely from the tomatoes grown on this special acre plot. Using the standards set by the Dominion Government for determining the grade, these tomatoes gave a higher grade than the tomatoes from the general field run and approached the highest grade, known as fancy.

While the writer was at the plant on the day that the tomatoes from this extra potash plot were being processed, he noticed the loads of tomatoes being brought in by the various farmers. One load brought in by farmer X appeared to have considerable leather-end. Upon inquiring from the weigh clerk, he was informed that this grower had considerable leather-end all through and was unable to pick more than half of his crop. The next farmer to weigh



Picture of the stem end of tomatoes. Note the irregular shape and size and the extensive cracking of the lower potash plot. The tomatoes on the right received extra applications of potash.

A demonstration plot on the Smart Brothers' Farm. The tomatoes at the left received a fertilizer high in potash; those on the right were not fertilized.

in his load had a load of uniform, red, ripe tomatoes without the least sign of leather-end. The clerk volunteered the information that this particular grower always had top-quality tomatoes and received no dockage.

In order to find out why one grower in the same district with the same variety of tomatoes had high-quality and another grower had considerable leather-end, we visited both of these farms. Soil samples were taken and analyzed at the College.

The results of the analyses are as follows:

Mr. X high per cent of leather-end.

Reaction — Alkaline
Potassium — Very Low
Phosphorus — High
Calcium — High
Magnesium — Medium
Nitrate N. — Low

Mr. Y no leather-end.

Reaction — 6.3
Phosphorus — Medium
Potassium — Very High
Calcium — Medium
Magnesium — Medium
Nitrate N. — Low

Upon inquiring as to the fertilizer practice of these two growers, we found that Mr. X used 1,000 pounds of a 2-12-6 fertilizer applied with a Planet Jr. fertilizer distributor a few days ahead of planting. Mr. Y used 500 pounds of a 2-12-10 mixture. This field also received about 15 tons of well-mixed barnyard manure applied in the winter and disked in during the spring previous to plowing.

The test results were as follows:

Check Plot, No Treatment.

Reaction — 7.4
Phosphorus — High
Potassium — Very Low
Calcium — High
Magnesium — High
Nitrate N. — Medium

Fertilized Plot, Plus Extra Potash.

Reaction — 7.5
Phosphorus — M+
Potassium — Very High
Calcium — High
Magnesium — High
Nitrate N. — Medium

As indicated by the tests made on these two soils, Mr. Y's soil showed a very high supply of available potash,

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Mr. E. I. Morrison Diversifies Farming

By Joe E. Walker

Shreveport, Louisiana

ACCORDING to E. I. Morrison, Georgetown, Grant Parish, Louisiana, profit from any crop can be increased by the use of fertilizer. In 1937 by using a total of 18,600 pounds, or 443 pounds per acre on 42 acres of row crops, he proved his belief by putting it into practice.

Prior to 1928 Mr. and Mrs. Morrison divided their time between teaching school and farming. Since then, however, they have found it more profitable to devote the whole of their efforts to the farm. Of their 338 acres, 71 acres, protected from erosion by more than 3 miles of terraces, are subject to cultivation; 160 acres have been reforested to native pine trees which Mr. Morrison says he will never cut, leaving them for his children to harvest; and the other 107 acres are taken up in house and barn sites and a woods pasture.

In 1937, 24 acres were planted to corn. This crop received 400 pounds of complete fertilizer per acre, and a yield of over 900 bushels of corn was produced. Nine acres of cotton which received a total of 4,500 pounds of complete fertilizer produced 8 bales. Mr. Morrison could have planted 10.5 acres to cotton but since 1934, when he found he could produce his allotment of tax-free cotton on less than his allowed acreage, he has cut his cotton land more than that required by the Agricultural Adjustment and Agricultural Conservation Acts.

A 14-acre meadow produced 600 bales of hay and another 13 acres were planted to clover for pasture. One and one-fourth acres in garden furnish fresh vegetables for the table almost all the year.

Mr. Morrison has been growing sweet potatoes 16 years and has been using fertilizer on them practically every year

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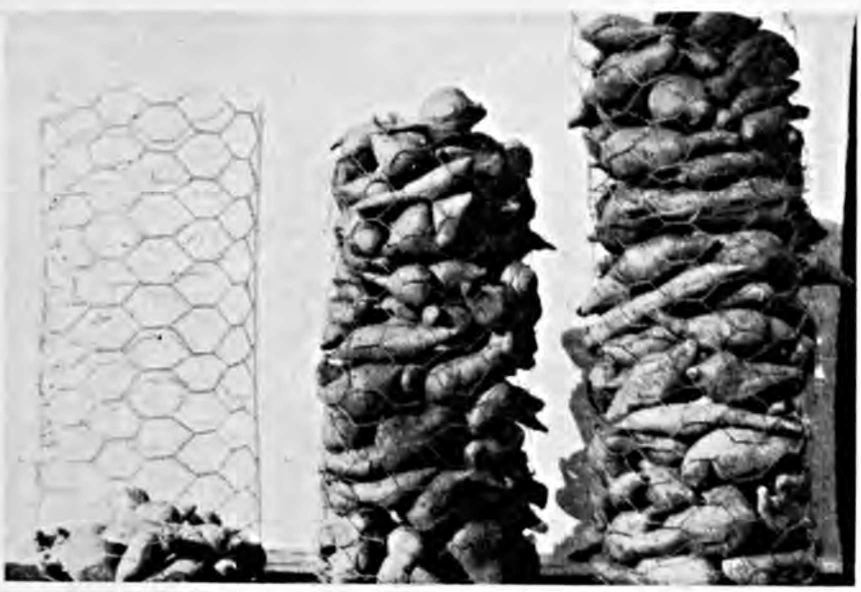

On the E. I. Morrison farm, Georgetown, Louisiana, no fertilizer (left) produced 39 bu. of sweet potatoes, 500 lb. of 4-12-4 (center) produced 248 bu., and 800 lb. of 6-10-7 (right) produced 296 bu.

How to Fertilize Cotton in Georgia

By E. C. Westbrook

Cotton and Tobacco Specialist, Georgia Agricultural Extension Service, Athens, Georgia

"HOW should I fertilize my cotton?" This question is asked by thousands of Georgia farmers every year. In this State the Georgia Experiment Station, at Experiment, and the Coastal Plain Experiment Station, at Tifton, have been at work for years seeking the answer to this all-important question. Farmers located in various sections of the State are aiding with these fertilizer experiments.

During the 18-year period, 1919 to 1936, inclusive, these stations conducted tests dealing with ratios of nitrogen, phosphoric acid, and potash; rates per acre; sources of phosphoric acid, nitrogen, and potash; ratio of organic and inorganic nitrogen; time of applying nitrogen materials; side-dressing with nitrogen and potash; comparative value of high analysis, concentrated fertilizers and low analysis, standard materials; home-mixed versus commercial mixed fertilizers; acid and basic mixtures; minor elements; placement of fertilizer with reference to seed; and other phases of the subject. Many of these tests were conducted away from the stations in cooperation with farmers.

Results of these numerous experiments, together with comments on their practical application, are recorded in Bulletins 151, 152, and 196 and in the 49th Annual Report of the Georgia Experiment Station, at Experiment, and in Bulletins 26 and 28 of the Coastal Plain Experiment Station, at Tifton.

A careful study of these data, as they apply to farming systems practiced in this State, leads to this conclusion and recommendations: The best all-round fertilizer for cotton on average Georgia soils is one that supplies 30 to 36 pounds of nitrogen, 32 to 48 pounds of phosphoric acid, and 24 to 36 pounds of potash per acre. This is equivalent to from 400 to 600 pounds of a 4-8-6 fertilizer plus a side-dressing of 75 to 100 pounds of nitrate of soda or some other quick-acting nitrogen fertilizer. A 4-8-6 fertilizer is one that contains 4 per cent nitrogen, 8 per cent phosphoric acid, and 6 per cent potash.

New Regulations

The Georgia fertilizer law was amended recently. The law now requires that for fertilizer formulae the nitrogen be expressed first, phosphoric acid second, and potash last. The old law required that phosphoric acid be expressed first, nitrogen second, and potash last. An 8-4-6 under the old law becomes a 4-8-6 under the new law. The new law also requires that the nitrogen be expressed in terms of nitrogen instead of ammonia and in whole numbers.

It is recognized that in actual farm practice certain variations from this specific recommendation will be desirable. For example, on newly cleared land or land which has not received much phosphate for a number of years, and on some limestone soils in northwest Georgia, more phosphate may be needed. Also, more phosphoric acid may be used on some soils which are abundantly supplied with moisture and where a winter legume is turned under and on soils that have a tendency to grow a large weed or where heavy applications of barnyard manure have been made.

There are very few soils in the State that do not need 36 pounds of nitrogen per acre. If this amount of nitrogen is applied early in the season (either at planting or chopping time), it will hasten the maturity of the cotton. There are a few exceptional soils in the State, mostly bottom land soils, which grow a large weed and keep a deep green color throughout the season, and on these soils less nitrogen should be used.

On some of the heavier Piedmont soils the potash may be decreased to 24 pounds per acre. On some of the sandier soils of the Piedmont and on some of the grey pebble soils of south Georgia, it will pay to use more than 36 pounds of potash per acre. This additional potash can be applied as a side-dressing of from 50 to 100 pounds of muriate of potash per acre at chopping time.

Despite variations in local conditions throughout the State, it is believed that an application, at or before planting, of 400 to 600 pounds of a 4-8-6 fertilizer per acre supplemented with a side-dressing of 75 to 100 pounds of some quick-acting nitrogen material at chopping time will meet the needs of the cotton crop about as well as any general recommendation which can be made at this time.

Should the farmer choose to use 3-9-5, 3-8-8, 4-8-4, 5-7-5, or similar mixture, a sufficient amount of side-dressing should be applied to bring the total nitrogen up to 30 to 36 pounds and the potash application up to 24 to 36 pounds per acre. Varying the amount of nitrogen in the mixture affects the yield more than a similar variation in either phosphate or potash.

A ready-mixed fertilizer analyzing 8-8-8 (N P K) applied at the rate of 400 pounds per acre would be a good fertilization for most Georgia soils. However, such mixtures as 4-8-6, 4-10-4, 5-7-5, and 4-8-4 in north Georgia and 3-9-5, 3-8-8, and 4-8-6 in south Georgia are popular among Georgia farmers. Usually such mixtures are applied all before planting. Where less than the recommended amount per acre is used or when one or more of the elements is too low, it may be advisable to make up the difference by side-dressing. An ample supply of nitrogen is essential for high yields.

Left: This plot has been fertilized with sulphate of ammonia for 4 years. The acidity had become so great that the cotton died. Right: This plot received the same fertilizer treatment plus enough dolomitic limestone to a little more than neutralize the acidity.

A mixture composed of 200 to 300 pounds per acre of superphosphate, 100 pounds sulphate of ammonia, 100 pounds of dolomitic limestone, and 50 to 75 pounds of muriate of potash at planting time, plus 100 pounds of nitrate of soda per acre at chopping time would supply the recommended amount of plant food. Other materials, adapted to the practice and carrying equivalent amounts of equally efficient plant foods, may be used with satisfactory results.

Station Recommendations

For a number of years the Coastal Plain Experiment Station, at Tifton, has recommended 400 to 600 pounds of a 3-9-5 fertilizer at or before planting to be supplemented with about 100 pounds of nitrate of soda or its equivalent at chopping time. On the basis of more recent experimental data, agronomists at the Coastal Plain Experiment Station have reached the conclusion that 400 to 600 pounds of a 3-8-8 fertilizer supplemented with about 100 pounds of nitrate of soda or its equivalent as a side-dressing at chopping time would be about the most profitable fertilization for cotton. However, if winter legumes are turned under preceding the cotton, the side-dressing of nitrogen may be omitted on soils that have a tendency to make excessive weed growth when legumes are turned under.

Generally speaking, the Tifton pebble soils appear to be more deficient in potash than any of the other south Georgia soils. When cotton follows a crop of peanuts or sweet potatoes, it is especially desirable to apply liberal amounts of potash to the cotton.

In the most recent findings of the Georgia Experiment Station, at Experiment, based on 6 experiments and 49 demonstrations located in all sections of the State, the largest profit was obtained from 32 pounds of nitrogen, 32 pounds of available phosphoric acid, and 32 pounds of potash per acre. These quantities of plant food can be supplied in the following ways:

1. By applying 400 pounds of an 8-8-8 fertilizer per acre before planting.
2. By applying 400 pounds of a 4-8-8 fertilizer per acre and side-dressing with 100 pounds of nitrate of soda or its equivalent in other forms of nitrogen.

These recommendations are made for average Georgia conditions and should be modified to meet special conditions.

On heavy soils that are not subject to leaching about the same yields have been obtained where all of the nitrogen was applied at the time or before planting as compared with applying a part of it at planting and the remainder as a side-dressing at chopping time. However, on sandy soils that are subject to leaching, better results have been obtained by applying a part of the nitrogen at or before planting time and the remainder as a side-dressing at chopping time.

Farmers who prefer to apply a part of their nitrogen or potash, or both, as a side-dressing will find this a practical thing to do. For example, the farmer may purchase a 4-8-4 fertilizer to use at or before planting. By using 100 pounds of nitrate of soda as a side-dressing, the farmer can step the nitrogen up to 8 per cent. If he wants to step the potash up to 8 per cent also, then he can do so by side-dressing with 32 pounds of muriate of potash. If additional nitrogen and potash both are needed, they may be supplied by using a nitrogen-potash side-dresser.

Plant Indicates Needs

The cotton plant itself is often a good indicator of fertilizer needs. Cotton rust or early shedding of the leaves and failure of the bolls to open properly may indicate the need for additional potash or magnesium, or both. Potash will reduce the loss from wilt in fields that are deficient in potash, although it is not a cure for cotton wilt. In the northern half of Georgia potash deficiency is more noticeable on the grey or sandy soils and on flatwood soils than it is on the red clay lands.

When used as the sole source of nitrogen, highest returns have been obtained

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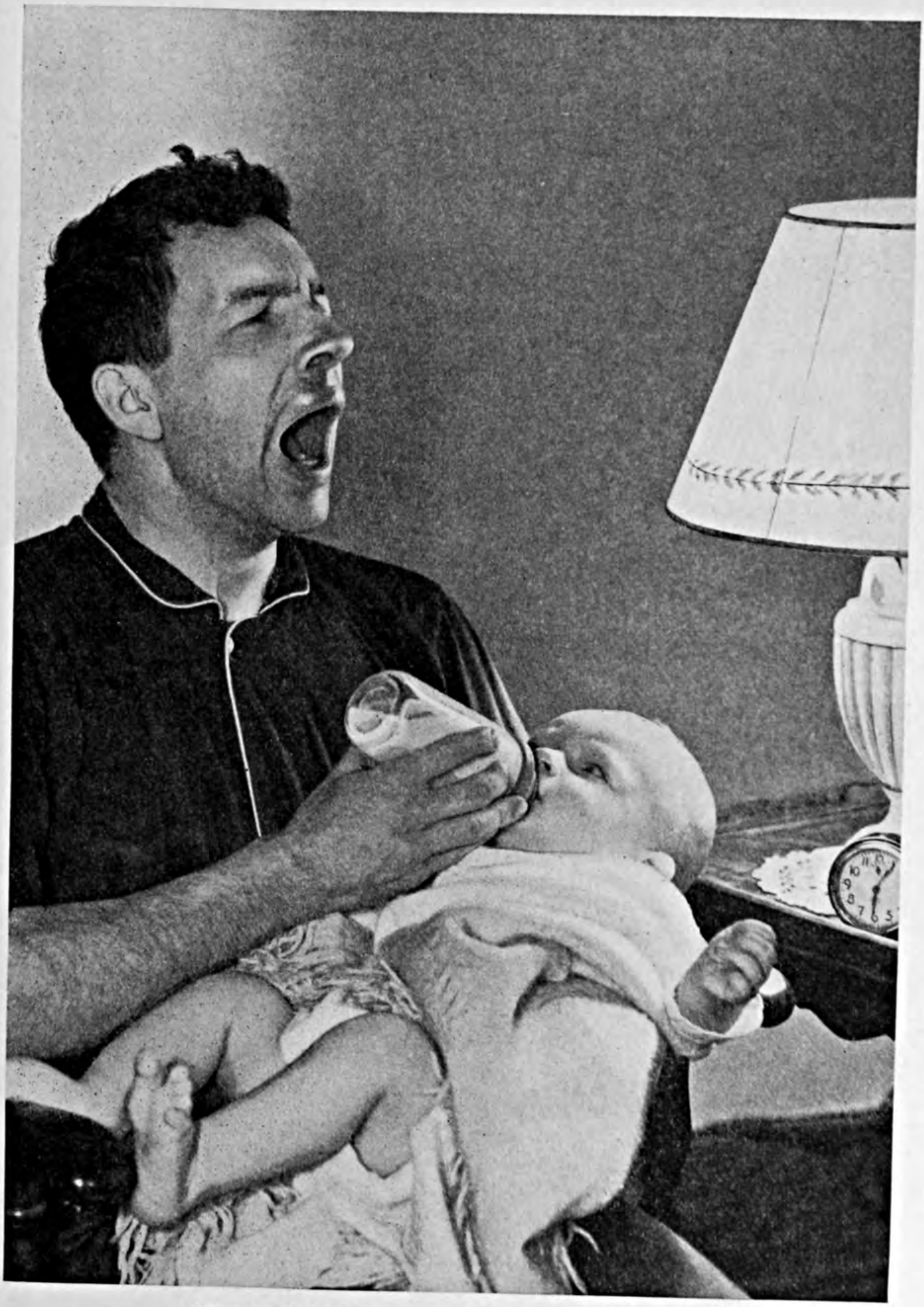
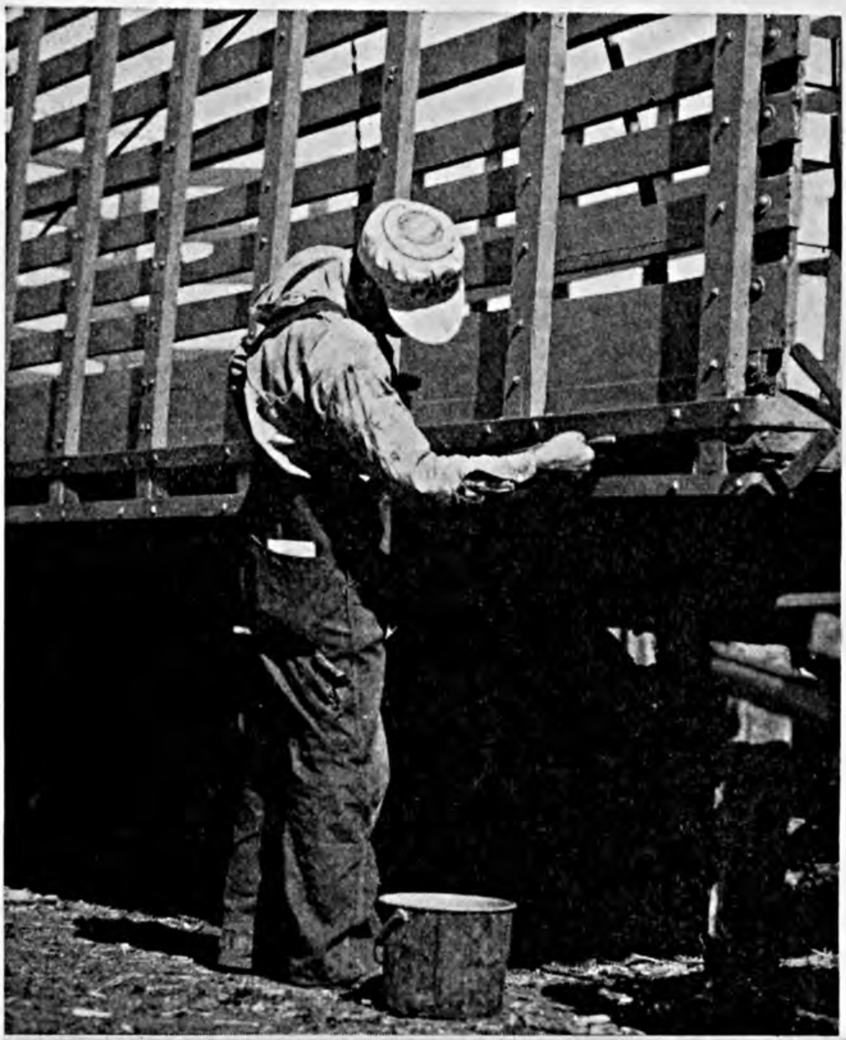
PICTORIAL



Many weird sounds accompany the break of day.

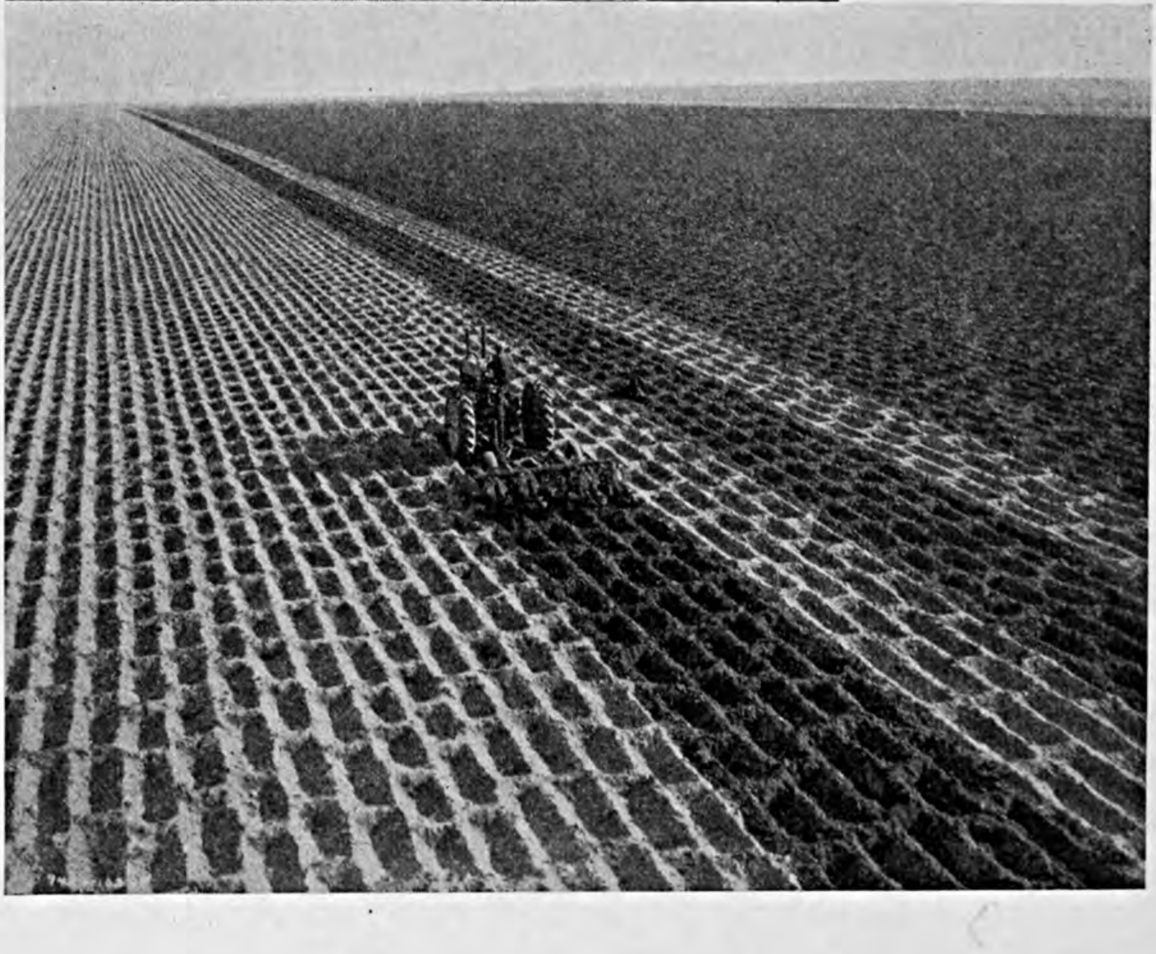
Primitive in many of its phases, Chinese agriculture is picturesque to Western observers. Above: The "watch duck" guarding his flock. Below: Culture of bamboo shoots, famous Chinese vegetable.

Although steeped in the tradition of their ancestors, Chinese farmers like to exchange ideas. Above: Country folks at an agricultural fair. Below: Threshing rice, the "staff of life."



Left: A farmer's life is a varied one, involving a range of interests from the study of related sciences to skill in the various trades. "Spare time," of which there is little, can always be filled with some "upkeep" job which has had to be side-tracked for more important work.

Below: Charles Peacock of Arriba, Colorado, is pictured using the machinery he created for conserving soil and moisture in the Great Plains area. It is called the damming method of farming, as it collects snow and rain in the hollows, preventing erosion and loss of soil by run-off.



The Editors Talk

British-American Trade Agreement

On November 17 the much heralded British-American Trade Agreement was finally signed, thus setting the stage for a new wave of public comment expressing opinions largely dominated by the political viewpoint of the individual writers. So much has been said about this particular trade agreement that the fundamental facts are pretty widely understood. It would appear that the chief point to be remembered from the provisions of the agreement is that about one-fifth of the American exports go to Great Britain and Canada, and that there is a pretty close balance between exports and imports to the two countries, with about one-fifth of our imports coming from the United Kingdom and Canada. Of all the agricultural exports to the two countries, cotton, wheat, and lard are the most important.

Our foreign trade problem probably has received more attention from those interested in American Agriculture than from anyone else. Programs for stimulating exports of agricultural products at prices comparable to the protective prices and wages of industry are not new. The famous McNary-Haugen Bill is well within the memory of most of us, and the veto of the late President Coolidge is the only thing that kept that program from becoming an actuality. For many years following the close of the World War, exports to foreign countries were stimulated through loans by the United States, which in turn were used for the purchase of our products. In recent years the piling up of surpluses of some of the key agricultural products has led to renewed vigor on the part of the proponents of legislation aimed at stimulating agricultural exports.

Improved farm practices, favorable weather, and high crop yields have largely been responsible for the almost unbelievable production of cotton and wheat. At the present time we have an all-time high in the production, carry-over, and supplies of cotton, and the wheat situation is rapidly approaching the cotton problem in magnitude. Because of mounting agricultural surpluses and a seemingly impossible task of expanding our domestic market in line with the rapid expanse of agricultural production, many schemes for expanding our foreign market have been concocted in the fertile brains of agricultural leaders, politicians, and economists, but the reciprocal trade idea has received the greatest attention of the administration leaders. An argument in favor of the reciprocal trade policy is that many of the other methods which have been suggested and are still being advocated do not consider the ability of importing countries to pay for our exports.

It is axiomatic under present conditions that for the United States to enjoy a thriving volume of foreign commerce, we must find means whereby our foreign customers can secure exchange to buy our products. Within recent years we have seen importing countries purchase products of an inferior quality or at higher prices than those prevailing in the United States for the simple reason that means of payment could not be established with this country. It is hoped through a more equitable adjustment of tariff duties and quotas that means of payment will be established.

There is little doubt that a trade program as large in scope as the United Kingdom, Canada, and the United States agreement will have far-reaching influence on the international trade of all nations involved. From the purely agricultural viewpoint, it is rather doubtful if the agreement will have much direct influence. The shifting of wheat to the free list will undoubtedly improve our possibility of achieving the 100-million-bushel export goal. Wheat from the United States, which had been competing in the face of a duty equivalent to about 7¢ a bushel, will now be placed on an equal footing with wheat from the provinces within the British Empire.

Placing of lard on the free list probably will not gain a greater proportion of the British market for the American producer of pork products, but it will place lard on a better competitive basis with the substitute fats which have been developing back of a British duty. The situation in this country with respect to balance between production and consumption of pork products has not reached a stage as yet where prices have been depressed unduly, but it must be admitted that with the present favorable corn-hog ratio and the current trend in hog production, it is time that some thought is given to the future expansion of American pork products in the world market.

Although Great Britain is the leading customer for the South's No. 1 cash crop, by virtue of the fact that cotton exports to Japan have been restricted in the past year, there is little direct benefit to be allocated to cotton. It is, of course, to be expected that the cotton producer will participate in any general increase in trade between the two countries resulting from the agreement.

Aside from the possible increase in exports of many of our minor commodities, such as prepared fruits, citrus juices, etc., it would seem that the only encouragement that can be offered to the farmer as a result of the trade agreement program is of a long-time nature and will be more or less a result of the general advance in trade, rather than impetus to any of the individual products.

Erratum: Our attention has been directed to an error in figures on plant-food removal in the article "Potash Saves Alfalfa, Clover, and Soybeans," by A. W. Blair and A. L. Prince which appeared in the October 1938 issue of Better Crops With Plant Food. The third from the last paragraph of the article, page 37 in the magazine: "Four tons of alfalfa, which is a good acre-yield for three cuttings, will remove about 68 pounds of potash (K_2O), and 130 pounds of lime (CaO). It would require 136 pounds of 50% muriate of potash annually to meet this potash demand, not to mention the amount required to replace that lost through leaching and soil erosion" . . . should have been: Four tons of afalfa, which is a good acre-yield for three cuttings, will remove about 168 pounds of potash (K_2O), and 130 pounds of lime (CaO). It would require 336 pounds of 50% muriate of potash annually to meet this potash demand, not to mention the amount required to replace that lost through leaching and soil erosion. . . .

This section contains a short review of some of the most practical and important bulletins, and lists all recent publications of the United States Department of Agriculture and the State Experiment Stations relating to Fertilizers, Soils, Crops, and Economics. A file of this department of BETTER CROPS WITH PLANT FOOD would provide a complete index covering all publications from these sources on the particular subjects named.

Fertilizers

¶ Pennsylvania farmers will find that State Agricultural Extension Circular 208, "Fertilizing Farm Crops," by J. B. R. Dickey, a very helpful and practical source of information on the intelligent use of commercial fertilizers. In addition to fertilizer suggestions for potatoes, wheat, and other small grains, corn, soybeans, timothy, alfalfa, clover, and permanent pastures based on field experiments and good farm practice, the author gives attention to such important subjects as higher analysis fertilizers, fertilizer ratios, method of application, and soil tests.

While slight variations from any particular analysis for a given crop in all probability will give little or no difference in results, there is no real reason for the infinite variety of analyses offered, Professor Dickey states. The higher analysis fertilizers now available make it desirable to base recommendations on the best ratio or proportion of plant-food elements, rather than a definite percentage of each. To bring out this point he shows that a 1-2-2 ratio suitable for potatoes and furnishing 200 to 240 pounds of plant food would be represented by a 4-8-8 analysis at 1,000 to 1,200 pounds per acre, 5-10-10 at 800 pounds and 8-16-16 at 500 pounds per acre. From 40 to 80 pounds of plant food for the grain crops are usually advised, which may be applied in a 1-6-3 ratio such as 2-12-6 or 3-18-9 analyses.

The circular mentions additional ratios and analyses for these and other farm crops to meet various soil and cropping conditions.

"The Production of Artificial Manure on the Farm," Agr. Exp. Sta., Gainesville, Fla., Press Bul. 517, August. 1938, F. B. Smith.

"Commercial Fertilizers and Legumes," Agr. Ext. Serv., State College, Miss., Ext. Cir. 101, June 1938, J. W. Willis.

"Magnesium as a Factor in Nitrogen Fixation by Soybeans," Agr. Exp. Sta., Columbia, Mo., Res. Bul. 288, July 1938, Ellis R. Graham.

"The Value of a Ton of Farm Manure in the North Platte Valley," Agr. Exp. Sta., Lincoln, Nebr., Bul. 318, May 1938, Lionel Harris.

"Virginia Field Crop Fertilizer Recommendations," Agr. Ext. Serv., Blacksburg, Va., Cir. E-341, July 1938.

Soils

¶ "To Hold This Soil," by Russell Lord, is a very interesting and thought-provoking publication on soil conservation, presenting a story of American soil from the earliest records to the present. Issued as Miscellaneous Publication 321 of the U. S. Department of Agriculture, it describes and illustrates with pictures what has been happening to soils that have been carelessly managed, as well as what can be done to prevent the devastating effects of soil erosion. The author follows the historic march of land occupation across the continental United States. He emphasizes that there is no simple cure-all for soil erosion, but shows how contouring, crop rotations, terracing, and other proved measures of curbing erosion can be formulated into a well-rounded program to save the soil.

"Some Profile Characteristics of the Pine-growing Soils of the Coastal-plain Region of

Arkansas," Agr. Exp. Sta., Fayetteville, Ark., Bul. 361, June 1938, Lewis M. Turner.

"Relative Productivity of Soils in Arkansas," Agr. Exp. Sta., Fayetteville, Ark., Bul. 365, June 1938, R. P. Bartholomew and O. R. Younge.

"Terracing, an Important Step in Erosion Control," Agr. Exp. Sta., Columbia, Mo., Bul. 400, July 1938, Marion Clark and J. C. Wooley.

"Soils of Petroleum County," Agr. Exp. Sta., Bozeman, Mont., Bul. 363, Aug. 1938, L. F. Gieseker.

"Soil and Moisture Conservation in Nebraska," Agr. Ext. Serv., Lincoln, Nebr., Ext. Cir. 118, June 1938, D. L. Gross and E. H. Doll.

"Some Interrelationships Between Soil Characteristics, Water Tables, Soil Temperature, and Snow Cover in the Forest and Adjacent Open Areas in South-central New York," Cornell Univ. Agr. Exp. Sta., Ithaca, N. Y., Memoir 213, June 1938, J. N. Spaeth and C. H. Diebold.

"Soil Erosion Control in Oklahoma," Agr. Ext. Serv., Stillwater, Okla., Gen. Ser. 56, Cir. 218, Revised 1938, W. H. McPheters.

"Synthetic Compost for Mushroom Growing," Agr. Exp. Sta., State College, Pa., Bul. 365, June 1938, J. W. Sinden.

"Soil Conservation Districts, How Farmers Can Organize Them, How They Help Control Erosion," Agr. Ext. Serv., Madison, Wis., Cir. 290, Aug. 1938.

"Soil Survey of Licking County, Ohio," U. S. D. A., Washington, D. C., Series 1930, No. 48, Jan. 1938, Robert Wildermuth, W. D. Lee, A. H. Paschall, and J. G. Steele.

"Soil Survey of Wayne County, Pennsylvania," U. S. D. A., Washington, D. C., Series 1932, No. 25, April 1938, C. S. Simmons, C. H. Atkinson, and L. A. Brown.

"Soil Survey of Halifax County, Virginia," U. S. D. A., Washington, D. C., Series 1934, No. 5, Mar. 1938, R. C. Jurney, S. O. Perkins, R. E. Devereux, S. S. Obenshain, Edward Shulkcum, and G. W. Patteson.

"Selenium Occurrence in Certain Soils in the United States with a Discussion of Related Topics, Third Report," U. S. D. A., Washington, D. C., Tech. Bul. 601, May 1938.

Horace G. Byers, John T. Miller, K. T. Williams, and H. W. Lakin.

"Chemical and Physical Properties of Certain Soils Developed from Granitic Materials in New England and the Piedmont, and of Their Colloids," U. S. D. A., Washington, D. C., Tech. Bul. 609, June 1938, Irvin C. Brown and Horace G. Byers.

"Conservation and Use of Soil Moisture at Mandan, N. Dak.," U. S. D. A., Washington, D. C., Tech. Bul. 617, June 1938, J. C. Thysell.

Crops

¶ Florida Agricultural Experiment Station Bulletin 325 entitled, "Preliminary Pasture Clover Studies," by Roy E. Blaser, gives a thorough discussion of winter pasture clovers best adapted to Florida. Methods of establishing clovers for grazing, some mineral deficiency symptoms, and grazing management are summarized along with other important considerations. Success with clover is dependent upon a soil supplied with lime, phosphorus, potash, and perhaps other nutrient materials in some cases; proper inoculation; and the choice of soil types adequately supplied with winter moisture. The nutrients to be added vary with types of soil and previous soil treatment. During the 1937-38 season 2,000 pounds of lime, 600 pounds of superphosphate, and 100 pounds of muriate of potash per acre gave good results. Manure may be added for still better results, and light applications of nitrogen appear somewhat beneficial. Growth of clovers is influenced by the degree of inoculation as well as plant nutrients and moisture supply. Where clover was planted on dry soils such as Norfolk fine sand, it resulted in complete failures.

Even though these studies are preliminary in nature and cover a short time, the observations reported in this bulletin are full of information that should lead to a better program of providing winter pasturage in Florida.

"Improvements in the Technique of Cotton Hybridization," Agr. Exp. Sta., Fayetteville, Ark., Bul. 359, June 1938, L. M. Humphrey and A. V. Tuller.

"Outlying Cotton Variety Experiments, 1936 and 1937," Agr. Exp. Sta., Fayetteville, Ark., Bul. 360, June 1938, L. M. Humphrey.

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Economics

¶ The Mississippi Department of Agriculture has recently released their statistical sheet, "County Fertilizer Data: Mixed Goods and Materials," for the fertilizer year July 1, 1937 through June 30, 1938. The material is based on a compilation of notices of shipments received from manufacturers and guarantors of fertilizer materials during the period, and is particularly valuable because it not only gives the total tonnages of the various analyses sold, but also divides the State up by counties and the grades sold within counties.

According to the report, the total sales for the 1937-38 period were greater by about 45,000 tons than sales from July 1, 1935 through June 30, 1936, but were about 35,000 tons under the figures for the corresponding 1936-37 period. The totals were 265,182 tons in 1937-38, 300,561 tons in 1936-37, and 219,250 tons in 1935-36.

By far the most important single analysis of mixed fertilizer sold was 4-8-4, which represented 106,579 tons of the total of 141,366 tons of mixed goods sales. Next in importance was 4-8-8 with 9,675 tons, followed by 6-12-6 with 8,489 tons, and 6-8-4 with 8,473 tons.

In the Mississippi report only 15 different analyses are listed. In some States it is not uncommon for the total to exceed 150 or 10 times as many different grades. In addition to the sales of mixed fertilizer in 1937-38, 89,340 tons of nitrogenous materials, 26,805 tons of phosphates, and 7,669 tons of potassium materials were sold, which compare to sales of 103,641 tons of nitrogenous materials, 40,099 tons of phosphates, and 8,360 tons of potassic materials sold in 1936-37.

¶ "Agricultural Production in New York, 1866 to 1937," by T. E. LaMont, is the title of an interesting survey of changes in New York agriculture. Since the turn of the century, there have been a great many changes in agriculture in the United States, particularly in the northeastern section. In the State of New York, according to Mr. LaMont, there has been a decrease of 4,200,000 acres of land in farms during the 55-year period (1880-1935), but the total agricultural production of the State has increased by 20%. He notes that this increase is due largely to increases in efficiency in agricultural production, brought about by the increased use of commercial fertilizers and lime, better farm practices, the use of more suitable land, improved varieties of crops, better control of insects and diseases, etc. Many who have been close to agriculture during the past 40 or 50 years often fail to realize the extent to which scientific methods and research have actually influenced our agriculture. The bulletin is especially interesting from this standpoint, since it does bring to light in a rather clear perspective the actual increases in efficiency that have resulted largely from the application of scientific methods to farming.

Data concerning most of the important crops grown in the State of New York are included in the work. Production per acre of crops other than fruit has been weighted by importance of the crop and has increased 21% from 1899 to 1934. This increase was caused by higher yields per acre and by shifts to more intensive crops. The higher crop yields are due, to a large extent, to the use of more fertilizer. It is noted that since 1924, between 2 and 2½ times as many tons of fertilizer have been used in New York State as were used in 1899.

In discussing livestock production, it is noted that the production of milk per cow in 1934 was more than double that of 1864. Brought about largely by the greater demand for milk, this increase is probably due to the change from the dual purpose type of cattle and the breeding of higher producing cows, combined with improved feeding practices and methods of caring for the dairy herd.

Perhaps as important as any one

thing has been the increased efficiency of production per man on the New York farms, which has about doubled in the past 60 years. Here again this increase is due to the higher yield of crops, greater efficiency in the production of livestock, and the use of improved machinery.

Of the total gross income derived by the New York farmers between 1926 and 1930, approximately 47% was from milk, 11% from eggs, potatoes and other vegetables about 14%, and fruit about 8%.

¶ According to the latest report from the Kansas Board of Agriculture Control Division, "Tonnage of Fertilizer Reported by Manufacturers as Shipped to Kansas During 1937," the total amounted to 12,114 tons. Since 1932 there has been a steady increase in fertilizer sales in Kansas. In that year only 1,199 tons were reported. In 1936, 4,605 tons were reported. Since the report does not give the data by analyses, it is not possible to calculate the actual plant food.

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Little Nellie's mother was entertaining a famous aviator. After he had finished a thrilling story, little daughter sighed deeply and said:

"I've clear forgot how it feels to sail through the air."

"Why, Nellie," said her mother, in a shocked voice, "you were never in the air in your life."

"Gracious! Mamma, have you forgot that the stork brought me?"

It seems the gate broke down between Heaven and Hell. St. Peter appeared at the broken part of the gate and called out to the devil, "Hey, Satan, it's your turn to fix it this time."

"Sorry," replied the boss of the land beyond the Styx. "My men are too busy to go about fixing a mere gate."

"Well, then," scowled St. Peter, "I'll have to sue you for breaking our agreement."

"Oh, yeah," yeah'd the devil, "where are you going to get a lawyer?"

The Tractor Industry Began in Wisconsin

By A. W. Hopkins

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TWO plucky Wisconsin engineers, struggling against more than a liberal helping of adversity and facing their full share of opposition, laid the foundation for the vast tractor industry of today. The two men, often accused of being visionary, dared to dream of a gasoline engine pulling plows or other farm machinery up and down farm fields in this and many other States.

It was while studying engineering at the University of Wisconsin, that C. W. Hart and C. H. Parr recognized, as did many others, the shortcomings of the steam engine when called upon to pull farm machinery. While others wondered what could be done about it, the Wisconsin engineers dared to think something might be done about it.

These men knew that even stationary steam engines called upon to drink the alkali waters in the Dakotas and on the prairies of Western Canada often rebelled. Under the hard pull of a full load of plows in tough prairie sod, steam boiler flues, surrounded by alkali water, would burn out in a few days. Besides they were aware that in many localities water was a very scarce article, obtainable only from dirty sloughs which had a very bad habit of drying up just when water was most needed.

Hart and Parr saw all these things and yet dreamed that they might build a tractor that would burn gasoline and kerosene for fuel, which would be lighter in weight than a steam engine of the same horse power, and which

One of the first models on its way to the exhibition.

would be able to stand the strains of uneven ground. They even dared to believe that they could use oil for cooling the motor.

Their dream was so different from current practices that builders of steam traction engines laughed at the dreamers. When from their shop there came very crudely built machines, competitors freely heaped ridicule upon the investigators. Despite open ridicule and not a little antagonism, Hart and Parr went steadily on, and the gasoline tractor came into being, subject of course to constant and frequent change.

They built their first tractors in two sizes, which were very similar in design. The larger of the two was called "60" as that was approximately the horse power it would deliver to the belt. The smaller tractor was dubbed the "45" for the same reason. The "60" became the most popular and formed the major part of the company's output from 1904 to 1916. During that period the firm brought out several other models, most of them designed for some special purpose, but the "60" continued in greatest demand.

At the Iowa Centenary Exhibition held in connection with the Iowa State Fair this year, three of these old models were shown. One of these was old No. 3, one of the first three to be produced. It is still in running order but was sold 5 years ago to the Rosenthal Museum in Chicago and borrowed for the Iowa exhibition. Another on exhibit was a "60" which probably was built considerably earlier than 1916 and is still in use on the farm of a man living at Dallas Center, Iowa.

Still Being Used

The third tractor at the exhibition was a "35" which was one of the models brought out about 1910 and used especially for building and maintaining roads as well as for belt work. This machine is now owned by a man living near Calmar, Iowa. When visited for the purpose of trying to get the loan of the tractor for the Iowa exhibition, the visitors found him threshing with it. By furnishing him with another machine with which to finish his threshing, they were able to secure his machine to exhibit at the Iowa exhibition.

Extra Potash & Borax Grew Good Celery

(*From page* 15)

Plants curled up, stems were cracked across the fibers, or split open at the base. Soil tests showed a pH of 6.6, or slightly acid. Both phosphorus and potash tested low. The field had been growing vegetables for 6 years and had just been limed. Professor Young of the Waltham Field Station agreed with Extension Agronomist Donaldson and County Agent Handy in diagnosing the trouble as a deficiency in some minor element, probably boron.

Mr. Lawrence promised to cooperate in holding field trials and followed his usual program of fitting the soil and fertilizing with 1 ton of 5-8-7 mixed fertilizer per acre. Plots measuring 25 x 35 feet were staked out, and extra superphosphate, manganese sulfate, magnesium sulfate, hydrated lime, borax, extra muriate of potash, and nitrate of soda were applied. Not only early celery, but Pascal celery, beans, beets, spinach, rutabagas, and cauliflower were grown on the trial plots.

By August 1, the extra potash plots

had the best growth of any, while the extra lime plots were poorest. Celery first showed stem cracking, the common symptom of boron deficiency, August 20, on the lime, magnesium, and check plots. By September 1 all plots except the two borax treatments were affected to some extent.

A side application of borax was made September 2 on the poorest row in the check plots, then badly cracked and stunted. Improvement started in 2 weeks. The hearts began to grow, and the final yield actually was the best in the field.

All borax treatments produced a profitable volume of celery. Quality was excellent. Extra potash was the only other fertilizer material to produce a yield to compare with the borax plots. Muriate of potash was used in the tests.

While extra potash improved the foliage and quality of spinach, beets, beans, and rutabagas, no significant increase in yield followed. Extra lime depressed yield. Borax plots showed better quality, especially with rutabaga turnips. Cauliflower made little response to any treatment.

Massachusetts soils seem to be near the danger line in boron supply. Liming to the neutral point lessens the available boron. Soil testing should always precede lime. Over 80% of the farm soils tested by the Middlesex County Extension Service last year needed potash. By contrast, over 80% had enough phosphorus, and 65% had sufficient lime.

Replace Minor Elements

Minor elements, manganese, boron, iron, etc., usually become deficient following extreme practice, such as overliming, single cropping, or overfertilizing. Replacing these minor elements requires only small amounts. Borax is applied at 10 to 30 pounds per acre. An excess may be just as harmful as a deficiency. Farmers should consult their county agent, experiment station, or other competent authority before using minor elements. Soil tests should guide the lime and fertilizer program.

How to Fertilize Cotton in Georgia

(*From page* 22)

from quick-acting inorganic sources, such as nitrate of soda and sulphate of ammonia. If the fertilizer is home-mixed, addition of at least 10 per cent of some conditioner like cottonseed meal will make it easier to handle the fertilizer in the distributor. Unless the mixture is in good mechanical condition, the distributor will not put it out uniformly. The acidity from acid-forming nitrogen materials may be neutralized by mixing with it some limestone. It requires about one pound of limestone to correct the acidity resulting from the use of one pound of sulphate of ammonia.

Possible injury to young cotton plants may be avoided by side placement of the fertilizer. If the fertilizer is put down in a small stream in close contact with the seed, injury to the stand is likely to result. There are numbers of different kinds of fertilizer distributors now on the market which place the fertilizer to the side of the seed rather than directly under the seed. If the fertilizer is mixed in the drill with a plow before cotton seed are planted, the danger of injury to the stand will be much less than if the fertilizer is not mixed with the soil. By applying a part of the nitrogen and potash as a side-dressing at chopping time the danger of fertilizer injury to stands may be further reduced.

For Sea Island cotton apply 300 to 400 pounds of a 3-8-8 fertilizer per acre at or before planting without any side-dressing.

Farmers Become Their Own Bankers

By E. B. Reid

Director, Information and Extension, Farm Credit Administration, Washington, D. C.

IN 4 significant years America's farmers have overturned a hoary fallacy, widely believed as it was groundless. This was that the average farmer doesn't know how to run his own business—is, in fact, a child in matters of financing the annual operations of range and farm.

At the end of 1937 upward of a quarter-million men of the soil were shareholders in 550 short-term crop and livestock financing institutions, which since early autumn of 1933 had done approximately a $800,000,000 business. These 550 grass-root banks, called production credit associations, cover every agricultural area in the United States, are at the service of every producer from the soil who has a sound credit rating, serve as a constant source of dependable credit. Every borrower from a production credit association purchases a voting right in its affairs with his acquisition of stock; with that vote he helps select the board of directors that will manage the business of the association in his behalf. Democratic control of the constructive lending activities is the rule with these farmers' credit organizations.

Those who still cling to the moss-grown belief that a farmer and his money are soon parted may be dumfounded to learn that each production credit association has a committee of the farmer-directors who decide upon the merits of every application for a loan. It is this loan committee's exacting job to weigh the applicant's reputation for meeting his obligations, assess his capacity as a producer, the chances of a good market for the commodity he wishes to finance—exactly the same questions a country banker, or other private lender, would or should ask himself before closing a short-term production loan.

Production credit associations are designed each to cover a territory which will insure the organization's becoming self-supporting through adequate loan volume and the resultant income from interest. In the nation's areas of concentrated farming this means two or more counties may be embraced by a single association. The more sparsely operated territories of the West, where livestock is the prevalent type of production, in some cases are served by a single State-wide association. In both instances, however, application takers have been appointed to cover outlying territory at a distance from the association's central office. County agents always serve as willing informants as to the whereabouts of the nearest representative of an association.

Loans Adapted to Needs

As with other permanent credit units of the Farm Credit Administration, loans offered by production credit associations are "custom made"; they are tailored, form-fitting, to the borrower's needs. This is the first consideration. The life of the loan is synchronized to the life of the commodity it is designed to finance; and interest—on a per annum basis—is charged, nevertheless, only for the actual time the borrower makes use of the money. It does not require a year to plant and harvest a winter wheat crop; the grain farmer repays his loan in about 9 months. A dairyman borrowing from an association for the purchase of more cows is allowed to make monthly repayments from his milk and cream checks, thus permitting him to make satisfactory financial progress out of the normal returns of his day-to-day business. Such loans usually run from 12 to 18 months.

In the financing of the purchase of farm machinery and fertilizer the production credit associations have assisted farmers to cut down their interest payments through cash buying. However convenient a time-purchase may be, there is no arguing the economy of buying for cash. A Florida citrus grower recently wrote the secretary-treasurer of his production credit association: "Through loans from our association I have saved hundreds of dollars on the purchase of fertilizer and other supplies for my grove by taking all the discounts in cash." Incidentally, cash customers rate the most satisfactory with the implement and fertilizer concerns.

Perhaps an illustration of the operations of one of the outstanding production credit associations in the country may serve to point up this brief exposition.

Out in the rich San Joaquin Valley, in California, the Visalia Production Credit Association put on its books $2,989,000 in the first 11 months of last year. This represented loans disbursed on 33 types of wealth-producing commodities, ranging from bees to watermelons and hitting oranges, range cattle, and cotton in between. The association embraces but two counties, yet here was a scant year's business rivaling that of any bank in the valley's 200 miles expanse. Since it received its charter from the Farm Credit Administration in December, 1933, the association's members have bought class B (voting) stock in the amount of $134,255—a sizeable stake. Net earnings in 4 years amounted to $67,615. Its losses, including reserves set aside for losses, have been less than one-half of one per cent.

Federal Refuges Use Land Unsuited for Cultivation

Drainage of marsh and swamp areas for crop land and quick profits has too often been unprofitable because the soil was poor and drainage expensive. Too, the natural habitat of many valuable birds and fur-bearing animals was destroyed, leaving them with little opportunity to reproduce.

Wildlife is worth hundreds of millions of dollars annually, says the 1938 Yearbook of Agriculture, "Soils and Men," and this return can be maintained and even increased by giving proper consideration to land planning.

In some areas, where attempts at drainage proved costly and unjustified, the land has been restored to marsh and swamps. An example is Lake Mattamuskeet in North Carolina. Here an expensive system of dikes and an elaborate pumping plant were installed to drain more than 50,000 acres of land. The project was never a success although it was tried for several years. Originally, the lake was an important refuge for greater snow goose, the whistling swan, and other waterfowl. As a Federal refuge it has been restored as a haven for these wild fowl.

The creation of large public reservations, however, is not the only way in which land can be restored as a home for wildlife, the Yearbook points out. Almost every farm has some unused portions that may be used profitably by wildlife.

High-quality Tomatoes Must Have Potash

(*From page* 16)

whereas Mr. X's soil showed a very limited supply. These findings were also borne out when soil tests were made on the check plot of the field at Smart Brothers, and on that portion of the field receiving the extra potash.

Based on these observations, it would appear that an adequate quantity of available potash is one of the primary requisites for uniformity and quality in the production of tomatoes.

Earn Soil Payments with Winter Legumes

(*From page* 9)

showing farmers getting their seed and also the various steps in inoculating legume seed with pure culture as demonstrated by the County Agent.

The records show that 500 Bertie farmers are participating in this program. The number of share-croppers cooperating with their landlords in using these seed will more than double this number. Orders ranged from one bag of Austrian winter peas, with P. R. Gillam of Windsor getting the largest order consisting of 2,000 pounds hairy vetch and 8,000 pounds Austrian winter peas, enough vetch and peas to seed 275 acres. This is the first time Mr. Gillam and many of the other farmers have seeded vetch and peas.

All farmers who were seeding the crops on land for the first time were urged to inoculate them, and practically all of them got culture for inoculating the seed. The total amount of vetch received and delivered was 88,000 pounds, and 62,000 pounds of peas, making a grand total of 150,000 pounds, enough to sow 5,000 acres. The records show that cooperating

Every bag of seed had to be checked before it was hauled away.

farmers got inoculating culture to inoculate 137,200 pounds of these seed, or more than 9 out of 10, and most of those not getting culture were seeding on land that had grown vetch or peas before.

A pamphlet was prepared by the County Agent giving directions for inoculating the seed, also instructions on seeding, and an outline of several demonstrations. Farmers were requested to conduct one or more of the demonstrations listed, so that they and their neighbors may see the value of the winter legume to the crop following it. These demonstrations are as follows:

(A) 1. Vetch or peas inoculated
    2. Vetch or peas not inoculated

(B) 1. Vetch or peas
    2. No cover crop

(C) 1. Vetch
    2. Check—no cover crop
    3. Peas

(D) 1. Vetch
    2. Peas
    3. Check
    4. Crimson clover

(E) 1. Check
    2. Vetch or peas
    3. Vetch or peas, same as No. 2 fertilized with 200 pounds 16 per cent superphosphate and 100 pounds muriate of potash per acre

(F) 1. Vetch or peas
    2. Vetch or peas, fertilized with 500 pounds basic slag per acre
    3. Vetch or peas, fertilized with 500 pounds basic slag and 100 pounds muriate of potash per acre
    4. Check

From these seedings we expect to get a number of real soil-building demonstrations which will be of value in future years. The 1939 summer crops on these demonstrations will be corn, cotton, and peanuts. In connection with the above types of soil-building demonstrations with winter legumes, the value of lime, phosphate, basic slag, and potash is being demonstrated throughout the county.

We are advised that this amount of winter legume seed is more than has ever been seeded in any one North Carolina county before, is more than had been seeded in Bertie County since the time it was made a county, and we challenge any county in the U. S. A. to show a record of a larger seeding in any one year.

Winter Protection

We find that Bertie farmers really appreciate this grant of aid from the Government in helping them to cover their fields with winter legumes. Instead of the soil being left bare to the elements this winter to suffer loss from leaching, it will be protected with a carpet of green vetch and peas that will add badly needed nitrogen and organic matter when turned under next spring. We believe that this experiment is the greatest work that could have been planned to help farmers really make a start towards conserving and improving their impoverished soils. With an early start next year, it should be possible to get twice as much acreage seeded in the fall of 1939 as was seeded this year. Many farmers state that they would like to have the AAA Program allow a larger part of their payments in winter legume seed, so they may cover a larger acreage in winter legumes.

On account of the short crops of cotton, peanuts, and tobacco this year as a result of excessive rains and boll-weevil damage to the cotton, Bertie farmers would have been able to seed only a small percentage of this acreage if the AAA Program had not provided this opportunity. Many farmers who were not interested in the Conservation Program in 1936 and 1937 have become interested through the winter legume program, and those who received no payments in 1936 and 1937, giving no particular attention to soil improvement, now see where the AAA Program helps them do better farming.

In seeding this acreage to winter

All kinds of conveyances were used to carry the seed away. This negro farmer used a mule and cart.

legumes, they will not realize that the seed have ever really cost them anything, since the AAA Office will deduct this cost from their soil-building payment. Most of them had not earned the full amount of this payment in 1936 and 1937. They will receive credit of $1.50 for each acre seeded to reach their goal, and it is expected that a similar payment will be allowed in the 1939 program for turning these crops under; so that in the final analysis the seed have not cost the producers anything, but will be an aid from the Government to farmers to help them conserve and improve their soils.

Thus we see that the Agricultural Conservation Program furnishes the opportunity of getting farmers to put into practice what the Extension Service has been advocating for these many years, and with the combined efforts of the two, much more effective results may be secured. Instead of compliance reports from Bertie County farms in 1938 showing the majority of them not reaching the soil-building goal and having to take a deduction for this deficiency, most of them will have fully reached their soil-building goal, and many of them will have carried out more soil-building practices than they can be paid for. Furthermore, Bertie farmers will have demonstrated that the first objective of the Agricultural Conservation Program can be more fully met through winter legume seed as a grant of aid to help them improve their soils.

E. I. Morrison Diversifies Farming

(*From page* 19)

of that time. In 1937, cooperating with his County Agricultural Agent, Mr. G. C. Smith, he conducted a fertilizer demonstration trying various kinds of fertilizer on sweet potatoes. Mr. Morrison's belief in fertilizers was certainly justified by the results of this demonstration. This year he used 800 pounds of 4-10-7 per acre on all of his sweet potatoes where he has formerly been using 500 pounds of 4-12-4.

Mr. Morrison's potatoes are all State

certified. He obtained his first certified stock from the Louisiana State Experiment Station at Baton Rouge. His reputation as a sweet potato producer has spread so far that Hon. Harry B. Wilson, Commissioner of Agriculture in Louisiana, often forwards to him for answering, letters from far and near requesting information as to cooking recipes, palatability of varieties, quality, etc.

This sweet potato crop is cured and stored in two dry kilns that have a combined capacity of 1,700 bushels. Since his acreage is small and certified, he disposes of his crop to local trade for consumption or for seed. He also trades potatoes to local stores for farm supplies.

To complete his diversified farm program his livestock consists of 3 mules, 16 head of Jersey cattle, 100 hens, and enough hogs to keep his family well supplied with meat which is cured and stored in a cold storage plant at Alexandria.

Mr. Morrison still finds time to work with his neighbors on community projects. However, his practice and conviction that to get the most out of his land, fertilizer must be liberally applied, has contributed much to make him one of the leading farmers in Grand Parish.

Selling Forage as Steaks and Chops

(*From page* 14)

ing his feed and forage with livestock depend upon the difference between the cost of producing his animals, or their purchase price and their market value. He is desirous of producing the quality of meat or other products that finds the greatest favor with the consumer, and hence also at livestock markets, if it can be done without prohibitive expense. Given a certain number of home-grown or available feeds, the farmer's problem is to combine them so as to produce the greatest possible tenderness and palatability in the meat. He must consider the kind, age, sex, breeding, and weight of the livestock to be fed; likewise the kind, quality, quantities, and prices of the grain, hay, silage, and pasture which are available or obtainable. Equipment, labor, time of year, and probable market are other factors which must be studied. Only then can the course be laid out and the decision made as to whether the product will be cow beef or baby beef, medium quality or choice beef, stackers or feeders, to be supplied to other regions for finishing purposes.

The ultimate success of the plan to diversify the farm program with livestock cannot be measured by the results of any one year any more than it can with the one-crop system. Farmers in one county during one year may show a profit from the all-one-crop system, while the farmers of a nearby county, depending chiefly upon cattle, make less. Perhaps the following year the situation will be reversed. Human nature is such that we forget our losses and number our triumphs and are content, yet that is neither good business nor sound agriculture. You cannot strike an average of two such groups of farmers and say that they are fairly prosperous, over a period of years. If, therefore, a judicial balance of crops, pasture, and livestock will enable a great majority of farmers to prosper year in and year out, that is the system to tie to. We know that such a system will do just that thing in many sections. We have every reason to believe it will succeed in many others.

Call cotton, tobacco, wheat, or any other product of the soil your money crop if you like. Manage your business to that end, but give improved livestock intelligently handled an opportunity to show you how they can enable the so-called money crop really to justify its title.

In the past, the viewpoint of many farmers has been, "how much feed will I have to buy with my cotton money to carry my livestock until pasture comes in the spring?" Too often it has not been sufficient, resulting in poorly fed animals and heavy purchase of feed when prices are highest. The viewpoint in reality should be "how much land will I need to plant in order to produce sufficient feed crops to carry my livestock until the next harvest with some to spare?" In this connection it is well to keep in mind that hay stacks and bulging granaries are the livestock producer's greatest security.

For Increased Production

In addition to corn, which is rather generally produced throughout the South, we sometimes ask the question, "how may we increase the production of corn, and is there a substitute for corn?" Among the points to be considered in order to do this are:

(1) Making better use of silage. In this connection the trench silo has and will continue to find an important place. It may also be possible to produce two silage crops on the same land during the year, thus greatly increasing the total nutrients per acre.

(2) It is important that more attention be given to crop rotations that will produce the greatest total yield of digestible nutrients per acre. It is urged that more attention be given to pasture in the rotation, as it has been shown that the total yield of nutrients produced per acre by such methods will be greatly increased.

(3) Certain varieties of oats are making most satisfactory yields and are worth almost as much as corn, pound for pound, for workstock, and for feeding other classes of livestock.

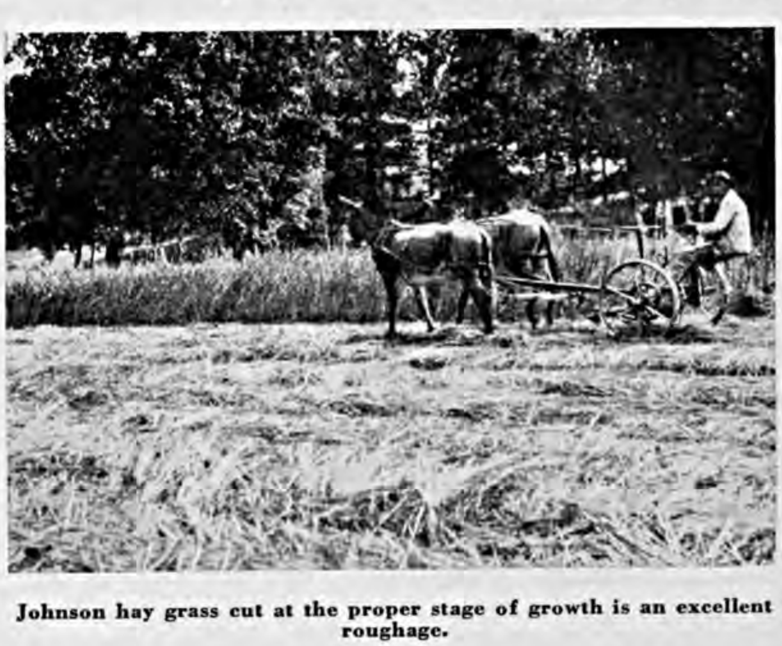
(4) Winter barley in the northern part of the South may be found to be one of the possibilities of increasing feed production. Consideration, however, will need to be given to possible damage from rust and insect pests. It is possible that this crop will be damaged less by pests than will corn from occasional dry weather.

(5) Corn and velvet beans have been used successfully in some sections in the past and may have greater possibilities than have yet been developed. The limitations of this crop, however, are pretty generally known.

(6) Grain-sorghums probably have greater possibilities in the Mississippi Delta and similar areas than have been developed to date.

(7) Sorghum for silage is perhaps one of the most dependable crops. It is from 85% to 90% as efficient as corn silage, and the yield is two to three times more per acre.

(8) Perhaps an increase in the production of digestible nutrients from hay crops would be the way of least resistance for many farmers at first thought. The production and making of good hay, either from the annual legumes, such as, soybeans and cowpeas, as well as from alfalfa, lespedeza,



Johnson hay grass cut at the proper stage of growth is an excellent roughage.

or Johnson grass, requires that it be cut at the proper stage of growth and be properly cured and stored for best results. To do this requires careful planning of the cropping system, proper hay-making equipment, and adequate storage facilities. One ton of legume hay is ordinarily considered equivalent to three tons of silage. By cutting the hay during the early stages of growth, the digestible nutrients per ton may be increased considerably, although such a practice possibly decreases the yield over a period of years. The cost of producing silage is estimated at from $2.50 to $4.00 per ton, and that of producing and storing hay from $4.00 to $6.00 per ton. The following table indicates the total digestible nutrients produced per acre of the different feed crops based on the average production over a period of years. The average yield of feed crops will appear very low to some, especially to farmers situated on good soil who may produce annually two, three, or even more times the average yield of all farms producing the crop. This fact should be taken into account when planning feed requirements and production possibilities for any given farm in any region.

COMPARATIVE QUANTITIES OF DIGESTIBLE NUTRIENTS PRODUCED PER ACRE—CALCULATIONS BASED ON AVERAGE YIELD IN SOUTHEASTERN STATES FOR THE 10-YEAR PERIOD 1922–1931

Feed Crop	Yields Per Acre*		Total Digestible Nutrients	
	Concentrates	Roughages	Harvested	Grazed†
	Bushels	Tons	Pounds	Pounds
Corn, ears	16	....	792	....
Barley	18	.80	1,200	....
Oats	22	.85	1,089	....
Wheat	10	.60	774	....
Grain sorghums	14	.75	1,280	....
Alfalfa	....	1.50	1,605	1,204
Lespedeza	....	.70	742	557
Annual legumes	....	.80	832	624
Johnson grass	....	1.00	1,016	762
Cereal hays	....	1.00	986	740
Corn stover	....	.70	647	....
Corn silage	....	3.20	1,152	....
Sorghum silage	....	6.40	1,743	....

* The percentages of grain and straw respectively are of the total crop yields as follows: ear corn 55, stover 45, oats 35, straw 65, barley and wheat 40, straw 60. The yield of silage is based on the assumption that 1 ton of silage will be obtained for each 5 bushels of corn it would produce.

† It is estimated that 75 per cent as much digestible nutrients are produced when pastured as when cut for hay.

From the above table, it is noted that:

(1) Corn and alfalfa produced much more total digestible nutrients per acre when harvested than when grazed with livestock.

(2) Oats, barley, and other crops sometimes cut for hay at an early stage of growth have slightly more nutrients when harvested.

(3) It is estimated that a rotation in any State on good land will produce from one-half to two-thirds more digestible nutrients when harvested than when the same crops are grazed.

Whether research worker or livestock producer, in making plans to make greater use of roughages and home-grown feeds to develop a successful farm program, there are certain goals we need to keep before us. Our efforts should be to make them sound, useful, and practical. This is necessary because the farmer thinks not only in terms of acres of crops, or number of animals to be fed, or of farm needs, but also in terms of dollars and cents from his own and the family's work for the year. Plans, methods, and research designed to help accomplish these objectives should among others include:

(1) Increase the yield of digestible nutrients per acre from all pasture, feed, and forage crops grown.

(2) Determine the kind, class, and type of animals best adapted to the use of increased amounts of pasture and other forage crops, thereby reducing the cost of production without impairing the quality of the products produced.

We have ample opportunity to increase the yield of nutrients per acre by increasing the corn yield.

Farm Samaritans

(*From page* 5)

the more normal working of the program. This time the operator and his wife had been renters, but three crop failures by drought wiped out their assets and left them with a $200 debt not fully covered by forced sale of the team and implements. After two years on meager day labor and relief, a federal loan was secured. Investigation proved them to be thrifty, capable, and honest, so $600 was advanced on an ordinary character loan, enough to buy a team, seed, a few tools, some feed, and family supplies. His debt was scaled down and installment payments arranged. The county supervisor helped him lay out a diversified farm program on 40 acres of rented land. In one year this man and his family had paid over half their debt to the government and met other obligations on time. The wife had canned nearly 500 quarts of fruit and vegetables from her own kitchen garden, and a milk cow and a small poultry flock eked out their needs. The family pitched in and built a small addition to the house, and next season they expect to rent a little more land.

SUCH folks used to be regarded as unsafe commercial risks by country bankers, and very few of them were ever reached by the general extension programs. One home economics supervisor in our northern counties has returned as a Security worker in the section she once served as county home agent, but she says the folks with whom she deals now were unknown to her in the heyday of her regular extension duties. "We simply didn't meet them," is her comment, "for they had no means to carry out our recommendations, and we sought those who could and would."

Increased school attendance, better nourished children, stronger mothers and infants, more courageous men, ownership of a vast amount more work stock and chattels, and a hopeful horizon for hundreds—surely this is a worthwhile investment in rural America. It is surely good policy to save two or three good men and their families for every partial failure encountered in this service.

INDEED I find that many of the subsistence loan clients are not only better on making payments but are more regular in bookkeeping and cost accounting than hosts of farmers who have not applied for relief. In my own State the roster of repayments made by loan clients show that they are far ahead of due date maturities, and taking the country over authorities say that of more than 700,000 borrowers under this system, fully 80 per cent will return every nickel advanced to them from the treasury. In matters of management via the farm accounting and farm planning method, the clients are obliged to follow the regulations calling for definite farm and household estimates and schedules. All the good old extension service could ever do was to hand them a form book and show them how to fill it in—on rainy days and Sundays, if they didn't go fishing.

TWO projects assigned at one time to the Security people have never been so furiously popular with the staff. One is the direct dole or emergency grant, and the other is the vague program of resettlement. Each has its obvious difficulties according to zone and temperament, and I dodge them for fear of exposing too much ignorance or prejudice.

Let me add this, however, that if I had a choice between trying resettlement (that is removing a group from a bad location to one more promising from the soil and market standpoint) and the direct un-American, enervating dole—then I would grab at the former by all means. Where families have persisted in squatting on isolated acreages that require expensive roads and schools to maintain them as part of a decent society, then somebody ought to shake them loose from their folly. But as I see it, the real job of the Security bureau lies in making modest investments in human welfare through supervised loans, and in trying to mend some of the mistakes in the farm tenancy tangle.

Now I admit that at the rate we have proceeded in the initial year of the Jones-Bankhead Act to grant tenant loans we will not catch up with the natural increase in tenancy in 50 years. This is because studies indicate that between 1930 and 1935 the average yearly increase in farm tenancy has been about 40,000 farms, while the tenant loans completed in the past fiscal year came to a trifle less than 2,000.

BUT far be it from me to draw any partisan or other half-baked conclusions from such a situation, for I verily believe that out of the studies and experience which F. S. A. workers get from close contact with tenancy in all sections of the country, we are going to strike eventually at some of the root causes of the renter and cropper problems—and with the help of awakened landlords and corporate managers—be able to publicize and circulate better leases. Better lease systems will be far greater help to the tenancy problem than meager loans scattered around the countryside, and mean more to the soil salvation besides.

Ultra conservatives ask me why all this furor over farm tenancy anyhow? They make me admit freely that some mortgaged farmers pay higher interest rates for less value received than renters pay for theirs, and the renter has less to worry about. They exclaim that city folks are heavier renters than country folks and manage to stand it. They say that landlords have been regarded as ogres and fiends, and all renters and share-croppers painted as abused saints, which is ballyhoo.

To which I counter with answers that renting is more common and growing faster in the richer soil areas; that renters do not feel stabilized and settled anywhere, their families get the drifting habit, their general living standards are not high enough, and the terms of short-time, indifferent leasing plans work havoc with America's foundation asset, soil fertility. If I get mad enough to be sentimental, I thrust at them with the old wheeze about native agricultural tradition lying in farm operation by independent ownership. But tradition and heroics do not solve the problem. In fact, it will bind you up as tight as red tape, and everybody in the Federal service knows what that signifies in terms of status quo.

FORTUNATELY, the F. S. A. undertook its first year's effort to administer this new law with two broad bases in view, namely, to get good men and women matched with good land. They had plenty of hurdles to leap, including the pettifogging political ones. But with the aid of county tenant loan committees whose majority proved sane and reasonable, they went at it with caution and conservatism. With twice the amount available next year and more counties open to loans, the effect of the program must begin to shape itself directly.

AS generally operated last year the tenancy loan deal, as I said, picked the best kind of experienced renters to take over as good farms as a reasonable price could obtain. This means that we have in theory the proper balance, consisting of willing and capable operators tilling the better grades of soil. It has not resulted in any "slumming or rescue mission" stuff insofar as human assets are concerned, for few reforms of worthless individuals were attempted. It has not to any extent drawn back abandoned and costly estates into the surplus farm picture. Nor have new raw lands been opened up to create new overproduction bogeys.

Training schools, regulation accounts and records, character studies, and definite farm and home schedules again dominate the picture here, as with "rehabilitation" loans. The amortized payment plan is used, the interest rate is low, and a program of so-called "variable payments" suited to the harvest yields and fortunes of each year have been established in many cases.

My idea is that with this kind of a fresh start, and with a set of fellows in double harness with their wives and the government, we can get a better line on leases and terms favorable to a sane kind of tenancy than we have ever had before.

THAT means we may soon be able to set up these men as examples of tenant success—other things being equal—and out of their experience we may help investors in farm land to construct a far sounder fabric of tenant relations than anything we have stumbled around with before.

I think we can dismiss all fond hopes of ending farm tenancy through the Security program. It may be too late to stop tenancy, if we wished to do so. But thank heaven, it isn't to right-about-face on some of the evils of tenancy.

I petition the wise and watchful chaps charged with administering this law to publicize the underlying principles of landlord-tenant agreements of the better kind. Just because the government has bought some land to hand over to a select minority of former renters, this doesn't solve the problem for hordes of others freshly recruited to the ranks.

Maybe we've got to subsidize a few landlords before we get done with the job. Maybe that's another way to improve the situation more directly than to buy farms outright and shift renters into owners. But anyhow, let's keep plugging hard at the task—and it seems to be one far tougher to handle than the Pilgrim fathers faced dodging Injuns during their first Thanksgiving dinner.

A Few Whinnies

TOO LATE TO START

A clergyman and a Scotchman were watching a football game together. The Scotchman continually kept taking nips from a bottle, and the clergyman, no longer able to restrain himself, at last cried out, "Sir, I'm sixty-nine years old, and never in my life have I touched alcohol."

"Well, dinnae worry yourself tae much," replied the Scotchman with a pronounced burr. "You're nae ginna start noo."

Twirp: "Just think, fella, every time I breathe somebody dies!"

Twill: "Ya got something there, guy. Why doncha try cloves?"

Sam, who works at the wash rack, was talking to his girl: "Liza, did you wear dem flowahs ah sent you de odder night, gal?"

Liza: "Yez, Sam, ah didn't wear nothing else but."

Sam: "Doggone, Liza, you musta near froze!"

"Lady, if you will give us a nickel my little brother will imitate a hen."

"What will he do?" asked the lady. "Cackle."

"Naw," replied the boy in disgust. "He wouldn't do a cheap imitation like that. He'll eat a woim."

Every year college deans pop the routine question to their undergraduates: "Why did you come to college?"

Traditionally the answers match the questions in triteness. But last year one University of Arizona co-ed unexpectedly confided: "I came to be went with —but I ain't yet!"

A woman visitor to the London Zoo asked a keeper whether the hippopotamus was a male or a female.

"Madam," replied the keeper, sternly, "that is a question that should interest only another hippopotamus."

"Who broke that chair in the parlor last evening, Jane?"

"It just collapsed, all of a sudden, father, but neither one of us was hurt."

"HOPE SPRINGS ETERNAL"

Son: "Father, I've got my heart set on a Rolls-Royce."

Father: "Well, that's probably the only part of your anatomy that will ever set on one."

Mrs. Hen: "I wonder what makes Mr. Gander look so seedy this morning."

Mr. Rooster: "He was out on a wild goose chase last night."

Pahson: "Well, Rastus, that's a fine garden you have."

Rastus: "Yes, Pahson."

Pahson: "Youse must thank the Almighty for that."

Rastus: "Yes, Pahson."

Pahson: "What a patch of cabbages you have there!"

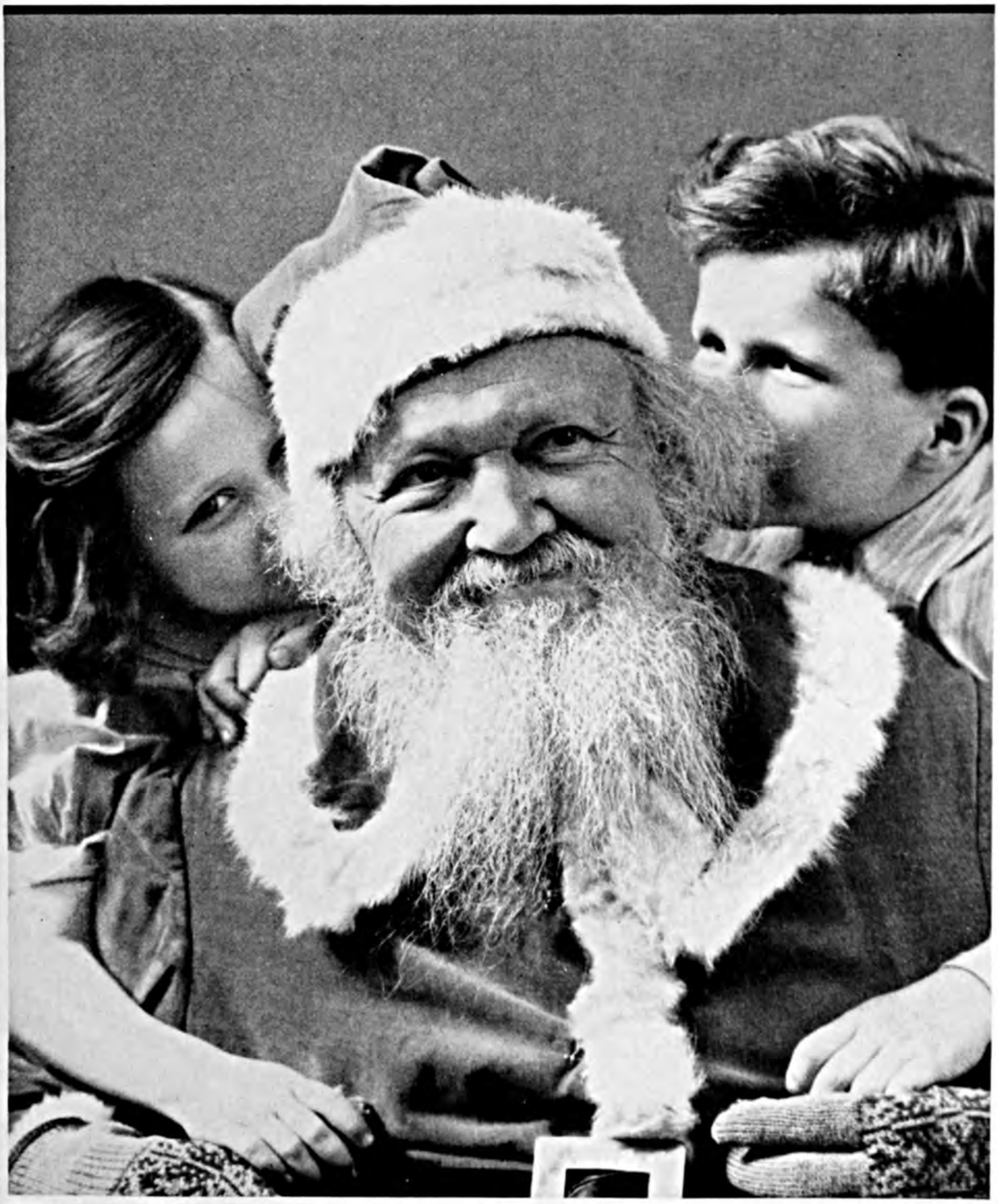
Rastus: "Yes, Pahson."

Pahson: "Youse must thank the Almighty for that."

Rastus (eyeing Pahson thoughtfully): "Pahson, did you ebber see dis piece ob ground when de Almighty had it all to Himself?"

Better Crops with PLANT FOOD

December 1938 10 Cents



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The following literature on the use of fertilizers in profitable soil and crop management is available for distribution. We shall be glad to send these upon request and in reasonable amounts as long as our supply lasts.

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Greater Profits from Cotton
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Asparagus (General)
Vine Crops (General)
Sweet Potatoes (Mid-Atlantic)
Southern Tobacco Recommendations
Grow More Corn (South)
Fertilizing Small Fruits (Pacific Coast)
Potash Hungry Fruit Trees (Pacific Coast)
Better Corn (Midwest) and (Northeast)
The Cow and Her Pasture (Northeast)

Reprints

K-2 Potash Increases Corn Yields Following Sweet Clover
H-5 Connecticut Valley Soils Need Potash
I-5 Apple Trees Need Balanced Diet
I-6 Virginia Tobacco Needs Potash
K-6 Fertilizing Pennsylvania Cigar-leaf Tobacco
HH-6 Flower Symptoms Warn of Food Deficiency
NN-6 Ohio Checks Fertility Needs of Vegetables
QQ-6 Fertilizer Distributors for Seed Drills
D-7 Successful Strawberry Practices in the South
E-7 California Prunes Respond to Potash
H-7 Potash for Cotton in the Delta Foothills
J-7 Meet Indiana's 1936 Onion King
K-7 The Tung Oil Industry in Mississippi
M-7 Better Crops of Better Quality (Corn)
N-7 Will Potash Benefit Your Apple Orchard
R-7 Results with Potash in Eastern Virginia
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AMERICAN POTASH INSTITUTE, INC.

INVESTMENT BUILDING WASHINGTON, D. C.

Better Crops with PLANT FOOD

The Whole Truth—Not Selected Truth

R. H. Stinchfield, *Editor*

Editorial Office: Investment Bldg., Washington, D. C.

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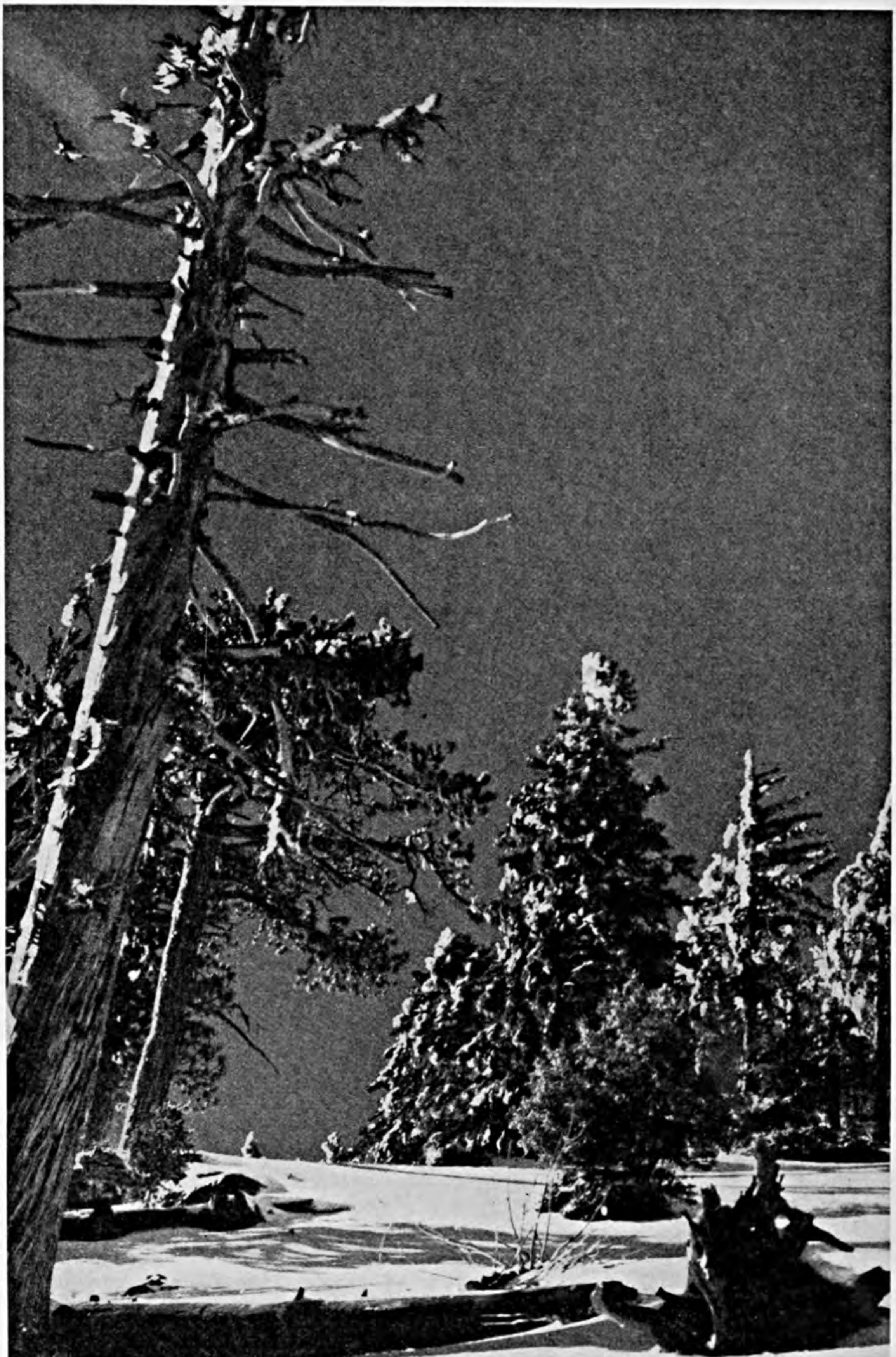

Even the unsightly takes on the eerie beauty of a winter's night.

Better Crops with PLANT FOOD

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Jeff reflects the glow from—

December's Embers

By Jeff McDermid

CHRISTMAS and New Year's are as dependable for staging a comeback as taxes, old-age pensions, and the Republican party. Here we have two universal anniversaries which do not alter their customs or mangle their traditions to suit a debunked era of skepticism. We do not mar them with our vociferous discussions on New Dealism; our personal inhibitions as to imaginary limitations; or our notions as to the rights and privileges of sex, racial stock, or years of experience and education.

Neither is Christmas the artificial creation of glory-puffing legislators, such as our acquired red letter days like Columbus Landing Day, Leif Ericson Day, Flag Day, and Labor Day. Likewise, the holly-wreathed holidays bear little of the commercial "sell-belly" stuffiness of our monstrous Cherry Weeks, Melon Months, Milk Marathons, Cheese Campaigns, and Potato Periods. 'Tis true we consume eatables and liquids up to the danger zone of dyspepsia and female embonpoint during the blessed Christmas interval, but there remains one distinction not to be overlooked.

In food surplus riddance races the objective is consuming tonnages to please the ad man and the campaign committee, while at winter holiday time we distend our alimentary canals to the glory of brotherly love, reciprocity, and that fuller feeling for its own sake. If the candy hawker, the cranberry merchant, and the goose vender benefit betimes, it is a mere prosaicism incidental to that rich inner satisfaction of soul and succulence, so blissfully inseparable from the ending of December.

AH, the stewing and the baking, the basting and the ladling, which with accompanying delectable odors carry us both backward and forward—backward to our earlier years of old chums and big appetites, and forward toward another hunk of plum pudding! It is a time to punch new notches in your belt and sing praises to the talent of good cooks, whether academic or practical. It is a time to put on a few extra plates and be bountiful to guests, even though they are your wife's relations!

As we thatch our domes with gray, many of us entertain but feeble reactions to the theme of various holidays and celebrations. Time was when I was not satisfied with a Fourth's festivities unless I had made as much unseemly noise as a thunderstorm and finished the day with a burnt blouse and singed eyebrows. I have often felt frustrated and unhappy over a Hallowe'en where our gang did not hang a wheelbarrow in a tree or push over an unoccupied, family-sized three-holer.

But in some unaccountable way, both the feverish Fourth and the hobgoblin evening leave me untouched today by any lingering urge to patriotism or cunning pranks. Our lawmakers have deleted the noisiest firecrackers, and yet I do not nurse any grudge to "get them" for it at the polls. On October 31 our neighborhood youngsters only knock and present themselves in masks and frowzy bedsheets demanding "grub or trouble." I hand them cookies and praise them for their forbearance—secure in the knowledge that modern indoor plumbing keeps us safe from privy privation at any rate.

Thus age and changing custom, law and modern regulation have combined to sift out the original American spirit from many calendared occasions. But December's feast days stay the same.

If change there be in certain intangible ways, it lies within ourselves and not in the genuine graciousness surrounding the advent of the Christmas spell. Given fair health and normal expectations, there is real danger facing those who have no means within them to enjoy the Yuletide recess. For nothing short of tough arteries will skid a fellow faster on the road to senility than the acceptance of Christmas as just another morning to put on your pants and go after more profits. We can insult our souls and stultify every other holiday without much risk, but when you flaunt Santa you're ready for the sanitarium!

I DO not know who invented Christmas in the first place—maybe a sorrowful bunch of emaciated victims of Roman terrorism, or a few jolly priests in the snowy Alpine valleys of the Austrian Tyrol, or rotund Saxon barons bringing in the boar's head. It makes no real difference who plotted the idea, it has survived and withstood every adverse current from Metternich to Mussolini and from the Huns to Hitler!

If we admitted skepticism to the fireside, we might inject some nasty comment on the lack of Christmas spirit on every day except the sacred Twenty-fifth, but cold water has no place on our December embers.

For after you have sat quietly with your wife before the glowing hearth, surmounted by its holly fringe and row of hopeful hosiery, listening to carolers along some distant street, you are not so apt to blame the world for its sins as you are to thank it for its charity.

OF course, if you are a non-stop professional reformer, hell-bent for next election, or a dour, deacon-like individual anxious to redeem everybody else by Sunday, I am afraid you won't sit long with us by dying embers. You'll grab some of 'em out to heap on somebody's head. But Christmas is no time for singed hair, here or hereafter. It is a time for happy humility and mutual respect, and the only intolerance we allow is intolerance of meanness.

So, although Christmas itself remains unaltered in its deeper meanings, I observe my own moods as I approach it are changed as my own age and situation change with the years. Bear with me a little while and check this over with your own impressions and memories.

You recall that when we were very young the uplift of this holiday came to us largely because of the combination of delightful mystery and great personal expectations. Prior to my tenth year I had implicit faith in the jingling journeys of the snowy saint and did not let mere physical improbabilities shake my confidence. I may have wondered why he chose to crawl into a sooty chimney and tarnish his beard with creosote, when we always left the back door unlatched to accommodate a brother working on a night shift. I may have easily questioned the saint's uncanny ability to read my precious requests when I could hardly decipher the scrawl myself.

I may have casually conjectured what reason implied Santa to fetch me the same kind of sugar cookies cut with crinkly tins that I saw my mother bake two days before; or why some of his packages bore trade stamps from Arthur & Johnson's, when the north pole factory was owned and operated by the Great Giver. Even when at Sunday School gift night I caught our local blacksmith stuffing his bulky anatomy into a red suit trimmed with white braid and muttering against the unreality of cotton batting whiskers—even then I rebelled against growing unbelief!

This phase of our lives in relation to blessed beliefs is only a natural course in man's existence. That is, we usually believe what we wish most to believe, and we yield such opinions only when we find new points of view more adapted to present convenience or necessity. Santa never kidded us as kids like we can kid ourselves now, when we want to. Almost any election proves that.

THEN came the time when we put on long pants and had socks too short for Santa, when our voices were breaking and changing, when we got into the grammar school and the fifth ward gang; and fed on Cooper, Henty, Cap Merrywether, and Robert Louis Stevenson. We knew all there was to know and much more that couldn't be repeated. We were experiencing growing pains and calf love pangs—proud of black eyes and grubby knuckles but ashamed of our report cards or a bum catch at first!

Ranging afield with air gun and fish pole, pockets bulging with treasures acquired through artful barter or fortunate finding, chummy with freckled

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Legumes have performed miracles on Mississippi soils. This field made an excellent stand of bur clover.

Legumes Improve Mississippi Soils

By F. J. Hurst

Editor, Agricultural Extension Service, State College, Mississippi

MISSISSIPPI farmers are working miracles in increasing yields of major farm crops. They are restoring new life and adding humus and needed fertility to hundreds of thousands of acres of crop land, which through years of one-crop farming and the relentless toll of unchecked erosion have been depleted of their virgin fertility. And the remarkable thing about this restoration of fertility to starved and impoverished soils is the fact that it is being done out of thin air.

Legume crops are the magicians which Mississippi farmers are using to enrich the fertility of their soils. Nitrogen is one of the most necessary elements needed to grow crops, yet more than three-fourths of the air is nitrogen. Farmers are now growing legumes on a vast scale as a means of capturing some of the inexhaustible supply of free nitrogen in the air and putting it into their depleted soil to increase crop yields.

And when nitrogen-rich legume crops, like hairy vetch, Austrian winter peas, and bur clover are turned under, they not only add valuable nitrogen to the soil, but they add huge supplies of organic matter, which increases the moisture-holding capacity of the land, gives new life to the soil, makes inert plant foods available, and increases crop yields.

Winter legumes also provide protection against erosion, which has taken such heavy toll of the fertile topsoil, plant food, and fertilizers. The leafy tops of legume plants break the force of falling raindrops. They form a thick blanket which helps to prevent surface run-off and to spread water evenly over the land so the soil can soak it up. Billions of tiny roots open passageways down to the soil that help to keep it porous and absorptive.

Soils Must Be Protected

Protection against the insidious inroads of erosion—probably the most destructive force threatening the foundation and permanency of agriculture—is vastly important to the State's agricultural rehabilitation.

A recent survey made by the Soil Conservation Service revealed that of the 46,000 square miles of land area in the State, only 15,925 square miles—approximately one-third of Mississippi's total area—could be reported as showing "little or no erosion." It was found that 8,373 square miles, or 18 per cent, showed "moderate sheet erosion," and that 12,592 square miles, or 27 per cent, showed "moderate sheet erosion with occasional gullies." The remaining one-fifth of the State was found to vary from "severe sheet erosion" to a condition which could be covered only by the report "destroyed by gullying."

While part of this alarming extent of erosion could be attributed to other factors, much of it was due directly to the fact that crop land had been left bare and unprotected during winter rains. Planted to clean cultivated crops during the summer and lacking a protective cover or root system during the winter, heavy rainfall has washed tons of fertile topsoil, valuable plant food, and fertilizers from the fields.

The thick growth of such winter cover crops as bur clover, hairy vetch, and Austrian winter peas holds the soil and protects the land from washing of winter rains. Planted in the early fall as soon as harvest has been completed, these winter legumes hold soil intact until the fields can be planted to other crops in the spring. Hence, winter cover crops have become one of the most important means Mississippi farmers are using to conserve and improve their soil. They supplement terracing, contouring, tree planting, pasture building, and retirement of steep slopes from cultivation in a multiple attack upon the conservation problem.

Unlike the other means used in the fight, however, legumes do more than protect the land; they add back much of that which has been lost. They not only save the land from further washing; they restore to the soil the humus and nitrogen taken from it by soil-depleting crops.

There is nothing new about the invisible forces put to work to make fertile soil. They have been stressed repeatedly for many years by county agents, extension specialists, farm lead-

County Agent Harris Barnes of Coahoma County showing the difference between the yield of cotton which was not preceded by vetch (left), and cotton which followed vetch (right).

ers, agricultural journals, the daily and weekly press. But only in recent years have farmers planted winter legumes on a big scale. There are probably a number of reasons for the rapid expansion in winter and summer legume acreage during the past 5 years. Probably the most important has been the remarkable increase in corn and cotton yields farmers have obtained after plowing under a good crop of winter legumes. Many farmers have actually doubled the yield of these two main crops following winter legumes. Many county agents have redoubled their efforts and improved their plans in getting farmers to plant more winter legumes. The offer of AAA payments for seeding and for plowing under legumes unquestionably has been an important factor in extending the acreage planted.

Fertilizer Increased Yield

Still another important factor, especially in the hill counties of the State, has been the fact that farmers learned how to grow these crops successfully. Many of them found out that the seed had to be inoculated and the crop had to be fertilized. Hundreds of field demonstrations show that the application of around 200 pounds of superphosphate, or 400 pounds of basic slag per acre, and the application of potash when needed has doubled and trebled the yield of hairy vetch and Austrian winter peas. And where plenty of phosphate and potash have been used under the winter legumes, it has not been necessary to apply these elements under the crops that follow.

In Mississippi the planting of winter legumes has increased from 5,000,000 pounds in the fall of 1934 to 9,000,000 pounds in 1935, to 14,416,295 pounds in 1936, and to 18,411,207 in 1937. Last winter Mississippi farmers had approximately 750,000 acres in legume cover crops, and in the spring of this year they turned under the largest crop of legumes ever planted in the State.

The planting of bur clover, especially in the delta, is increasing rapidly, in addition to the expansion in acreage planted to hairy vetch and Austrian winter peas. A record-breaking 5,604,000

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This field of corn, which followed a crop of bur clover, yielded more than 50 bushels per acre.

Does Weather Affect Tomato Yields?

By Victor A. Tiedjens

New Jersey Agricultural Experiment Station, New Brunswick, New Jersey

WEATHER, soil, and plant-food materials all play an important role in the production of tomatoes on the coastal plain soils. If you were to ask a grower whether he grew tomatoes in 1938, it is highly probable that he might come back with the question, "Do you mean vines or fruit?" That sums up a situation that existed generally on coastal plain soils. If you ask him further, "Did you follow recommendations regarding the use of lime, fertilizers, and green manure crops?" don't be surprised if he says, "To the letter." So we may jump to the conclusion that "Old Man Weather" controls the yield of tomatoes.

But is that the answer? Is it a simple weather problem? Growers like to blame the weather, yet there are growers who year in and year out grow 10 or more tons of tomatoes to the acre regardless of weather. As a matter of fact, this season there are growers who produced 10 tons of tomatoes to the acre for the first time.

Yes, weather is a factor, but something can be done about it. If you look into the practices of the growers who grew only a crop of foliage and claimed they followed recommendations you find that they may have used enough lime and fertilizer, but they slipped up on some details that to them seemed unimportant.

If we were to list briefly some of the details that might be overlooked, we might get a clue to the small yields of fruit. These might be grouped under those factors that produced poor growth and consequently low yields and those that produced good vine growth but no yields.

Those factors that produced no yields, because of poor foliage, are self-evident, and we may list them briefly as soil acidity, poor drainage, insufficient plant food, insects, diseases, poor plants, poor tillage, low organic matter, and weeds.

Much Foliage but Low Yields

To list those factors that contributed to low yields with abundant foliage, we have to be more specific. Not too much fertilizer, but the method of applying the fertilizer, coupled with variety, contributed largely to over-vegetative fields. In a dry season this would not be a factor, because lack of water prevents efficient utilization of nitrogen. In a season such as prevailed in 1938, it is a very important factor. It is not enough to say that the tomato crop requires 75 pounds of nitrogen, 120 pounds of phosphorus, and 105 pounds of potash. We have to specify how those ingredients should be used, if we are to get ahead of "Old Man Weather."

There were many Rutgers and Marglobe fields in 1938 where all the nitrogen was placed under the plants that had prospects of 20 tons to the acre the first of August, and did not pick a single ton of tomatoes. Such varieties as Rutgers and Marglobe grown on a Collington loam or sandy loam in a high state of fertility, with 1,000 to 1,200 pounds of fertilizer under the plants, in addition to a coating of manure plowed under, will jump a rail fence in no time without taking time to set fruit. Yet that treatment has produced very good yields

In the 1938 season, 500 pounds of fertilizer produced a yield of 6 tons of tomatoes. Lack of plant food means poor plants and low yields.

in past years. Generally speaking, 1938 was a very wet year in spots. Abundant water, with good growing temperatures, produces foliage with any kind of fertilizer.

The Pritchard tomato, grown under similar conditions, produced a good crop of fruit in 1938 under New Jersey conditions, because it needs that kind of treatment to produce a big crop. It is a rich-soil crop, while Marglobe and Rutgers are poor-soil varieties, relatively speaking. On rich soil, Rutgers and Marglobe grow rapidly and may make too much foliage.

Need Balanced Nutrients

Abundant foliage means a manufacturing plant of large capacity. It should be a firm growth and should not be watery and wilt easily. Such foliage also has a heavy root system. Watery, succulent foliage, even though extensive, may have a weak root system which cannot meet heavy demands. Plenty of water, nitrogen, and optimum temperatures, with a poorly balanced supply of nutrients in the soil, produces soft, watery growth.

To use fertilizer nutrients to best advantage, every leaf must function efficiently. Good foliage is capable of manufacturing many pounds of sugar and starch, which is necessary to set the fruit and mature it. To work efficiently, every leaf should be in a position to receive sunlight. Crowding plants cuts down their efficiency through shading, and the result is not a partial crop, in accordance with the reduced amount of sugar, but no crop at all, because other factors destroy what little fruit did set.

What can we do about it? In a wet year we can plant farther apart, provided we know it will be wet. In a dry year plants may be planted close together, if we know it will be dry. Wide planting distances cause wastage in a dry year. Since we cannot tell what sort of weather we will have, it would seem that our solution is to control the growth of our plants by our methods of fertilization adapted to our varieties.

Rutgers and Marglobe are free-growing and respond rapidly to nitrogenous fertilizer. They must receive their nitrogen in small enough amounts to promote a growth that is not too soft. Frequent side-dressings of nitrogen and potash, with the phosphorus applied in the row or broadcast, have given very good results with these varieties.

Pritchard and Bonny Best types which are slightly earlier, but also good yield-

In 1938 1,500 pounds of fertilizer produced 15.6 tons of tomatoes. Vigorous vines on well-drained soils grow tomatoes regardless of weather conditions.

ers, need their nitrogen early. Side-applications of fertilizers do not give the response in these varieties. To obtain the largest yields, they must be given ample fertilizer early to make a heavy vine growth, which in turn will set fruit freely and mature a large crop. It seems peculiar that a Rutgers plant will set and mature 75 fruits on 500 pounds of a 5-8-7 fertilizer under the row early, while a Pritchard plant will require 1,200 pounds early to do the same thing. But that is the situation, and until our growers recognize that varietal differences with respect to fertilizer needs do exist, they will not grow consistently good yields in spite of the weather.

Tomato plants build up sugar and starch in their leaves and store it in the leaves, stems, and roots. They also take the nitrogen from the soil and by using up some of the starch made in their leaves they build protein. The more nitrogen they use, the more sugar is used up. In other words, at any one time there is a certain ratio between the carbohydrates (starch and sugar), and proteins (nitrogen). This has been called the carbon-nitrogen ratio of plants.

That this ratio is very intimately associated with the setting of fruit and yielding capacity of the plant cannot be denied. The amount of starch in a plant varies with the hours of sunlight the plant receives in 24 hours. Therefore, the nitrogen requirement must also vary to produce a balanced type of growth. Under our climatic conditions, we can only approximate these values with our treatment. However, we do know that a tomato plant growing in full sunlight in July probably will utilize 20 times the nitrogen that the same plant will use in full sunlight in the same locality in December. The same difference exists between bright and dull, cloudy weather.

No Potash—No Sugar

Potassium apparently makes it possible for the plant to manufacture sugar. No potash—no sugar! Deficiency symptons which we associate with potassium deficiency are in reality due to carbohydrate or starch deficiency.

As the efficiency of starch formation is reduced through potash starvation, plants become softer. If there is no starch there can be no cellulose, which means no stability to the plant. The stems are weak and get quite succulent. About 45 pounds of potash per acre are necessary to prevent carbohydrate defi-

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Growing Sweet Potatoes In South Arkansas

By G. W. Ware

Assistant Director, Fruit and Truck Branch Experiment Station, Hope, Arkansas

SWEET potato production is steadily increasing in Arkansas, the total production in recent years ranging from 3,000,000 to 4,000,000 bushels. Although this crop is generally grown throughout the State, the bulk of production is concentrated on the sandy soils of south Arkansas. The sweet potato is generally grown under field crop conditions, serving as a balance wheel in distributing farm labor, supplying food and feed, and providing additional farm revenue.

The Porto Rico and Nancy Hall are the only important varieties for home and commercial use, the former variety being preferred by the markets. It is highly desirable that only disease and insect-free seed be used for bedding. The Arkansas Plant Board now prohibits the sale of potato slips which have not undergone proper inspection, and the State is using higher quality slips than in the past.

The general practice is to bed small to medium-size seed potatoes, since roots from ¾ to 1½ inches in diameter produce more plants per bushel of seed and per square foot of seed bed than do larger potatoes. Five to six bushels of seed are required to furnish enough slips to set an acre at one pulling.

© *"Southern Vegetable Crops," picture by South Carolina Experiment Station*

Large, well-developed, hardy slips give best results. Sweet potato slips normally grow on the end attached to the vine, as shown.

© *"Southern Vegetable Crops," picture by South Carolina Experiment Station*

Cold-frames with bottom head are recommended for producing large early slips.

It is recommended that the potatoes be bedded in March in well-drained, muslin or glass-covered, bottom-heated frames in order to produce large, stocky plants for early setting. The seed potatoes are placed close together, but not touching, and are covered with approximately 2 inches of sandy soil. The temperature of the beds should be held at 60 degrees Fahrenheit or above, either by natural or artificial heat.

The slips should be pulled when they have attained a height of about 6 inches, as large vigorous slips are more desirable than smaller ones. Planting in late April and early May is recommended for highest yields. Closer spacing, 12 to 15 inches apart in the row, is also recommended for early plantings in order to prevent "chunky" or jumbo potatoes which often result from the longer growing season when the plants are spaced 18 to 20 inches apart.

Fertilizer experimental work with sweet potatoes on the Ruston soils of the University of Arkansas Fruit and Truck Branch Experiment Station in south Arkansas, presents some interesting results as shown in the 5-year averages of table 1.

These results gave a computed relative value for the three principal elements as follows: nitrogen, 98; phosphorus, 85; and potassium, 101. This represents a ratio of approximately 1-1-1, and upon this information, a profit could be expected from the use of 500 pounds of 8-8-8 fertilizer when potatoes can be sold for as much as 60

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TABLE 1.—THE EFFECT OF DIFFERENT FERTILIZERS AT THE RATE OF 1,000 POUNDS PER ACRE ON THE YIELD OF SWEET POTATOES, FRUIT AND TRUCK BRANCH EXPERIMENT STATION, 5-YEAR AVERAGE.

Treatment	Grade	Average Acre Yield (Bu.)	Gain over Check (Bu.)
Check—No fertilizer	Marketable	64.90	00.00
	Culls	28.12	00.00
5–10–5 plus 10 tons manure	Marketable	188.82*	124.48
	Culls	45.38*	16.94
5–10–5	Marketable	172.77	107.87
	Culls	43.39	15.27
5–0–5	Marketable	117.61	52.71
	Culls	35.16	7.04
0–10–5	Marketable	109.19	44.29
	Culls	32.27	4.15
5–10–0	Marketable	107.38	42.48
	Culls	38.76	10.64

* Four-year average.

New Methods Help Tomato Growers

By E. R. Lancashire

Raw Products Specialist, Continental Can Company, Chicago, Illinois

IT HAS been my good fortune to know tomato growers in every part of this country and also to see them at their work. Tomatoes are grown for the fresh market in every State, and in 37 States tomatoes are grown for canning. How tomato growers harvest round, fully colored fruits instead of flat-sided, puffy, poorly colored fruits; how other farmers have eliminated the laborious task of growing seedling plants in hot-beds and cold-frames; and how still others have overcome the very serious handicap of the hot suns and blistering winds are examined as this story proceeds.

A Corn-Tomato Pioneer

Two years ago, a negro working on a farm near Dyersburg, Tennessee, was told to plant a few hills of field corn between the tomato plants as he hoed his way through the weeds. His appetite must have anticipated the savory meal which the job eventually promised, for contrary to his easy-going nature, or perhaps on account of it, he planted not a few kernels but a whole field of them.

The old Mississippi River had laid down an especially rich, black, level batch of corn-belt prairie silt, liberally mixed with sand which originated farther north. The negro scratched a hole midway of every two plants and entombed therein a couple of corn seeds.

The final results are all that count, and these were astounding. When the summer sun and winds had done their worst, there remained a 5½-ton per-acre yield of good, average quality, Tennessee canning tomatoes and a 30-bushel per-acre yield of ear corn which escaped the negro's appetite at roasting-ear time. The grower was well remunerated for his farmhand's zeal, and it was done on a sizeable field and not on a fraction of space in a backyard garden.

Skipping a year and a few States, we find ourselves way down in South Carolina on the farm of Walter Rawl. In the course of our visit, the story of the negro corn-tomato pioneer was told and partially believed. Once more a commercial planting of canning tomatoes was interplanted with corn at the last hand hoeing. Again the results were almost unbelievable. This time there was a 700-bushel pile of corn in addition to the best colored, earliest, and biggest yield of tomatoes grown in 1938 on this particular farm near Gilbert, South Carolina.

The hot sun and the devastating wind had been fooled again. Such results cannot be laughed away, strange as they may seem. The idea will spread in places where defoliation of tomato plants through disease attack, insect injury, or just plain run-down soil are contributing causes. And on the best of farms the scheme should work even better.

There was still another farmer near Trafalgar, Indiana, who had a fleeting idea of how to grow corn in a tomato field. Being in a sweet corn country he planted sweet corn and sold the roasting ears.

Late in September 1938, the tomato plants growing in the shade of the long-dead sweet corn plants were still vigorous of vine and loaded with plenty of large fruits. Needless to say, this farmer will really get down to business in 1939 and grow a man-sized patch of corn and tomatoes, and so too will many of his neighbors.

Tomatoes Need Shade

It has long been known that tomatoes grew redder, bigger, and more abundantly in the shade than in direct sunlight. It is only necessary to look at a crop of tomatoes growing on a north or a northeastern slope and then examine a field of tomatoes handled in identical fashion except for the fact that a south or southwestern slope was used. The odds are all in favor of the cooler slope.

Apparently, then, the shade is the thing. Tall corn provides the shade in a most efficient manner. To those among you who may be interested, it might be well to point out that a trial planting made in 1939 will cost but little and promises much. Whatever your usual planting distance may be, you have only to plant two kernels of corn between each two hills and let nature do the rest. Perhaps you can narrow a bit the wide difference in yield per acre which annually occurs between tomato fields in cool northwestern New York, where the average yield exceeds 7 tons per acre, and the smaller and smaller yields produced in States which are farther and farther southward and also westward.

Leaving the corn-tomato idea, let us examine the tomato-growing methods used by a farmer in the Lower Rio Grande Valley. Transplanting methods as ordinarily used in most places failed, and so he and his Valley neighbors annually plant 17,000 acres of Rutger's tomatoes by a "direct seeding" method, that is, the seedlings are "blocked out" by cutting out the surplus plants.

Many growers in California and Utah, and more recently in northwestern Ohio, northeastern Indiana, central Illinois, and central Pennsylvania, have gone into "direct seeding" in a large way. William Hertzel, Hicksville, Ohio, was the pioneer of this method in the northern mid-continental States. Today Mr. Hertzel will say he would

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The rows on the left were seeded without a fertilizer attachment on the corn planter. The rows on the right were seeded and fertilized all in one operation with a corn planter of modern design which placed the fertilizer in a stream on either side of the tomato seed.

Improved Ginning Makes Better Cotton

By C. B. Sherman

United States Department of Agriculture, Washington, D. C.

A FARMER can use fertilizer to better advantage than usual, grow a better crop of cotton, pick it promptly, and then have his work spoiled in the ginning, if the gin is in poor condition, or if the equipment is lacking in any essential detail, or if it is not operated well. When cotton reaches the market, its quality is as much dependent on the way it has been ginned as on the variety of the cotton or the cultural methods that have been used.

Gin damage is chiefly in the form of sample preparation. This kind of damage is easily detected and is one of the principal quality defects that buyers complain about. So it is the one that is considered here.

A Stroboscope is used in observing the gin performance.

State and Federal men have long worked for the improvement of cultural methods and varieties, but only during recent years has it been possible for them to combine in a well-planned and concerted attack on the solution of practical ginning problems. Congress provided specifically for this attack by appropriating funds with which the Department was to investigate the ginning of cotton by establishing and maintaining experimental ginning plants and laboratories and by making tests and demonstrations of equipments and methods.

Studied Ginning Problems

When the experimental cotton gin and other necessary buildings and equipment were built and installed at Stoneville, Mississippi, the Bureaus of Agricultural Engineering and Agricultural Economics combined to get results that can be put into immediate and effective use. Moreover, they are cooperating with other Federal and State agencies and maintaining close relations with gin manufacturers, cotton breeders, and other agencies that can help, as was contemplated by Congress. Problems of ginning are many. One by one they have been systematically tackled at Stoneville, and one by one they are being solved in explicit terms that can be readily used by the ginners in action.

Damp cotton is one of the ginners' first troubles. Drying cotton by artifi-

Testing the moisture of a load of cotton with a hygrometer.

cial means is of great interest in the South today. At Stoneville different methods of drying were tested. Designs for new types of mechanical driers were developed, manufacturers were encouraged to put them on the market, and the results have been carefully watched. The best drier may turn out poor results, if it is not operated properly. The right degrees of heat to use under given conditions have been determined. Ginners are being urged to heed this question of temperatures, for the first enthusiasm for drying led to the belief in some quarters that if a little heat could accomplish such good results, a lot more heat would bring perfection. The fall of 1937 was so wet that the driers had a chance to prove their worth over a wide territory. About a million bales were dried by more than 550 driers in commercial gins.

Poor ginning usually shows up in such defects as naps, stringy condition, and roughness. If the ginner's investigations show that these defects were not caused by damp cotton, the next place to look for trouble is in the condition of the seed roll in the gin stand. Time was when these seed rolls were often expected to run through the season practically without adjustment. Now we know that using tight rolls instead of loose may lower the price of a bale from 60 cents for short-staple dry cotton to $4.50 for long-staple damp cotton. Ginners are now being told the best way to learn whether their seed rolls are right.

Then there is the question of gin saws. Are they worn? Dull? Is the tooth shape right? The pitch? If these points, or any one or two of them, are out of whack, they may tighten the seed rolls and they will decrease the ginning capacity. Stoneville shows the ginners that gin saws should be replaced before they are worn down as much as one-sixteenth of an inch. The other items have been checked in a similar way.

Lint-doffing System

Ribs are still making trouble. Stoneville is finding out how and why, and telling the ginners how to correct and prevent. But still more attention goes to the lint-doffing system, because when neglected it may bring severe lint damage. The best approximate speeds for each size of brush and the range within which increases and decreases may be made with safety have been ascertained. Then the fact has apparently been established that no fixed ratio of speeds and saws is necessary, which simplifies the solution of the doffing problem considerably. Many other phases have been studied—condition of brushes and their set, fan speeds, position of nozzle.

In fact, the whole gin apparatus is receiving this detailed study—the proper setting of the seed, mote, and dividing boards and the results if the setting is incorrect; the correct timing of feeder speeds; the care of cleaning and extracting devices, lint flues, and condensers.

Response to the investigations at Stoneville has been immediate, but with something like 13,000 gins of every size and kind operating in the Cotton Belt, it will take a long time to get results known to all of them and a still longer time to get them all to try out the results themselves.

All kinds of extension methods are being used. Many States have gin extension specialists, or extension agricultural engineers, or extension agronomists working among the ginners and farmers. The Agricultural Extension Service of Louisiana was the first to put on a full-time cotton gin extension specialist and to develop a State ginning improvement program under the guidance of the ginning research laboratories at Stoneville. Far-reaching progress has been made in this work, which greatly increases the practical value of the experimental results. The ginners proved to be willing cooperators so that, within a year, official reports showed that the ginning situation in Louisiana was changing rapidly. There were many drier installations and other improvements, like installing the latest improved roll-box fronts and seed-roll dumping devices. To a considerable extent, the organization, set-up, and method of approach developed in Louisiana have been used as a pattern or model for the development and prosecution of the work in other States.

The cotton ginning improvement program in Texas is of especial interest because of its bearing on improving the quality of the cotton we export. In this

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In the fiber array laboratory at Stonewall, these workers arrange fibers according to their length. Variations in length result from different methods of ginning.

How Michigan Grows White Pea Beans

By E. B. Swingle

Michigan State College of Agriculture, East Lansing, Michigan

FARMERS in Michigan have the reputation of doing the unusual. So it can be accepted that Michigan's navy or "white pea bean" crop of 1938 is larger than the crop of 1937, although the total of all beans in the United States is nearly a million bags smaller.

Perhaps it is a new realization of the value of fertilization that has resulted in Michigan farmers consistently growing about 80 per cent of the navy beans in the United States. At one time, little thought was given to a bean plant's needs. Thrifty farmers who started the industry often remarked that beans were vigorous enough for the poorest soil, and so beans usually occupied the washed hillsides and the areas which already had been heavily cropped in grains and feed crops.

The first experimental work of staff members at Michigan State College concerning bean fertilization was in 1921. Fifty-seven farms in 18 counties, with 11 soil types, have added to the information since that beginning. Dr. C. E. Millar, head of the soils department, R. L. Cook, and J. F. Davis in summing up this period of experimentation find they still have problems, but at least they are able to make some recommendations.

They've scanned the response of beans to various fertilizer analyses, rates of application, and methods of application. Of one detail they are certain, the white pea bean may be taken for granted by Boston and the Navy, but as a plant it is about as touchy a plant-food consumer as can be found.

When bean fertilization became customary in Michigan, the usual methods were to apply and then plow, apply broadcast, or drill in when seeding a field. Years of experimentation out in the State produced a puzzle of results. In some years on some types of soil this fertilizer or that one seemed to prove practical and profitable. In other years or on other soils, at times it seemed as though the same fertilizer hurt the crop.

Threshing beans on the farm of William McAlpine, Fairgrove, Michigan.

Finally, the experiments with fertilizer placement brought out an apparent secret. Contact with the seed seemed to be a mistake. Through cooperation with the U. S. Bureau of Agricultural Engineering, an experimental bean

William McAlpine of Fairgrove, in Michigan's famed Thumb section, got 40 bu. to the acre from both Robust and Michelite, the latter the State's new white pea bean.

planter was designed and used on trial plats. This planter permitted placing the fertilizer at different depths in relation to the seed, also at different rates of application, and in bands alongside, underneath, or in contact with the seed.

Results began to come after this decision in early 1934. Yields indicated the benefits from fertilizers applied correctly in relation to the seed. From placement trials, the experimenters have concluded that band placement methods most promising were: "The placement of the fertilizer in a single band 1½ to 1¾ inches below the seed, and in bands 1½ inches out from the seed. In the applications at the side of the seed, a band on one side was as satisfactory as bands on both sides of the seed, and placing the bands deeper than the seed was more satisfactory than placing them on a level with the seed."

In the analyses ratings, the research continues. The men conclude that no single fertilizer analysis or grade is the best for beans on all soil types and in all seasons. Superphosphate alone proved an economical fertilizer on some soils, but for the average conditions of soil and weather encountered during these experiments, a fertilizer containing both phosphate and potash, as the 0-16-8, gave better results from the standpoint of yield and profit than did the superphosphate or the 4-16-8.

How much to use? In general, data show that applications greater than 300 pounds an acre were not economical. But work on that score is not completed. Tied in with this fertilizer placement work and the study of amounts and analyses, the indicator points to a greater study of green manure and simplifying applications by using fertilizer on the crop that goes into the soil to provide plant food for the bean plants.

Plowing under sweet clover green manure for beans gave very good results on two different soils in 1935. This, the research workers say, is in keeping with the idea that perhaps the best place to apply fertilizer for beans would be on the green manure crop preceding the beans rather than for the bean crop directly. This problem is being investigated further.

In the meantime the growers, by chance or otherwise, are hanging on to that navy bean or white-pea-bean-growing championship of the Nation. Acreage of the navy beans in Michigan in 1938 was 504,000 acres as compared to 485,000 acres in 1937. Production is estimated at 4,738,000 hundred-pound bags, or 940 pounds of marketable beans to the acre.

Fertilizing Asparagus In South Carolina

By A. B. Bryan

Editor, Agricultural Extension Service, Clemson, South Carolina

DIFFERENTIAL fertilizer treatments for asparagus at the Sandhill branch of the South Carolina Experiment Station during the past 4 years 1934-37 have yielded data of significance to asparagus growers in the southern States where soils and climatic conditions are similar. These data lead to the following conclusions:

1. There was no increase in yield or improvement in grade from the use of more than 5 per cent of nitrogen in the fertilizer.

2. When phosphorus was omitted there was a reduction in yield, but there was no increase when more than 7 per cent of phosphorus was used.

3. When potash was omitted, there was an immediate and significant lowering of yield and grade of asparagus, 5 per cent of potash being, it appeared, an efficient percentage of that element.

4. For varying amounts per acre of a 5-7-5 fertilizer 2,000 pounds per acre produced significantly greater yields and larger spears than 1,000 pounds per acre, but 3,000 pounds did not show significantly greater yields than 2,000 pounds.

These fertilizer tests were made on a block of Mary Washington asparagus planted in 1929, under supervision of L. E. Scott, assistant horticulturist. The crowns were spaced 20 inches apart in 6-foot rows, and the planting was kept under uniform treatment from the time of planting until after the 1933 harvest. For the 3 years, 1931-33, yields of the individual plots were carefully taken. These preliminary yields were used in arranging the plots for the variable fertilizer treatments started in 1933, so that the group of three plots selected for one treatment had essentially the same average yield for the 1931-1933 period as the three plots for every other treatment.

A typical bunch of South Carolina green asparagus is 8¾ in. long with 5 in. minimum of green.

The fertilizer treatment from time of planting until 1933 consisted of an annual application of a 5-7-5 (NPK) fertilizer at the rate of 1000 pounds per acre in 1929 and 1930, and 2000 pounds per acre in 1931 and 1932. In 1933 the different fertilizer treatments were started.

The effect of the uniform treatment during the 4 years 1929-33 continued for some time after the differential treatments were started. For this reason the results for 1937 in the case of some treatments are of greater significance than either the average results for 1934-37 or those for the first year or two after the uniform treatment was discontinued.

In comparing treatments, the basis of comparison was the performance of the 5-7-5 (check) treatment applied after harvest, with half of the nitrogen reserved as a side-dressing which was applied in July. This fertilizer consisted of superphosphate, sodium nitrate, cottonseed meal, and muriate of potash. One-sixth of the nitrogen was supplied in cottonseed meal with the remainder from sodium nitrate. Basic slag was substituted for superphosphate in one treatment.

Nitrogen and Phosphorus

The asparagus apparently could not utilize to advantage more nitrogen than that in a ton of 5-7-5 fertilizer. Hence increasing the nitrogen above that percentage showed no worthwhile advantage in yield or grade.

As to phosphorus, it is noteworthy that omission of this element did not affect the yield of asparagus for the first 2 years. But in 1936 there was an indication of a depressing effect, and in 1937 the downward trend was decided, the 5-0-5 treatment yielding 2,582 pounds per acre against 3,025 pounds for the check. The lack of response during the first 2 years indicates that the preliminary fertilizer treatment had built up a phosphorus reserve in the soil.

There was no definite effect on size of spears, over the 4 years, by the varying applications of phosphorus.

Where basic slag was used as the source of phosphorus, the yield was only slightly but consistently lower than that obtained when superphosphate was used. Acidity determinations showed a pH value of 6.6 for these plots as compared with 5.44 for the plots where superphosphate was used.

Results With Potash

"Omitting the potash from the fertilizer caused a decrease in yield that was observable the first year (1934) and that became more pronounced each succeeding year," says Mr. Scott. "In 1937 the yield from the no-potash treatment was 2,315 pounds per acre as compared with 3,025 pounds from the 5-7-5 treatment. The size of spears as indicated by the percentage grading Colossal was also greatly influenced by the lack of potash. When 5 per cent of potash was used in the fertilizer, the proportion of asparagus which graded Colossal was increased from 38.4 per cent (for the base period) to an average of 44.0 per cent for the 4 years, 1934-37, while there was a corresponding decrease from 47.7 per cent to 41.3 per cent in the case of the no-potash treatment. This was equivalent to a net gain for the Colossal grade, amounting to 12 per cent of the total yield, in favor of the 5-7-5 treatment. The high potash treatments (5-7-10 and 5-7-15) showed a tendency, particularly in 1937, to produce lower yields than the 5-7-5 treatment. The results are from unlimed soil. Data are not available as to the effects of heavy applications of potash on limed plots."

The effect of potash on yields and on percentage of yield grading Colossal during the 4-year period 1934-37 is shown in the following table:

Fertilizer (NPK)	Yield in pounds per acre Average 1934–1937	Percentage grading Colossal increase over 1931–1933
5–7–0	2,124.2	−6.4
5–7–5	2,495.1	5.6
5–7–10	2,374.8	6.3
5–7–15	2,385.6	1.3

It must be remembered that all plots received 1,000 pounds of 5-7-5 per acre in 1929 and 1930 and 2,000 pounds of 5-7-5 per acre in 1931 and 1932; and

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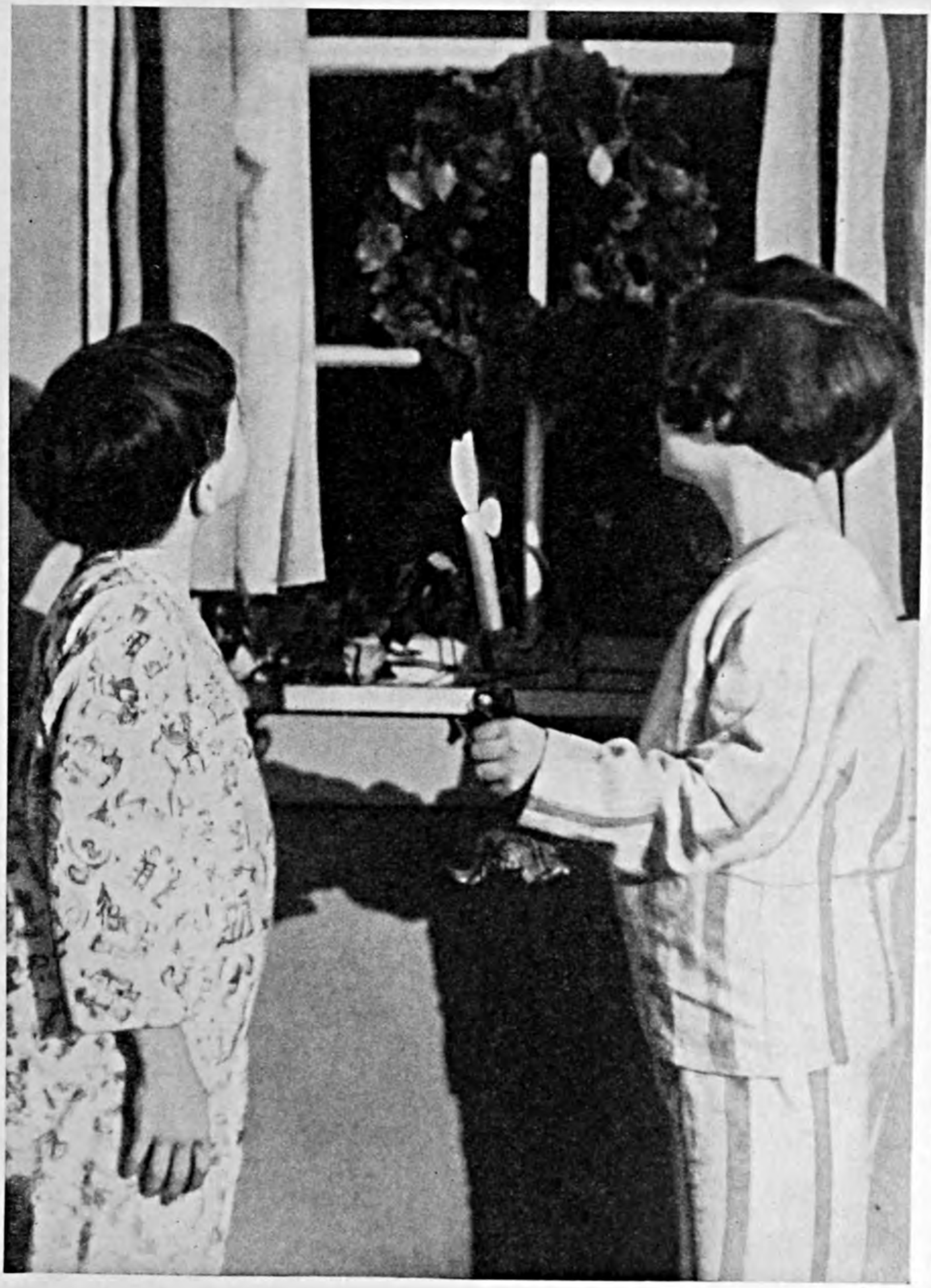
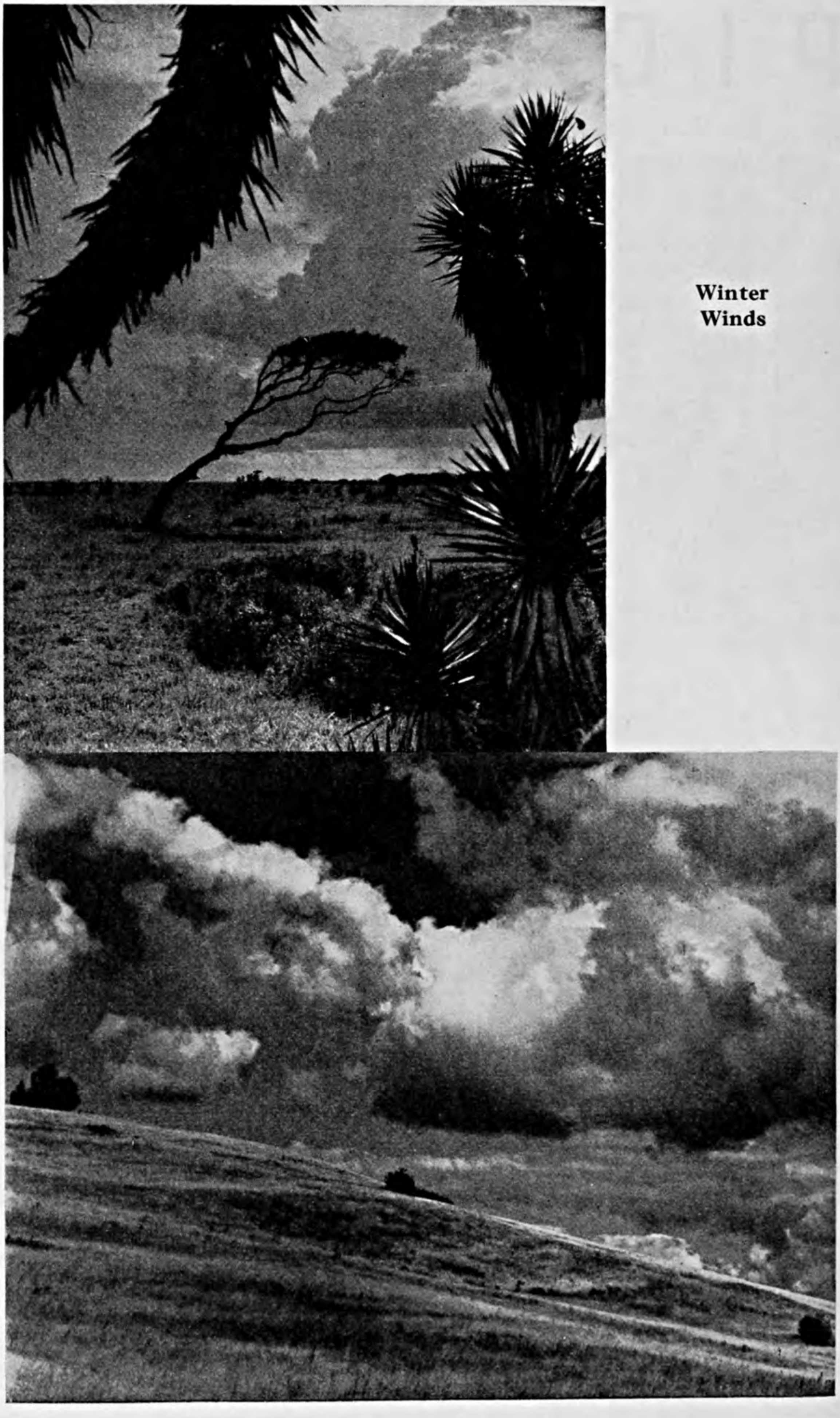
PICTORIAL



"In hopes that St. Nicholas soon would be there."



Winter Winds

Winter
Calms

Above: The Northern Indiana Muck Crops Show held November 15-18 at Walkerton, Indiana, selected pretty Jeanne James of Winamac for their queen.

Below: Little Nancy Schumacher appointed herself queen of this showing of Clair Spotts' tobacco crop grown near Ephrata, Pennsylvania.

The Editors Talk

Merry Christmas

We come again to the time of year when store windows are rigged up for the dress parade, when streets are crowded with busy shoppers, when there are mysterious connivings at home—and mysterious smells come from the kitchen. It takes us back to the time when Christmas was the milestone in our year, the point to which and from which the rest of the year's happenings were measured.

And strange, the occasion has lost but little of its childhood fascination. Old familiar streets become glamorous in their seasonal finery, handshakes are a bit firmer, greetings more sincere. In fact, Christmas rejuvenates the best that is in us. Someone once said, "Clothes and manners of life may change, but Christmas is honored in men's hearts and its spirit is timeless."

The phrase-makers are forever trying to catch in words the spirit of Christmas. Trying to explain why, of all our celebrations, it is the one we never quite outgrow, or want to discard with our childhood. It is difficult to reconcile the vastness of the Christmas spirit to mere words. But outside, growing just by the window, a tree lifts its branches skyward in a gesture that embraces the full meaning.

The gratitude of growing things is the faith of all mankind. At Christmas especially, we are more than usually aware of our gift of life, aware of the lives that were lived that we might live, the lives that are to be because we have lived. And so, a bit more thoughtful than usual, and with hearts warmed by the evidence of Christmas on every hand, we extend to our many known and unknown friends a sincere wish for a happy holiday season, and may a good year be in store for you.

Looking Backward

As the year draws to a close, it is natural for one to review the hopes with which the New Year was ushered in and the accomplishments or failures incident to its passing. In this vein, it was of interest to us to turn back to the editorial "Looking Ahead" in the January 1938 issue of this magazine in which we dusted off the crystal ball and oiled up the "if-ometer" to see if we might foretell some of the things in store for American agriculture.

We note that we said the slowing down of industrial production would result in a decreased demand for agricultural products, but that reduced farm prices would offset, in part at least, the effects of this decrease in demand and that consumption would not fall in proportion to the drop in consumer purchasing power. We further predicted that increased agricultural production would have a stabilizing influence on farm income and that farmers' cash income would not decrease in proportion to the drop in prices.

We now find that farm prices have fallen about 19 per cent whereas the U. S. Bureau of Agricultural Economics has estimated that farm income will be from 10 to 12 per cent less than in 1937. The index of industrial production has increased materially within the past 4 or 5 months and is now about normal as compared to 84 per cent a year ago, and the volume of retail trade is showing improvement. This confirms the prediction that 1938 would wind up traveling in the opposite direction from 1937 with business activity and other important indices of economic conditions well above the so-called depression levels.

Here are some of the high spots of 1938—Cotton yields continued to maintain record levels, with 219.7 pounds per acre producing an estimated crop of 12,137,000 bales. A bumper wheat crop was produced at an average yield of 13.2 bushels compared to the 10-year average of 13.5 bushels. Farm income is estimated at $7,600,000,000 as compared to $8,600,000,000 in 1937. The curve of industrial production pulled out of its power dive about the middle of the year and began almost as steep an ascent. Factory payrolls have increased from 70.8 per cent of the 1923-25 average to about 85 per cent, whereas the monthly cash income of farmers over the same period has increased from 60.5 per cent to 87 per cent. Industrial production has increased from 76 to nearly normal. All of this has taken place without any material increase in the wholesale price index.

As we look back, we find 1938 fulfilling pretty well the hopes and predictions we had for it. The year closes on a basis on which the inspiration and hopes of the new year may be well founded.

David R. Coker

On November 28 the South lost one of its most important agriculturists. Tributes following the passing of David R. Coker at Hartsville, S. C., will fix in minds, not already cognizant of the great service of this man, the underlying vision of a greater American agriculture which dominated his interests.

Well-born and provided with the opportunities for an education, it nevertheless was Mr. Coker's own initiative which placed him among the leaders in science and business and won for him an honorary doctor of science degree from Duke University in 1930, law degrees from the University of North Carolina and the College of Charleston, and another science degree from Clemson College. He came into national prominence as a member of the National Agricultural Advisory Committee, of the National Agricultural Commission to Europe in 1918, and director of the Federal Reserve Bank of Richmond. He also was a member of the U. S. Commerce Department's Business Advisory Council.

Mr. Coker's personal business, "Coker's Pedigreed Seed Company," grew out of his interest in plant breeding which began in 1902. With an ideal of rebuilding the South into a prosperous agricultural section, he combined the results of his laboratories and experimental fields with sound business judgment in growing seeds of new and improved varieties of crops and the marketing of these seeds all over the world. The company experienced times of heavy financial losses, but the ideal behind it built an organization which now includes a large staff of scientific and business workers.

David R. Coker will be sadly missed, but his influence on Southern, national, and world agriculture will never cease.

REVIEWS

This section contains a short review of some of the most practical and important bulletins, and lists all recent publications of the United States Department of Agriculture and the State Experiment Stations relating to Fertilizers, Soils, Crops, and Economics. A file of this department of BETTER CROPS WITH PLANT FOOD would provide a complete index covering all publications from these sources on the particular subjects named.

Fertilizers

¶ To the list of numerous new publications containing instructive information on the subject of fertilizers issued in recent months should be added the New Jersey Agricultural Experiment Station Bulletin 651, "Fertilizer Materials and Mixed Fertilizers," by A. W. Blair, and U. S. Department of Agriculture Circular 487, "Selecting Fertilizers," by A. R. Merz. General discussions on the different fertilizer elements, high analysis fertilizers, soil reaction due to the various fertilizer materials, and methods of application, among other related topics, are given in both publications. The New Jersey Bulletin, which supersedes Bulletin 541 published in 1932, contains specific recommendations for fertilizing crops of that State.

With the increased knowledge gained in the past decade on proper placement of fertilizer, more emphasis is being given to the economic advantage of purchasing higher grade fertilizers. Reducing freight and handling charges, made possible by the use of more concentrated fertilizers, without in any way lessening the efficiency of the fertilizer, helps materially in the program of reducing crop-production costs. Striking examples of how farmers in many States save on their fertilizer bill by purchasing fertilizers containing increased amounts of plant food per ton are cited in the U.S.D.A. circular. Merz points out that farmers in New York, New Jersey, and Georgia who purchased one ton of 10-20-10, instead of 2 tons of 5-10-5 that would have been necessary to furnish the same quantity of fertilizer elements, for instance, saved \$10.15, \$7.65, and \$9.76, respectively. Comparing one ton of the high analysis mixture with 2½ tons of 4-8-4 represented a saving of \$14.78, \$13.03, and \$16.19 in the respective States.

While farmers are generally aware of the danger of improper use of the "high powered" fertilizer, Professor Blair states that they should experience no trouble with it where good judgment is exercised. The key to success by way of obtaining the most from the more efficient fertilizers is in having the fertilizer properly placed in the soil, so that it does not come in direct contact with the seed. A considerable amount of literature on this important phase of fertilizer application is now available and is proving invaluable to countless thousands of growers and agricultural advisers. Consulting the above and similar publications should provide a far better understanding of the up-to-date principles with respect to selecting fertilizers.

¶ H. A. Lunt, of the Connecticut Agricultural Experiment Station, provides the reader with a host of interesting facts pertaining to the fertilizer requirements of the coniferous nursery stock based on extensive soil fertility investigations as summarized in Bulletin 416, "The Use of Fertilizer in the Coniferous Nursery." In view of the increasing need of reforestation in the production of timber and wood-pulp, and the demand for tree-planting in the soil conservation and flood control program, the author states that from the standpoint of the soil there are two problems which must be faced. These are: 1. Increasing the productive capacity of old nurseries; and 2. Maintaining the productive capacity of new ones. Continued cropping, together with scarcity of manure, has in some instances created a real need for the use of commercial fertilizer to produce trees of average size, to say nothing of larger stock.

Under the conditions of these studies, it was shown that red pine and other conifers responded to the application of fertilizers, both in the seedbed and transplant-bed. Precaution must be taken, however, to avoid injury from too high concentration of soluble materials in fertilizing the seedbed. Nitrogen is absorbed in the largest amount and should be available in the soil in the ratio of 10 parts N to 4 of P_2O_5 and 5 of K_2O. One may conclude from the data obtained in these studies that on sandy soils where an adequate rotation cannot be used and where manure is difficult to obtain, the fertilizer for the first-year seedbeds should be supplied with 50 to 75 pounds of nitrogen per acre for pines, and 25 to 40 pounds for spruces. Phosphorus should amount to 20 to 25 pounds of P_2O_5 for pines and 20 for spruces; and potash, 25 to 30 and 10 to 15 pounds K_2O, respectively. For the second year, 100 to 150 pounds of N, 40 to 60 pounds of P_2O_5, and 50 to 75 pounds of K_2O are suggested. For the first-year transplant-beds, these amounts could be reduced by a third. In the absence of positive proof as to the merits of organic nitrogen over the inorganic forms, the author advises a mixture containing both forms.

It has not been possible through the use of fertilizers on these soils to shorten the time necessary for plants to remain in the nursery, but it has been possible to produce somewhat larger plants in the same period of time. These studies on nursery stock requirements and response to treatment are being continued, and according to the author, findings will be reported in later publications.

"Fertilizers for Different Crops Including the Best Percentages of Water-Insoluble Nitrogen of Totals in Fertilizer Mixtures," Agr. Exp. Sta., Raleigh, N. C., Cir. 107, April 1937.

"Tobacco Fertilizer Recommendations for 1939," Agr. Exp. Sta., Raleigh, N. C., Cir. 111, Aug. 1938.

"Fertilizer Mixtures for Different Crops (Home Mixing), Agr. Exp. Sta., Raleigh, N. C., Cr. 113, Sept. 1938, W. H. Rankin.

"Results of Potato Fertilizer Experiments at the South Carolina Truck Experiment Station, (A Preliminary Report)," Agr. Exp. Sta., Clemson, South Carolina, Sp. Cir. 3, Dec. 1937, J. M. Jenkins, Jr., and J. J. Mikell.

Soils

¶ A large number of references on soil erosion and soil and water conservation are contained in U. S. Department of Agriculture Miscellaneous Publication 312, compiled by S. H. Gaines with abstracts by F. Vincent, M. Bloom, and J. F. Carter. The title is "Bibliography on Soil Erosion and Soil and Water Conservation." This bibliography is intended primarily to assist students, teachers, and writers explaining the subject of soil conservation and related fields. Its scope is indicated by reference to the table of contents and list of citations by geographic regions. The volume contains more than 650 pages and covers upward of 4,000 individual citations. A large majority of the references deal with material published during the past 25 or 30 years, but not later than August 1937. Both popular and scientific references are included. Some 50 pages are devoted to an author index, thus making it comparatively simple to review subject matter contributed by known authors.

"The Physiography of Arizona Valleys and the Occurrence of Groundwater," Agr. Exp. Sta., Tucson, Ariz., Tech. Bul. 77, June 15, 1938, G. E. P. Smth.

"Surface Run-off and Erosion on Granitic Mountain Soils of Idaho as Influenced by Range Cover, Soil Disturbance, Slope, and Precipitation Intensity," U. S. D. A., Washington, D. C. Cir. 482, Aug. 1938, George W. Craddock and C. Kenneth Pearse.

"Legumes in Soil Conservation Practices," U. S. D. A., Washington, D. C., Leaf. 163, 1938, A. J. Pieters.

"Soil-depleting, Soil-conserving, and Soil-building Crops," U. S. D. A., Washington, D. C., Leaf. 165, Sept. 1938, A. J. Pieters.

"Anchoring Farmlands in the Ohio Valley Region," U. S. D. A., Washington, D. C., Soil Cons. Serv., Reg. 3, Revised July 1938, J. S. Cutler.

"Soil Defense in the South," U. S. D. A., Washington, D. C., Farmers' Bul. 1809, Sept. 1938, E. M. Rowalt.

Crops

¶ Tobacco farmers should be vitally interested in J. E. McMurtrey's explanation of diagnosing nutritional deficiencies which commonly affect the growth and impair the quality of the crop as outlined in U. S. Department of Agriculture Technical Bulletin 612 entitled, "Symptoms on Field-grown Tobacco Characteristic of the Deficient Supply of Each of Several Essential Chemical Elements." The nine elements considered are nitrogen, phosphorus, potassium, magnesium, calcium, boron, manganese, sulphur, and iron. Decreased growth results when the supply of any one is insufficient, and in certain parts of the plants characteristic effects are displayed which serve to identify accurately which of the essential elements is deficient, Dr. McMurtrey says.

Nitrogen deficiency is accompanied by a slowing down of the rate of growth, the plant showing a decrease in intensity of the normal green color. Firing and yellowing of the lower leaves are typical effects of nitrogen starvation. A lack of phosphorus is shown by a dark green color, narrow leaves in proportion to length, and the plant's failure to mature properly. Leaves from such plants are undesirable in quality.

A shortage of potassium is readily determined if the lower leaves of the plant show mottling or chlorosis at the tips and margins. This is rapidly followed by necrotic specking that usually spreads to most of the leaf tissues between the veins and results in a ragged appearance of the leaf. Portions of the leaf which are not disintegrated have a darker color than normal, with a bluish-green cast. The mottling due to potash deficiency usually progresses rapidly from the lower leaves to the upper leaves of the plant. The cured tobacco leaves affected by plants deficient in potash lack body, elasticity, aroma, ability to condition when exposed to moist air, and possess poor fire-holding capacity. Magnesium deficiency causes a chlorotic effect between the principal veins, producing a light green to almost white color in leaves; however, the leaf tips and margins show little or no crumpling as in the case in potash starvation. Many growers are familiar with the common disturbances due to magnesium deficiencies or sand drown, which is more prevalent in deep sandy soils and during excessive rainfall.

In general, the lack of the four essential plant foods described above affects the lower or older leaves of the plant and may affect the entire plant. A shortage of calcium, boron, manganese, sulphur, and iron affects the upper and bud leaves of the plant in the initial stages. A deficiency of iron, for example, may be noted as the young leaves are chlorotic or lack the normal green color. When this condition is accentuated, the leaf tissue becomes white or yellow. Boron deficiency results in a peculiar but typical twisted type of growth in the upper part of the plant. This is due to improper growth at the growing tip of the plant. The younger leaves of the bud are light green, the bases of the leaves being lighter in color than the tips. When the deficiency is acute, a characteristic dieback of the plant develops.

A color plate shows the appearance of plants lacking one of the nutrients, with a normal plant for comparison. The author has worked out a key whereby one is able to track down the nutrient most deficient, by observing the abnormalities of the plant.

¶ A grape breeding and testing program carried on by the Georgia Experiment Station for 29 years distinguishes it as one of the South's foremost authorities on this crop. In Bulletin 199, "Muscadine Grapes, Culture, Varieties, and Some Properties of Juices," M. M. Murphy, Jr., T. A. Pickett, and F. F. Cowart describe the characteristics of 13 varieties of the muscadine group that the Station has developed and introduced during the past 20 years. These new types are superior in one or more respects to older varieties. The bulletin gives a summary of analytical data of the chemical and physical properties of expressed juices which were determined from a laboratory study of 35 varieties. Recommendations concerning cultural practice, spacing the male vines, training of vines, pruning, and propagation are also included.

Data on the influence of proximity and ratio of male vines show that bearing vines should not be over 50 feet from the male vines. Establishment of about 8 to 10 bearing vines for each male vine is recommended, and a chart showing an ideal planting scheme is given in the bulletin. The muscadine grape is quite difficult to root from cuttings, so that propagation by layering is a practical method.

An annual application of 300 to 400 pounds of 6-6-6 or similar fertilizer per acre is recommended after the third year. For the first year ¼ to ½ pound of the same fertilizer should be applied to each vine. Additional applications of ½ pound per vine are advocated during the second and third years about the middle of May and last of July. If the vines seem overly vigorous, the nitrogen content of the fertilizer should be lowered, or it may be increased if they appear lacking in vigor.

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Economics

¶ According to the bi-annual report of the North Carolina Department of Agriculture, Raleigh, North Carolina, "Fertilizer Sales by Grade in Order of Tonnage, January 1, 1938 to June 30, 1938," there was a decrease of 8.3% in mixed fertilizer sales within the State as compared to the corresponding period in the previous year, and a decrease of 6.9% in total fertilizer sales, mixed goods, and materials. A brief analysis of the report discloses a number of interesting changes that have taken place within the past 2 years. On the mixed goods list, 3-8-3 decreased from 36% of the total in 1937 to 30% of the total in 1938, 3-8-5 dropped from 23% to 22%, whereas 4-8-4 just about held its own, and 2-10-6 increased from 1% to 3%, 3-8-6 from 3% to 4%, and 3-10-6 from 3% to 5%. Changes in consumption of mixed fertilizers affected plant-food consumption as follows: 28,347 tons of N, in the first half of 1937, 25,846 tons in the first half of 1938; 71,151 tons of P_2O_5 in the first half of 1937, 65,880 tons in the first half of 1938; and K_2O dropped from 37,109 tons to 35,565 tons.

The weighted average analysis of all mixed fertilizers sold in 1937 was 3.2-8.1-4.2, and the corresponding analysis for 1938 was 3.2-8.2-4.4. The total plant-food content in all mixed fertilizers in the first half of 1937 averaged 15.5%, whereas in the first half of 1938 the average was 15.8%, an increase of 2%. Perhaps the most significant feature of the 1938 fertilizer season was the fact that in a depression year the average analysis of all fertilizers sold increased and the relative importance of the so-called low grade fertilizers actually decreased. This is contrary to the popular belief that in years of declining farm income the relative importance of the lower grade fertilizers which are priced lower per ton tend to increase.

¶ According to the annual fertilizer control bulletin, "Commercial Fertilizers in 1937-38," published by the Texas Agricultural Experiment Station, the total sales of fertilizers for the 1937-38 season were 79,640 tons, or about 5% less than for the corresponding period in the previous year, when sales amounted to 84,938 tons. The 1937-38 figure is still considerably above the 1935-36 tonnage of 60,016 tons. Practically all of the sales of mixed fertilizers in Texas in 1937-38 were confined to about 20 different analyses. The four leading grades in order of their importance are 4-8-4, 4-12-4, 4-8-6, and 6-10-7, with tonnages of 18,743, 10,345, 8,107, and 4,901 tons respectively. These 4 grades represent 52% of the total sales of all fertilizers.

¶ Of special interest this month is the changed form of the fertilizer consumption report, published by the Fertilizer Statistical Division of the Bureau of Inspection, Florida Department of Agriculture. In the old form, fertilizer consumption data were published monthly. The data furnished were by counties, but there was no breakdown in the total tonnage figure itself. In the new report, "Consumption of Mixed Fertilizers by Counties of Florida for Month of September, 1938," both mixed fertilizers and materials are broken down, and the data are still published by counties. The new reports will furnish a cross-sectional picture of Florida fertilizer consumption, and should in the future prove to be a valuable asset to those interested in the fertilizer industry.

¶ An interesting analysis of the changes in prices of hired farm labor, feedstuffs, and fertilizer materials in New Jersey has recently been published by the New Jersey State Department of Agriculture as Circular No. 293. In this circular Mr. D. T. Pitt, Agricultural Statistician, has presented figures showing the changes that have taken place in the price levels of these three important items which enter into the farmer's cost of production. Since about 1920 the average wage paid to workers by New Jersey farmers has been considerably higher than for the nation as a whole. The combined index of the three items covered in the circular began its decline in 1930 when the index stood at 156. By 1933 it had dropped to 93 in successive jumps from 122 in 1931 and 100 in 1932. In 1934 the trend was reversed, and the index began to move upward. In 1937 it reached 132 or about 32% above pre-war, i. e., the 1910-1914 average. However, fertilizers showed relatively little increase, and were still only 91% of the 1910-14 average, as compared to 152 for hired farm labor, and 129 for feedstuffs. The low point for hired labor came in 1933 when the index stood at 119, for feedstuffs in 1932 when it was 68, and for fertilizer materials in 1932 and 1933, both averaging 74.

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Sweet Young Gal (in parlor): "Mamma! Mamma! Come here and make Dick stop teasing me!"

Mamma (from stairway landing): "What is he doing, dear?"

Sweet Young Gal: "He's sitting on the other end of the davenport."

The homely girl approached the information desk at a tourist park and asked for a road map. The obliging clerk gave her one.

"Thank you, I hope I won't go wrong," the girl said sweetly.

"With a map like that," retorted the attendant, "I don't see how you can."

Specialty Farming Depends on Markets

By E. N. Bressman

U. S. Department of Agriculture, Washington, D. C.

THE POSSIBILITIES in the field of specialty crops might on first consideration appear almost limitless since there are some 250 different common drug plants alone that might be grown. Actually, however, the possibilities are limited by the small and indefinite market that exists for most of these plants. Most specialty crops have been exploited or propagandized at one time or another, and it cannot be too strongly emphasized that prospective growers should not become too enthusiastic about the possibilities of rare or little-known ones.

There is, however, no desire to discourage prospective growers in cases where there are real possibilities of successful production, an assured market, and fair returns. In the specialty field, a grower need not limit himself to plants used exclusively in drugs, for there are many related plants that have uses in the manufacture of drying oils, insecticides, and related fields. In recent years possibly the greatest interest has been in plants yielding drying oils and insecticides, such as soy beans, safflower, pyrethrum, and nicotine tobacco.

There are several established growers of crops of relatively minor importance, such as spearmint, peppermint, wormseed, ginseng and goldenseal. The possibilities for new growers in the production of these crops, however, are definitely limited.

At present many of the plant products that go into drugs are imported. Chemists and industrialists interested in producing every possible agricultural product in this country, noting these products on import lists, have time and again set them up as having real agricultural possibilities. A few years ago a drug manufacturer stated that under certain conditions there were 50 different drug plants that could be grown in this country. There was little evidence, however, that any of the plants he had in mind could be profitably grown in this country.

Several New Crops

There are a number of miscellaneous crops of sufficient value to warrant an investigation of their possibilities in the United States. Two comparatively new crops that might find a place in the drying oil industry are perilla, adapted in the South and Southeast, and chia, apparently somewhat adapted in the Southwest. Likewise, there are two crops that have shown some possibilities in tannin production. They are canaigre, in New Mexico and Texas, and sumac in the South. For perfume oil, roses, lavender, and clary sage in the Pacific Northwest and West, and rose geranium in Florida and southern California have been under consideration. There are a number of species of Ephedra that are being investigated for alkaloid content. The adaptation of this crop to areas of low moisture and poor soil makes it of particular interest. One of the newer plants thought to have value as an insecticide is commonly known as Cracca and devil's shoestrings. This leguminous plant, which grows wild throughout the East and South, has in some localities been found to contain a fairly good yield of rotenone in its roots.

It is extremely important that any prospective grower of botanical crude drug plants, such as digitalis, belladonna, and aconite, should get in touch with one of the various large wholesale drug concerns dealing in these products before embarking on their production. Many concerns have very strict requirements as to the kind and quality of materials that they use, also as to packing and handling. Because of the variation in these products, no standard package or bale is available for all drugs. It must be remembered that in some cases the whole plant is desired, whereas in others, it is the leaves, stems, or rootstocks that are wanted. Some plant products are purchased solely on the basis of their drug content and others on the basis of their appearance. Naturally, it would be desirable to pay only for the actual drug content of a plant, but in many cases this is difficult to determine. In the case of pyrethrum, purchases were formerly made entirely on the basis of appearance, but there is now a great tendency to make purchases on the basis of the pyrethrin (poisonous principle) content.

Fluctuating Prices

Prices of drug plant products fluctuate violently. Overnight they might be reduced 50 per cent or increased to 300 per cent. This is sufficient reason for any grower to require some sort of specific agreement or contract for his crop. Certain drug plants require more than one year to come into production, and in the case of many perennials, it is not profitable to grow them unless the crop can be harvested for several years after it is established. No one would wish to establish a permanent crop on a price basis that might change overnight. In other words, the production of this sort of plant is risky unless an assured market is established before any kind of production is undertaken.

Many roots, herbs, barks, and leaves are gathered from the wild by farmers. There are various centers for this sort of collecting. In the southern Appalachian Mountains, in the vicinity of Asheville, North Carolina, and in southwest Virginia there are important centers for collecting, and several of the large wholesale drug houses have warehouses in these places for the purchase and storage of certain products. In the mild coast area of the Pacific Northwest, many drugs are collected from indigenous plants, including the world's supply of cascara bark, an important cathartic drug. Another area for wild plant collection might be found in the New England States.

Medicinal Plants

In Miscellaneous Publication No. 77 of the United States Department of Agriculture there are described 128 different American medicinal plants of commercial importance. These range all the way from aletris, a grass-like herb, the rootstock of which is used in drugs, to yerba santa, a tarweed, the leaves of which are used in the drug trade. Some of those listed are used only in limited quantities, but others are in fairly constant demand. Among the latter group may be mentioned black cherry, bloodroot, boneset, burdock, cascara, catnip, ginseng, goldenseal, jimson weed, mayapple, pokeberry, sassafras, snakeroot, tansy, and wormseed.

It is well to remember that every crop has an optimum environmental condition. No one condition is satisfactory for all plants. There is great variation in requirements of heat, moisture, shade, and soil conditions. Many plants will not stand the warm, humid conditions found during the growing season in some parts of the South. On the other hand, plants of the non-hardy type will not survive winters of low temperature. As a whole, specialty crops are not attacked to any great extent by diseases or insects, although each has some sort of enemy—a leaf-spot, fungus, borer, leaf-eater, rodent, or other pest. Still, growers of specialty crops run all the risks of growers of staple crops, and in addition, have far more specific requirements to meet as regards the quality of the crop produced.

In general, a grower of specialty crops must be a specialist. Although training in chemistry is not essential, it is desirable, since it helps the grower to appreciate proper handling of his plants, particularly after harvesting, in order that the greatest amount of valuable principle may be retained. In many ways the specialty crop grower is like the seed grower. He must produce a quality product if it is to find a ready and profitable market. Wheat, corn, and cotton even of inferior quality usually find a market of some sort, but there is no assured market for specialty crops of just any old kind, poorly harvested and cured. In many cases specialty crops of poor quality find no market and are a total loss.

Potash Puts New "Kick" In Iowa's Alkali Soil

BY applying potash fertilizers to their "sick," alkali soils, farmers in nine northern Iowa counties this year boosted their corn yields around 13.5 bushels per acre and their income —over fertilizer costs—around $4 per acre, on the average.

The fertilizer demonstrations were carried on in Hamilton, Webster, Humboldt, Wright, Winnebago, Emmet, Palo Alto, Pocahontas, and Kossuth Counties by 35 farmers cooperating with the Iowa State College Extension Service. Bruce Kilpatrick, Iowa State College extension agronomist, supervised the demonstrations.

Five types of fertilizers were used: 0-20-0; 0-20-10; 0-20-20; 0-9-27; and 0-0-50. The first four were applied with planter attachments at corn-planting time at a rate of around 125 pounds per acre. The fifth was applied with cultivator "side-dressing" attachments at 100- and also 200-pound rates after the corn developed symptoms of potash starvation.

The fertilizers applied with planter attachments (except 0-20-0, which contains no potash) increased the yield an average of 12.5 bushels per acre and the value of the crop over fertilizer costs, $3.72 per acre. The 0-20-20 and 0-9-27 were most effective on the more alkaline and 0-20-10 on the less alkaline soils.

In the cultivator applications, the 0-0-50 fertilizer increased the yield an average of 14.5 bushels per acre and the value of the crop over fertilizer costs $4.10 per acre. In one individual case the corn yield was increased 48 bushels per acre, resulting in a profit and value over fertilizer costs of $21.93, Kilpatrick reports.

"Every year since potash demonstrations were started about 10 years ago, applications of potash fertilizers on 'hot' alkali soils have consistently given profitable returns," Kilpatrick says. "Last year the value of potash was demonstrated even more strikingly than this year."

Not only does the fertilizer increase the corn yield, but also the percentage of marketable corn.

Addition of potash fertilizer is necessary on alkali soils because potash naturally present seems to be locked up in an insoluble form. Corn plants which do not get enough potash either die or develop stunted stalks, marginal firing of the leaves and small, chaffy ears. Annual applications of potash fertilizers are recommended, since experiments have shown that with heavy applications intended to last for several years soon the potash seems also to become "locked up."—*"Better Iowa" Dec. 5, 1938.*

Building *for* Productiveness

By C. B. Williams

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ON THE part of operators of the farms of North Carolina, since the farm income of the State is very largely from the production of crops, one of the greatest essentials is that of securing economically moderately large yields per acre. To do this, certain factors, largely under the control of farmers, will have to be looked after carefully, viz., proper cultivation of the crops, including preparation of the land; use of improved and adapted planting seed of high viability; the practising of proper systems of crop rotation, using in the rotations suitable legumes for soil-improving purposes; and the use of proper kinds and amounts of fertilizers and lime when and where needed. It is well to bear in mind that the growers' failure to look carefully after all of these essential factors will generally result not only in reduced yields, but products of less than the highest qualities.

For instance, as an average of 17 years of field experiments at the Piedmont Branch Station in Iredell County on a dominant soil series of the Piedmont region of North Carolina in an average state of productiveness to begin with, the use only of proper preparation of the soil and cultivation of the crops coupled with the use of good seed and the practise of a good four-year rotation of crops including the growth of and plowing under of legumes have given only 157 pounds of seed cotton, 6.7 bushels of corn, 0.5 bushels of wheat and no yield of red clover hay per acre. When each respective crop was fertilized with suitable complete fertilizer mixtures, the yields per acre were on an average 1,095 pounds of seed cotton, 27.0 bushels of corn, 14.4 bushels of wheat, and 788 pounds of red clover hay. When both lime and complete fertilizers were used, the yields were 1,350 pounds of seed cotton, 45.9 bushels of corn, 20.7 bushels of wheat, and 2,853 pounds of red clover hay per acre.

Favorable Growing Conditions

So it seems that for this typical red clay loam soil providing some of the factors essential for goodly crop yields and leaving others unprovided for will not bring profitable yields. These same kind of results will be the outcome in other parts of the State where the soils are poor or only moderately productive. In other words, providing only part of the essentials for moderately high to high productiveness of crops will always result in small yields, except on a very limited number of soils which are in excellent physical condition and are high in available plant nutrients. These latter soils for a time and with good cultivation usually will produce good yields during normal seasons, but sooner or later they will wear out.

In the light of the above facts, if farmers of North Carolina and the nation generally are to get the most out of the efforts and money which they put into the production of their crops annually, they will have to make their soils more productive by making all essential controllable factors just as favorable for crop growth as it is economically possible to do.

Legume Gets Two-Thirds Its Nitrogen From Air

THE amount of nitrogen added to the soil when legumes are turned under depends on the kind of legume, the condition of the stand, and the stage of growth. A. J. Pieters and Roland McKee, of the United States Department of Agriculture, discuss the subject in "Soils and Men," the Department Yearbook for 1938.

The amount of nitrogen in a legume when turned under, they point out, represents the nitrogen it has taken from both the soil and the air, but the amount taken from the air is all that is really added to the soil. The relative amounts derived from each of these sources are difficult to determine, and it can only be stated that as a broad average about two-thirds of the nitrogen in a legume is believed to have been taken from the air and one-third from the soil.

An extra 2 or 3 weeks of growth in spring may double the nitrogen value of a winter cover crop. A winter crop of hairy vetch in Alabama had a nitrogen content of 137 pounds to the acre on April 19 and a little more than 200 pounds on May 9. In Delaware crimson clover crops varied from 140 to 190 pounds of nitrogen to the acre. In North Carolina sweet-clover supplied 124 pounds of nitrogen in early April and 160 in late May.

These results are roughly parallel, and the authors translate them into practical fertilizer terms. The amounts of nitrogen added in these cases would have been equal, they say, to the application of 600 to 800 pounds of nitrate of soda to the acre.

Legumes Improve Mississippi Soils

(*From page 8*)

pounds of bur clover seed were sown in Mississippi last fall. One delta planter harvested 40,000 bushels of bur clover seed to supply the demand, and operated his own harvester with a capacity of 1,000 bushels of seed a day.

As a result of the increased production of winter legumes, Mississippi farmers have added millions of dollars to their farm income. The 1928-32 5-year average yield of cotton was 185.6 pounds per acre. Paralleling the expansion in legume acreage, the average yield of lint cotton in Mississippi was 194 pounds in 1933, 214 pounds in 1934, 218 pounds in 1935, 304 pounds in 1936, and 369 pounds in 1937. This increase in cotton yields is probably without equal in the history of a major farm crop in the United States.

In Coahoma County, where acreage in winter legumes was increased from 20,000 acres in 1933 to 60,000 acres in 1937, the yield of cotton was increased from 223 pounds for the 1928-32 average to 530 pounds, or more than 1 bale per acre in 1937. Despite somewhat unfavorable weather this year, County Agent Harris Barnes estimates that Coahoma County will average 400 pounds of lint cotton per acre this season. Similar results have been obtained in all other counties where legumes have been grown extensively.

The acreage planted to summer legumes has also increased during recent years. For example, Mississippi farmers interplanted 450,000 acres of corn to soybeans in 1937 compared with 95,000 acres in the 1928-32 5-year period. Acreage of corn interplanted to cowpeas was increased from 134,000 acres in 1928-32 to 477,000 acres in 1937. Acreage in alfalfa for hay increased from 27,000 acres to 75,000 acres; cowpea hay jumped from 80,000 to 180,000 acres; and soybean hay increased from 116,000 to 229,000 acres.

More farmers are becoming interested in proper fertilization of winter legumes. The Mississippi Experiment Station recommends around 200 pounds of superphosphate or 400 to 500 pounds of basic slag, and from 50 to 100 pounds of muriate of potash or its equivalent, applied before planting. Of course, where the fertilizer is not applied under the legumes, it should be applied before planting the following crop when the legumes are plowed under.

The experiment station recommends for cotton 500 pounds of complete fertilizer carrying from 4 to 8 per cent potash. For hill land of medium to high fertility, 500 pounds of 4-8-4. Hill land with low fertility, 500 pounds of 6-8-4. For all bottom and second bottom land, 4-8-8 and 6-8-8. On bottom land of medium to high fertility, 4-8-8, and for low fertility, 6-8-8.

On the Gulf Coastal soils the station recommends for cotton, 6-8-4 and 6-8-8, depending upon the amount of potash deficiency of the soil. For all truck crops, the station recommends the application of around 1,500 pounds of a complete fertilizer analyzing from 4 per cent to 8 per cent potash. At present, the station recommends nitrogen only for corn, with the exception of the Gulf Coastal area where a 6-8-4 is recommended. However, records of farmers who produce high yields as well as those of 4-H club boys show that most of them use a complete fertilizer before planting and side-dress heavily with nitrogen.

The delta foothills have been found to be very deficient in potash, and the station's recommendation for this section is 24 to 36 pounds of nitrogen, and 24 to 48 pounds of K_2O, or potash. This

Cotton following bur clover produced 2 bales of cotton per acre.

amount of potash is equivalent to 50 to 100 pounds of muriate of potash per acre.

There are areas of flat lands in the State, including the area around Grenada, Forest, and other areas, which are very deficient in potash and where 8 per cent of potash is needed in the fertilizer. There is also a considerable area of sandy hill land where cotton rusts, and this land should have around 8 per cent potash in the fertilizer.

Growing Sweet Potatoes in South Arkansas

(*From page* 13)

cents per bushel. Such a fertilizer can be provided by applying 500 pounds of 4-8-4 before planting, and by side-dressing with 125 pounds of nitrate of soda or its equivalent, and 40 pounds of muriate of potash when the slips have become well established. The main application of fertilizer should be thoroughly worked into the soil several days before planting, and the side-dressings should be worked into the side of the beds.

The experiment also showed that the highest percentage of culls was produced on the unfertilized treatments, and the next highest on the 5-10-0 treatments. The lowest percentage of culls was grown on the complete 5-10-5 treatments.

Although manure gave some increase in yield, the additional cost did not justify its use.

Sweet potatoes should be given the usual row cultivation often enough to control weeds. Two hoeings and several plowings are generally made before the vines interfere with the cultivators. Moving the vines for later plowing is believed to be unprofitable, and vine pruning to stimulate root development is of questionable value.

© *"Southern Vegetable Crops," picture by South Carolina Experiment Station*

The Porto Rico, leading moist-fleshed variety, produced by a well-balanced fertilizer.

New Methods Help Tomato Growers

(*From page 15*)

quit growing tomatoes before he would go back to the old transplanting method.

On a farm south of Urbana, Illinois, tomato-grower Clark took a two-row corn planter, with fertilizer attachment and broom corn plates, and on the afternoon of May 8, 1937, planted 9 acres of Illinois Pride tomatoes. It had been a wet spring and the rain began again just as he finished drilling the field. It rained off and on for the next 3 weeks.

It was June 1 before the soil was dry enough to cultivate, and on that black, fertile, prairie soil of central Illinois the weeds took things over in a big way. The field was a sea of weeds in which farmer Clark had planted 6 pounds of tomato seed.

Clark got out the corn plow and first plowed with the rows and then across them. He had left a square foot of weeds several inches high at the place where he wanted each tomato hill to be. With a good, sharp hoe he thinned out each hill, leaving only one tomato plant. It cost Clark $4.00 per acre to hand-hoe the hills, figuring the labor at 25 cents per hour.

To make the story short and to the point, Clark's yield was 8½ tons per acre. Never in his life before had he been able to produce such a yield.

Direct Seeding Successful

"Direct seeding" has come north to stay, for strange as it may seem, there were 1,000 acres or more of it in Indiana and Ohio in 1938. These tomatoes were planted during the last part of April and withstood a killing frost on May 13. This frost killed transplanted tomato plants in the same territory.

"Direct seeding" does not slow up the date of first harvest, and neither does it result in speeding up the early death of the vines. Yields of "direct-seeded" tomatoes and the quality of the fruit are equal to any produced by the older transplanting system.

The method is not fool-proof. Weeds and run-down soil and insects make results of the system uncertain. However, these hazards are controllable and will not stop the spread of "direct seeding."

The details of the job as worked out by Mr. Hertzel include

1. Selection of well-drained, fertile soil.
2. Fall plowing clean-cultivated fields for the tomato seedbed.
3. Building up organic content of soil.
4. Thorough fitting of seedbed and seeding one month ahead of normal plant-setting time.
5. Drilling on each acre ½ pound of treated seed ¼ inch deep.
6. Setting drill to space seeds one inch apart in rows.
7. Keeping field free of weeds by means of a rotary hoe operated at high speed.
8. Keeping soil crusts from forming by using a rotary hoe.
9. Dusting or spraying for flea beetle control if necessary.
10. "Blocking out" to desired stand.

It would seem that in the States where the average yield of tomatoes is less than 5 tons per acre, "direct seeding" or interplanting corn between the tomatoes, or both methods used in the same field, should offer a practical way of reducing the cost of tomato production. Since very few States can boast of an average yield exceeding 5 tons per acre, these two new developments will very likely find widespread usefulness in places where they have not already been introduced.

It is of little use to grow cheaper tomatoes if the color is poor or the fruits are puffy and flat-sided as was the case on the farms of Mr. Hinton near Reedsville, Virginia. The sandy soils of the coastal plain respond most generously to proper treatment.

Corrected Leather-neck

Mr. Hinton was able to correct the puffy, poorly colored, leather-necked condition of his tomato crop by the addition of organic matter and a liberal supply of a high-grade chemical fertilizer. He first proved to his own satisfaction that organic matter was absolutely essential, and next he discovered that leather-necked fruits showing greenish yellow stem ends and puffy, flat-sided fruits could be corrected by using the right amount of potash in the fertilizer.

Time was when neighbor Hinton grew 2 or even 3 tons of sickly tomatoes per acre, but for the past few years a 10- to 12-ton per-acre yield of fine quality tomatoes has become an established custom. Tomatoes cannot take care of themselves, much as some folks would like to see it that way.

Skill in the many tricks of the tomato-growing trade will always be essential. If the old, time-honored methods have failed you, and you are not satisfied with the results, there seems no other way out than to try a new method or quit the business.

Perhaps the shade created by a corn plant may be enough deviation to turn the trick. "Direct seeding" will help you further reduce the cost of tomato production. You will at least have a crop of corn in case of a tomato failure. And the correct use of fertilizer will further improve both the quantity and quality of your marketable tomatoes.

Fertilizing Asparagus in South Carolina

(*From page* 22)

that the applications in 1934-37 were 2,000 pounds of the formulas in the table.

When sodium nitrate, ammonium sulfate, and a combination of these two materials were each used as the source of nitrogen in a ton of 5-7-5 fertilizer per acre on unlimed soil, the average yields for the 4-year period were not significantly different; however, the yield from ammonium sulfate exhibited a downward trend the last 2 years. There is the possibility that this trend was due either to the increasing soil acidity or to a deficiency of potassium, or both. Where sodium nitrate was used as the source of nitrogen, a portion of the requirement for potassium may have been supplied by the substitution of sodium for potassium. When ammonium sulfate was used as the source of nitrogen, part of the potassium requirement may have remained unfilled, resulting in reduced growth and yield.

These generalizations are further supported by the fact that large and successful asparagus growers in South Carolina are increasing farm uses of additional potash on asparagus with very beneficial results, as was recently reported in an article by John Miley appearing in the April 1938 issue of *Better Crops With Plant Food*.

A pronounced and immediate effect of the no-fertilizer treatment was, of course, to be observed. In 1934 the yield from this treatment was 2,054 pounds per acre against 2,603 pounds for the 2,000-pound application. The difference became greater each year until in 1937 the yields were 1,214 and 3,026 pounds per acre, respectively. In the case of the 1,000-pound application the difference was also marked, the yield from this treatment gradually decreasing until in 1937 it was only 2,150 pounds per acre. When the rate of application was increased from 2,000 to

Dr. J. B. Norton, noted plant-breeder, examining a good hill of Washington asparagus.

A field of good "grass" after harvest season. Note the light, sandy soil.

there was a noticeable improvement in the grade of the asparagus from this high analysis fertilizer.

Varying the time of application of fertilizer produced no significant differences in yield. Applications were made (1) all before harvest, (2) all after harvest, (3) half before and half after, (4) several divisions of the fertilizing elements before and after—eight different schedules, but using the same total amount of plant food in each case. Neither yield nor size of spear showed any pronounced differences because of varying the time of application.

3,000 pounds per acre, the total yield was not significantly increased.

The no-fertilizer treatment produced much less of the Colossal grade in 1937 than the 2,000-pound application. Spear size in the case of the 1,000-pound application did not decrease so rapidly or to such an extent following the discontinuance of the preliminary treatment. The 3,000-pound treatment produced no significant increase in total yield, but

A 1,500-pound per acre application of dolomitic limestone did not affect significantly the yield of asparagus in this experiment.

No significant effect upon yield or grade resulted from the removal of the tops of the asparagus in the fall as compared with leaving them until spring.

Improved Ginning Makes Better Cotton

(*From page* 18)

program the improvement of the ginning is a vital link between the production of improved varieties and improvements in the marketing of cotton through which farmers may realize the full value of their lint and seed. Every ginner in the State has been reached through the inclusive series of meetings held for 2 years in all cotton-growing sections. Special meetings have been held for both farmers and ginners. Ginners have recognized their important position in preserving the value of the cotton produced by the farmers. They have given it consideration in every meeting of the Texas Cotton Ginners' Association since Stoneville has been in a position to recommend the most suitable methods of ginning.

Bringing groups to Stoneville for direct contact is a favorite method of spreading results. Among other groups last summer, the extension specialist from Missouri brought 50 men—farmers, ginners, and extension workers—for a 2-day learning and inspection stay at Stoneville. About 30 gins that handle about one-third of the State's crop were represented. Besides seeing the layout and work, they visited nearby commercial gins that are using Stoneville's results in their daily ginning. Evening meetings were held for discussions.

When the Mississippi Cotton Ginners Association met at Stoneville this year, it attracted ginners from Texas, Georgia, Alabama, Tennessee, Missouri, Arkansas, and Louisiana. About 500 people visited the ginning and fiber laboratories, and more than 300 took part in the business sessions. The Texas delegation, 50 strong, had held a meeting of its own there the day before, coming in an "autocade" from every section of Texas except the lower valley.

The theory back of all the work is that to put a better crop of cotton on the markets we need to work with the ginners just as much as with the farmers. It is a joint problem in which each group bears responsibility. Improvement of ginning is of equal interest to farmers and ginners, and improvement in varieties grown is proving to be of as much interest to ginners as to farmers. Both are interested in getting a product that will be more readily marketable.

A resolution passed by the last convention of the Georgia Cotton Ginners' Association convincingly stated the mutual interest of farmers and ginners in the general program for the production and marketing of better quality cotton and endorsed the recommendations for improvements developed at Stoneville. The more rapidly the people in both groups recognize the mutual nature of their problems and the necessity for mutual understanding and effort in solving them, the sooner we shall have complete success in the production of American cotton.

Does Weather Affect Tomato Yields?

(*From page* 11)

ciency from appearing. That does not mean that this is enough potassium. Within the range between 45 pounds and the 105 pounds, which we consider sufficient for a fair yield, occur a number of growth conditions that may be considered more or less normal as far as appearance of the foliage is concerned, but are wholly inadequate from the standpoint of producing good fruit. Chemically we know this deficiency is insufficient carbohydrates.

We find the maximum amount of carbohydrates manufactured where 45 to 50 parts per million, or 90 to 120 pounds of potassium per acre are available to the plants. Increasing the potassium slightly beyond that amount has little effect in changing carbohydrates. If it were doubled we would again find our carbohydrate curve dropping, but this we cannot attribute to a lack of potassium. It is, however, carbohydrate deficiency, and is brought about by other causes which we call physical. This brings up another idea, i. e., the ratio of potassium to other ions plays a very important part.

In studies conducted at this station, it has been found that there seems to be a certain ratio between potassium and calcium which affects the quality of growth. Too little available calcium causes dying-back of the tips of the plants and dying of the roots. Forty parts per million of calcium are sufficient to prevent dying of the plants but do not promote a good type of growth. The foliage is soft and succulent, and increasing potassium beyond that needed by the plant tends to accentuate the softening effect by increasing water requirement. Increasing the calcium increases the dry matter or decreases the succulence of the plants by decreasing the water requirement. In short, calcium has a hardening effect, while potassium has a softening effect. One counteracts the other. It would seem reasonable, therefore, that potassium deficiency would show up more quickly on a highly limed soil. That is actually the case. The effect of too much lime can be counteracted by increasing the amount of potassium.

Correct Ratio Necessary

When figuring any ratio between calcium and potassium, we must not use so little potassium or calcium that we produce deficiency symptoms. We are concerned with the physical effect of the calcium and potassium ions on the protoplasm of the cell. This effect influences the efficiency with which the cell can do its work. We are assuming, of course, that the plant is exposed to other environmental factors at optimum values.

Too much calcium in the soil solution may prevent potassium from being taken into the root if the level of potassium is not high enough. Likewise, too much potassium may prevent the plant from taking in sufficient calcium, if calcium is too low. Therefore, best results seem to be obtained with a ratio of approximately 6 or 7 parts of calcium to 1 part of potassium.

In a series of plants all receiving 20 parts per million of calcium and increased potassium, the severity of the calcium deficiency symptoms increased as the potassium was increased. Where twice the amount of calcium was supplied, deficiency symptoms of calcium did not occur but potash deficiency symptoms did occur. Therefore, it seems that if we are to get the most out of potassium, we must be assured of a good supply of calcium, and then supply potassium accordingly.

It has been shown that abundant calcium may bring about boron deficiency symptoms, and that this deficiency is often corrected with potassium applications. This may be a case of more boron being supplied with the potassium, or it may be due to the fact that increasing the potassium prevents calcium from being taken into the plants as freely.

Environmental factors have a tremendous effect on the utilization of all fertilizer ingredients. In a series of experiments on varying amounts of potash, 105 pounds of potassium gave the best results. The yield was 10.8 tons of tomatoes per acre. In another experiment the same amount of potassium gave 16 tons of tomatoes when the plants were mulched, and again, increasing amounts of potassium above 105 pounds per acre did not change the yield. These fields were similar from the standpoint of pH and rapid soil tests. At the present time we do not have data for tomatoes from high calcium fields to know whether more potassium would be nec-

Potash deficiency symptoms on tomatoes: Left—Hollow, ribbed, irregularly ripened fruit; leaves yellowed with greenish-tinted veins. Right—A healthy tomato leaf and fruit.

essary to obtain the same yield. From laboratory results it would seem that more potassium is necessary as the calcium level increases, but soil moisture, aeration, and similar factors undoubtedly affect the availability of potassium. Applications of lime have their effect. As a result it is difficult to say how much potassium should be put on the soil to give maximum results. All we can do is to supply the plants with enough so that if weather conditions permit, they will not suffer from potassium deficiency. Potassium deficiency means soft, weak plants which are not capable of producing large yields.

December's Embers

(*From page* 5)

boys of no ancestry, and followed by yellow dogs of no pedigree—that was the age of independence and nonchalance. It was likewise the era most barren of any consciousness of Christmas.

We knew full well where the "old man" got his dough and perhaps how little would be left over for holiday joy after the everyday groceries were secured. We sometimes had day-dreams beneath some blossom-laden apple tree, starring aloft at floating air-castles among the wafting clouds. Each of us knew he was "father of the man to be," and realized it was our last great recess before the signal bell of adolescence and the first job. Not much time in those days for saints or Christmas myths. It was the period of renunciation and disdain, yet made tender and livable by family ties and dreams of future enterprise and knightly valor.

I'M sometimes kind of sorry for that kid; he had so much sturdy faith in himself and the world and opportunity and destiny, and a lot more stuff harder to swallow than Santa Claus. At least, that's the way it looks to me and the mirror now. He thought he was renouncing fairy tales and entering the gates of go-get-'em, fit as a fiddle and out to win! He was putting away childish things, to see as his elders saw. He wasn't hanging up no socks no more. He was out to hang up a record!

Then finally in the course of life's cycle he met the girl who was willing to take him for what he appeared to be on casual acquaintance under favorable social circumstances. Thereupon old Christmas ideas crept back to warm his heart and plague his meager resources, in trying to match the bewildering "for her" lists with the state of his stipend. It was not such a tough job seen in retrospect, however, as she was sweetly appreciative of the gift for love's sake, and counted each dollar saved as so much more for the hope chest.

In substance, this reawakening of the original holiday theme under the urge of youthful, ambitious, home-planning hearts is the vital link which keeps alive the spark from dead pasts to vivid futures. Whether we realized it or not, we were high priests dedicating the lighting of fresh family altar fires. I wish the storekeepers always felt this way and saw to it that their gifts for brides and grooms were marked down a little! Maybe we should create a new federal "authority" to take care of that.

The first Christmas eve with the first baby marks another epoch among one's cherished moments. There was not always much else to make merry with, especially if maternal grandma insisted on trotting the infant on her lap every time it cried—which meant successive shirt-tail parades for you on chilly winter nights of long wails and short slumber. But at least you were not knocking at somebody's overcrowded inn, and your credit with the milkman was good enough for a small discount.

Later as the tots became toddlers you

assumed the secret role of Santa yourself, just as your father had done with even less to do with. It began with cautious excursions in company with your wife to size up the shelves and store windows. Sometimes you slipped aside at the toy counter to count your change against furtive purchases for each other, doubtful of their intrinsic worth but certain of their ultimate cheerful acknowledgment.

THOSE were the days of rancid cigars, wrinkled neckties, no-go wrist watches, and cheap perfume bottles. But after all, those beautiful presents pictured in the de luxe magazines were not meant for a subordinate clerk with two babies, a yawning furnace, and a heavy mortgage.

It was a time for slaying economic dragons, with just a little time out for holiday mirth. But you took it in mighty measure all the same, up there in the tiny flat, or maybe on the eighty-acre rented farm. You forgot the dreams of fish-pole days and settled down in earnest to face the world as it came along, sure of the helpful handclasp of the finest little lady since Mary of the Manger!

So then we said, "Come, my friends, smuggle those mysterious bundles into the house through back door or cellar window; hide them in locked drawers or leave them for awhile at the neighbor's until the time arrives when the little tree shall be trimmed and the inquisitive children unwillingly shall be forced to bed. Tune in the radio to make Christmas carols loud enough to muffle the rattling of the paper parcels or the squeaking of those unhappy toy dogs while you are busy doing the honors expected by the expectant ones.

"Stoke the furnace again, wind the clock on the mantel, pat the lumpy stockings as they hang there in a row in the ghostly firelight, count your limping bank account once more for the tenth time, and then heave yourself on the mattress. You won't need to set the alarm clock on Christmas morning—young voices and pattering feet will be your reveille."

If as the years go by and children vanish, one manages to acquire a little surplus revenue, then once more a chance arrives to brighten some Christmas tree in memory of bygone family tapers. Too often we neglect the opportunity to enlarge our holiday sphere and fail to do those kindly, helpful things which glorify this season or any season. The absence of familiar reminders and ancient associations should not deter us from indulging ourselves and others less fortunate in a bit of holiday happiness. Crabby old folks who forget it's Christmas because their children are gone are worse off than miserable bachelors, and with less excuse.

AND lastly, Christmas renews our courage and cements our resolves. It may have started as a pagan feast with apoplectic appetites and drunken revels. But it has softened and matured as the years have passed, touched by many tender customs and devoted sacrifices, so that regardless of what altar we seek or how many candles we light, the Christmas season is a treasure to us all.

Dedicated mainly as a toast to humble lives and common mortals, the chorus swells into a universal anthem, sweeping us all into a human unity not found on any other notable occasion.

In the North the snow falls and icebergs form on street and farmstead. In the South the palm trees wave and the breath of summer still remains. But among us all alike a spirit moves which neither soils nor frosts nor race nor creed can overcome. Thus once a year at least we all are one and speak a common language, and our password at the portal of the Lodge of Love is always "Merry Christmas!"

COLLABORATORS

At a luncheon of newspaper men the following toast was offered:

"The ladies! Second only to the press in the dissemination of news!"

Jake—"Just between you unt me, Herman, vot you tink of Lena Schuitzel?"

Herman—"Between you unt me, not so hot, Jake, but alone, oh poy!"

"What the deuce are you doing down there in the cellar?" asked the puzzled rooster.

"Well, if it's any of your business," replied the hen, "I'm laying in a supply of coal."

Tobe: "See hyah, woman! Didn't Ah see you kissin' a no-count piece o' trash las' night?"

Liza: "Gwan, Tobe. It was so dark Ah thought it was yo'."

Tobe: "Come to think of it, mebbe 'twas me—what time was dat?"

"Well, Willie, your sister has given herself to me for a Christmas present. What do you think of that?"

"That's what she done for Mr. Bunker last year, an' he give her back 'fore Easter. I bet you'll do the same."

Little Myer, after hearing so much talk about prosperity and depression, asked his papa:

"Papa, vot is de deefrance from prosperity and depression?"

"Vell, my boy," papa replied, "in prosperity ve had vine, vimmin, and song, but in depression all ve got is beer, momma, and de radio."

FOR BREAKFAST

"See that? It's a heron."

"Goodness. I've never seen one before—only kippered."

A cow has got two legs in front and
two more in addition,
To help hold up her chassis, her rear
end, and transmission.

In the hills of Arkansas, a son was born to one of the natives. As he grew from infancy he never spoke a word and his parents raised him as a deaf mute.

One day the father was bent over at his work in the orchard and did not notice that he was directly in the path of an enraged bull.

"Look out, Pa," the son shouted. "Here comes the bull."

The father ran to safety and expressed his joy his son had found his speech.

"Well, Pa," the son replied, "I just ain't had nothing to say before."