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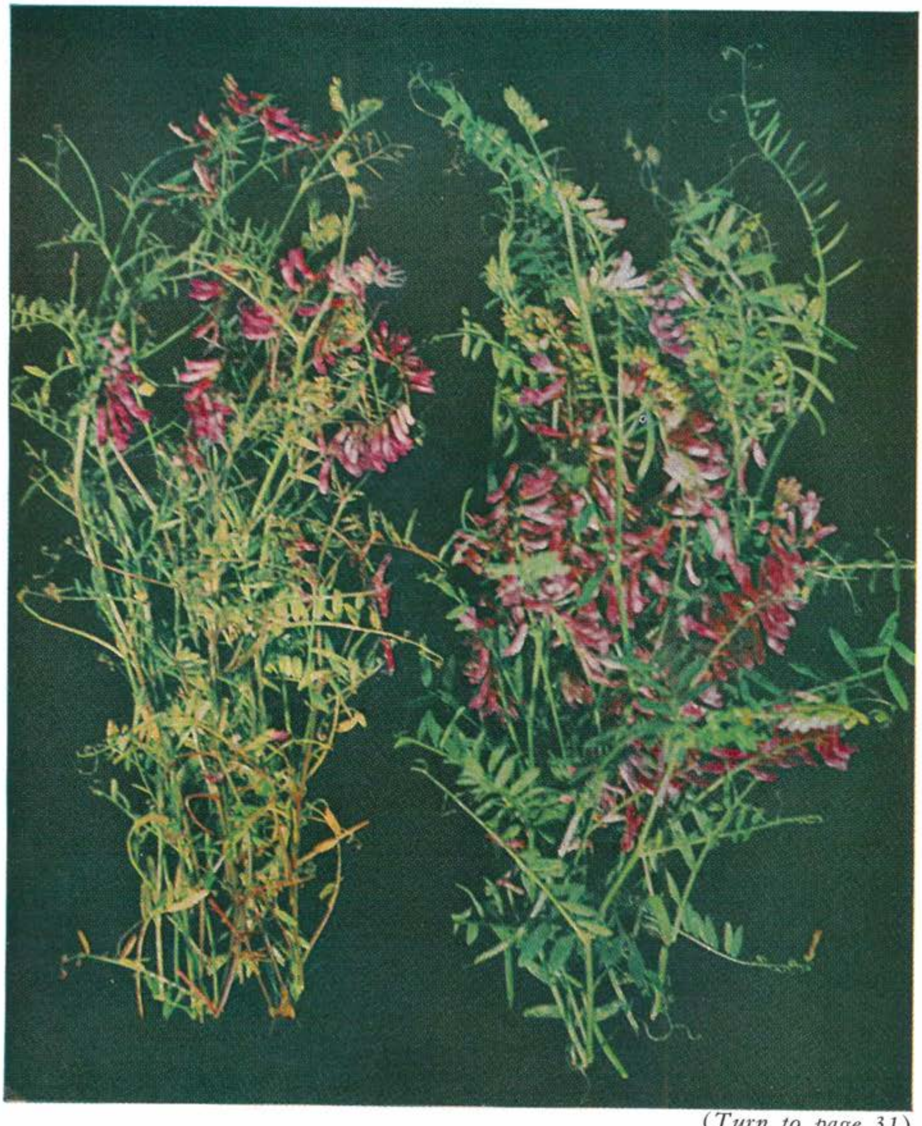

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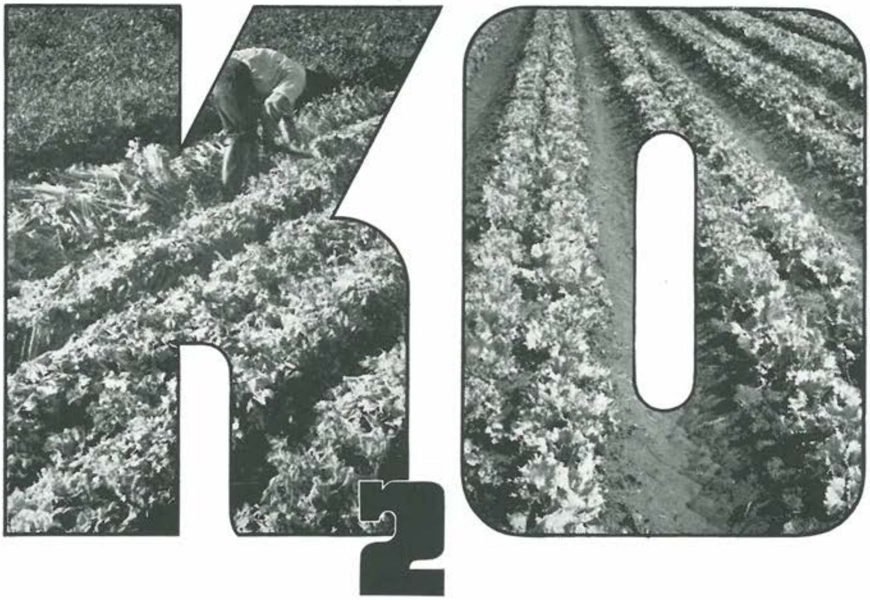
The Pocket Book of Agriculture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Better Crops with PLANT FOOD

The Whole Truth—Not Selected Truth

R. H. STINCHFIELD, *Editor*

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VOLUME XL NO. 9

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What Next?

Better Crops with PLANT FOOD

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VOL. XL WASHINGTON, D. C., NOVEMBER 1956 No. 9

Agrimetro America

Jeff McDermid

(ELWOOD R. MCINTYRE)

MAYBE I've just coined a good word for it—that combination of devoted skill and progress that represents our farm and city consumers and producers of mutually wanted commodities. If so, there is no patent on its use, because Agrimetro is an everyday fact of life in our nation.

Yet far too many of the folks who live and work in metropolitan zones above the 2,500 mark in population—now classed as "rural"—seldom get those facts in a proper light. In the same way, many of our farmers nurse wrong ideas about the denizens of the congested areas.

There is something astir this month to create a better understanding between the 87 per cent of us who are nonfarmers and the minority of only 13 per cent who remain on the land to provide the wonderful array of staple and fancy groceries for 100 per cent of our people, with an abundance left over for overseas supplies and relief. Evidently, this newer understanding is badly needed—both ways.

Each winter when the regional stock shows and farm youth conventions visit our larger cities to stage demonstrations of skill and enthusiasm, these rural performers are greeted with acclaim and showered with tributes. Nothing is too good for them, for one week anyhow. Civic clubs and commercial corporations outdo one another in laying trophies at the feet of vigorous young men and women from the fast shrinking ranks of farm production.

City newspapers and magazines run columns of stories and feature pictures. Radio and T. V. proclaim their triumphs. Top champion animals fed by these young farmers go on tours to strut their stuff before more urbanites.

Honor farmers are picked and lauded by city clubs at various times. Farm homemakers receive prizes and praise. Chambers of commerce offer cash awards to champion corn and cotton growers. City banks set up special farm loan offices and hold soil conservation contests. Half the nation's wage earners hold jobs that depend on food and fiber from farms—in transporting, processing, packaging, storing, distributing, and retail selling what our diminishing farm operators are so well qualified to produce.

DESPITE all this favorable build-up and positive background, hosts of city dwellers have never been touched by this mutual movement for a better insight into the true situation of sod-busting America. Through prejudice, unfounded rumor, superficial observation, disinterest, and much political misinformation and half-truths, our city cousins are victims of distortion when they look afield to the farm belt.

Usually, they are unaware of it. They think they really know. The average man on the pavement will sneer at any good words for the farmer, often stating that "the blasted, cry-baby farmer has everything coming his way." And how literally true that is, my misguided friend—"coming his way" like a well-aimed brickbat.

Less than five million farmers belong to farm organizations, against 17 million in trade and labor unions. Nearly 40 per cent of our actual farmers work only part time and must earn money at nonfarm jobs. Farmers cannot bargain collectively with consumers over prices, terms, hours, and conditions of work, seniority rights, and terminal pay. They couldn't strike if they wanted to. They can't shut down or slow down their production plants on short notice—and get the devil if they try to manage it by allotments and quotas.

Farm costs go up with higher wage levels for steel, oil, and railroads. Agriculture is the only outstanding slice of our economy that went through a severe and prolonged recession. Farm income has fallen 30 per cent since 1947, when it hit the peak. Prices for many items the farmer sells keep sliding downward, reaching 22 per cent less than five years ago.

Yea, verily, a lot of things are "coming his way" as the farmer sees it. But how to make the outsider on the pavement realize the actual case is the question to be solved. We must find a way to make him get wise and refuse to belch all that blather every time somebody mentions farmers and food supplies. That's the task to tackle—not only for November this year but steadily and regularly, day in and day out.

THE inability of the operators of small farms to eke out a profitable existence in farming alone is often overlooked by the sidewalk critics. Nonagricultural employment and part-time farming are on the increase. Between 1950 and 1954, the number of farm people primarily engaged in agriculture dropped by one and two-thirds million. At the same time, the number who were working mainly outside of agriculture actually went up by over 100,000. That is, the proportion of farm people working primarily outside of agriculture rose from 30 to 38 per cent. Few if any periods in our history have shown such rapid changes in the status of farm operation.

There seems to be no probability of any reversal in this current trend in the immediate future. This comes as a direct result of many forces. The larger farm unit made by small farms being sold and consolidated is one factor. Much higher capitalization with the greater interest return required is another. Rapid mechanization of farm operations is a competitive force as well, and the less skilled and low-income farmers and farm laborers are giving way before its advance. If this general shift continues, it is not unlikely that by 1965 our farm population of real producers will dwindle to one tenth of all our population.

As this decline goes on we are sure to find that farming will become an even more highly skilled occupation than it is today. In 1950 the average value of farms that produced at least $2,500 worth of commodities was

$26,500. City folks who cling to the old shibboleths and traditions surrounding farming and farm life—as seen in old prints and nostalgic movies—must be made to realize that ancient rural folklore and romance can no longer be much of a factor in the management of such a valuable business.

For years the farm folks were content to be simple countrymen, rather infrequent in their visits to near-by trading centers, somewhat aloof and highly rugged in their independence of other men and other agencies outside their own rural realms. Some farmers in some areas remain that way today, but more than 80 per cent of our farmers are actually living in the same economic environment and using the same mechanical and social devices as their city associates.

No city man would give up his rights and privileges, and his training and capital investment are real tangible items in his present and future security. Many of the city men are professional in some sense and have been educated to pursue a specified direction in earning a living. How many of them would enjoy a situation that obliged them to patch up their income in some occupation which took them entirely away from the course they had been trained to follow? And if their specialized field happened to be one that was of national importance and yet became hazardous and insecure, would they hesitate about organizing and studying means to protect it and improve it? More especially, would they not take action when asked to sacrifice a big capital investment used for the production of articles and services indispensible to the national welfare?

To make the confusion of the urbanite over the agricultural dilemma much worse, there has been a great overabundance of politics mixed into the batter. To but a limited degree has this been fostered by the farmer. His wide diversification in many lines, more or less specialized, has made it difficult for him to chart a course of government action which would be widely beneficial. What proved logical for one segment of the farming industry often hampered another branch seeking stability through laws and voluntary regulations.

AMERICAN agriculture is made up of over five million separate, independent enterprises. The farmer must face the vagaries of weather. His products are not man-made, but are the result of complex and vulnerable biological processes. He teams up with nature and her laws cannot be hurried or changed except over a long period of experiment, as with hybrid corn and new livestock breeds.

He is always hoping for abundance in yields, and relies greatly on the consumer's purchasing power to bring incentives for the application of scientific methods. Yet he too often finds that high levels of consumer income do not guarantee him reasonably satis-

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Fig. 1. C. F. Morris, Appling County, Georgia, Altamaha Soil Conservation District, turned 3-year-old Bahiagrass sod for tobacco.

Experience With Row Crops Following Perennial Grasses[1]

By J. E. Pollock

Management Agronomist, Soil Conservation Service, Augusta, Georgia

SOIL Conservation District Cooperators in South Georgia are finding that turning a good perennial grass sod for row crops is an excellent way to improve quantity and quality of crops. They also are finding that the perennial grasses provide longer lasting residue than annual crops.

Farmers' experiences and results reported in this article with tobacco, corn, cotton, and peanuts following sod crops are based on 40-odd field trials with this practice during 1954 and 1955. There are many more such results in other Southeastern States.

[1] All pictures made by the Soil Conservation Service.

Tobacco Following Bahiagrass

C. F. Morris in the Altamaha Soil Conservation District was one of the first farmers to turn a perennial grass sod for tobacco. His three-year-old Pensacola Bahiagrass was on a Lynchburg soil, Class IIw land, dominant limitations excessive water, low in fertility. The sod was dense and about 2 to 3 inches high when turned 6 to 8 inches deep with a moldboard plow in October 1953. Shortly after turning the sod, Mr. Morris realized that he might have done better by cutting it with a harrow before turning. As a result, several harrowings, plus turning with a disk plow, were done to insure a good seedbed.

In June 1954, or eight months after turning the sod, there were approximately eight tons of undecomposed air-dry Bahiagrass residue per acre to plow depth. At the same time, in an adjoining field on the same soil type that had been in continuous row crops for several years, there were approximately 1.5 tons of crop residue per acre. Tobacco was fertilized and spaced in accordance with Experiment Station recommendations. A good season at planting time produced an excellent stand. Insect damage was no more than usual. A regular one-row tractor cultivator was used and, according to Mr. Morris, the grass residue was a little bothersome at first cultivation.

There was practically no rainfall during most of the growing season; however, the plants did very well. The eight tons of Bahiagrass residue per acre helped to conserve the needed moisture. Tobacco following sod wilted, but only a very small percentage of the leaves burned. The percentage of burned leaves was much higher in the adjoining field where tobacco followed continuous row crops. Moisture was deficient for maximum growth until most all of the plants were in full bloom. At that time (June 12) rain accompanied by hail and wind hit a portion of the field where tobacco was following sod. Practically all the stalks were blown over and had to be straightened up. Some were broken off at the ground. The ground was littered with leaves. Some of the leaf stems were broken near the tip and remained on the stalk. This reduced the quality of the crop. Mr. Morris estimated a 25% damage on that portion of the field hit by the storm. There was no indication of diseases or rootknot damage.

Many of his neighbors and some technicians thought the tobacco following sod would not ripen. However, it did and came off fairly fast. Before all the tobacco was harvested, there was a fair stand of volunteer Bahiagrass in the field. It made a remarkable recovery in spite of the field being used from October to March as a feeding lot for hogs and cows.

Tobacco following sod, even with the drought and storm damage, pro-

Fig. 2. B. A. Alderage, Bacon County, Georgia, Altamaha Soil Conservation District, was well pleased with his tobacco following Bahiagrass on Class IIw land. His tobacco produced 2,250 pounds per acre that sold for $53 per hundred.

Fig. 3. W. H. Coley, Bacon County, Georgia, Altamaha Soil Conservation District, examines Coastal Bermudagrass that came back after turning sod and making 75 bu. corn per acre on Class IIw land. Corn was hogged-off.

duced 1,557 pounds per acre of high-quality leaf that sold for an average of $50 per hundred. Tobacco in the adjoining field received the same treatment except the sod and storm damage. This field made only 1,379 pounds per acre that sold for an average of $48 per hundred. By simple arithmetic we can see that the tobacco following Bahiagrass made $116.58 more per acre.

Tobacco Following Coastal Bermudagrass

In January 1954, D. J. Harrison in the Satilla Soil Conservation District burned a four-year-old stand of Coastal Bermuda on Class IIw land and dug planting stock. After this he turned the land deep with a flat bottom plow. It was harrowed once before applying fertilizer recommended by Experiment Station and setting tobacco. Six months after preparing land there were approximately 5.5 tons grass residue per acre. The rainfall in 1954 was very light in this section; however, the grass residue helped to conserve the moisture needed to make an excellent crop of disease-free tobacco. This field produced 1,700 pounds per acre of high-quality tobacco that sold for nearly $60 a hundred. No Bermudagrass came back. Tobacco was in the same field in 1955 and was followed by Coastal Bermuda. More Coastal Bermuda was turned for 1956 tobacco acreage.

R. N. Olliff in the Altamaha Soil Conservation District turned a two-year-old stand of Coastal Bermuda on a Lynchburg soil, Class IIw land, with a moldboard plow in January 1954. Field was harrowed four times before applying fertilizer recommended by Experiment Station and ridging for tobacco. The whole seven-acre field was prepared for transplating at one time. However, plants gave out after planting about half the field. There was about a week or ten days delay in planting the remaining half. Results—an excellent crop of high-quality tobacco was made on that portion of field planted shortly after throwing up ridges. Where there was a delay in transplanting after preparing ridges, the Coastal Bermuda came back fast and competed with the tobacco, and the grass reduced the quantity and quality of leaf.

Fig. 4. Harold Fears, Soil Conservationist, Calhoun County, Georgia, and Mr. Weber, Flint River Soil Conservation District, inspect corn following fescuegrass on Class I land. This corn produced 132.71 bu. per acre.

This field produced an average of 1,175 pounds per acre that sold close to $60 a hundred. From the first planting, where there was no delay between preparing ridges and planting, the yield was estimated by Mr. Olliff to be 1,500 pounds per acre. After harvesting tobacco and cutting stalks, the field gave excellent grazing. All of Mr. Olliff's 1955 tobacco followed Coastal Bermuda, and his 1956 allotment was after Coastal Bermuda. These were no isolated cases of tobacco following perennial grass. Table

Fig. 5. Ralph Matson, Richmond County, Georgia, Soil Conservationist, and J. G. Phillips, Briar Creek Soil Conservation District, examine corn and soybeans following Bahiagrass on Class IIs land. This corn produced 85.9 bu. per acre. Note volunteer Bahiagrass at Conservationist's feet.

I gives summary of farmers' results with this practice.

TABLE I.—SUMMARY OF TOBACCO FOLLOWING PERENNIAL GRASSES.

Tobacco following	No. of farms	Acres	Average	
			Pounds per acre	Price per 100
Bahia.......	10	41	1,917	52.10
Coastal Ber..	8	35.1	1,764	52.68
Native Ber...	3	13.2	1,993	52.80
Pangola.....	1	2.7	2,366	50.00
TOTAL.....	22	92	1,883	52.34

Corn Following Coastal Bermudagrass

Farmers' experiences and results with corn following Coastal Bermudagrass as a whole were good. For example, C. F. Warnell in the Coastal Soil Conservation District had corn following a three-year stand of Coastal Bermuda on Class IIw land. The grass was turned in January with a moldboard plow. Land was harrowed twice before planting. Four hundred pounds of 4-8-8 were used under the corn, and it was sidedressed with 150 pounds of 16-0-6 per acre. Mr. Warnell experienced no difficulty in cultivating with conventional tractor cultivators. The field had no more than normal insect damage. In spite of all the dry weather in '54, the yield was 33 bushels per acre. At time of harvesting there was a good stand of Coastal Bermudagrass back in the corn.

In 1955 this same field was back to a good stand of Coastal Bermuda and was used for hay and grazing along with an adjoining field of Coastal that had not been planted to corn. As far as Mr. Warnell could tell, both fields gave about the same amount of hay and grazing. Corn following fescuegrass on this farm in '55 produced 60 bushels per acre.

James Graham in the Upper Coastal Plain section turned a 4-year sod of Coastal Bermuda on a Tifton soil, Class IIe land (dominant hazard erosion), with a moldboard plow in Jan-

(*Turn to page* 41)

Fig. 6. M. P. Dean, Taylor County, Georgia, Soil Conservationist, and E. B. Swearinger, Ocmulgee Soil Conservation District, inspect cotton following mixed stand of fescue and Common Bermudagrass. This field produced 1,122 pounds lint cotton per acre.

Potassium—The Alkali of Life[1]

A Critical Review

By Clement D. Vellaire

Kalamazoo, Michigan

Concentrations in the Body—Special Functions

To study the location of potassium within the body we will trace it through with the aid of Figure 1. In this chart we have the areas representing the total amount of potassium and concentrations shown in grams per kilogram.

The average diet supplies two to three grams per day, but this may be increased to 20 without harm (143). Saliva and gastric secretions, both containing concentrations several times that of the plasma (17), are added to the food. The source of this high concentration is the glycolysis and other reactions which supply the energy for secretion (40). Lack of this element hinders secretion (29) and contributes to ileus (106). The other digestive juices supply their share in concentrations greater than that of the plasma.

In the colon, the dehydrating area, potassium is absorbed and a large portion goes back to the plasma. Thus we have a cycle of potassium similar to that of bile acids. The loss in the stool is regulated by supply and demand.

Fluid losses from the gastro-intestinal tract from any cause, except excessive oral intake, leads to deficiency of potassium as well as other materials. The excessive oral intake may lead to these other deficiencies. A special case is the pathological diarrhea caused by the abuse of laxatives and cathartics (112, 147). All these conditions have been helped, and some cured, by various methods of replacement. Sodium frequently aggravates these conditions.

The diarrhea-producing effect of excessive intake has been demonstrated in two lots of hogs (163). In the first a large amount of corn steep liquor was fed and a forceful expulsive type of diarrhea resulted. The animals retained good appetites and were active and healthy. In the second lot the same result was obtained with U.S.P. potassium chloride added to the control diet. The experimental period of one week was followed by a second control period in which they returned to normal.

Intestinal stasis results from low potassium diets. The first report (138) was with highly synthetic diets used for nutritional studies. More recent extensive work has confirmed these findings (83, 166) and extended them to humans (69, 76). Calcium is also an important factor in this condition. The constipating effect is due to two factors: first, the material is held to prolong absorption and a degree of dehydration sufficient to cause impaction results; second, with the lowered intracellular potassium and the resultant weakness, the force for propulsion is insufficient (160).

We now find it in the plasma, the extracellular, continuous phase of the blood, the transport organ of the body. Here and in the other extracellular fluids, its concentration must be ap-

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[1] Presented before the Division of Fertilizer and Soil Chemistry, American Chemical Society at Minneapolis, Minnesota, meeting, September 1955. *Continued from October issue.*

proximately equal to that of the free ion in the intracellular free water, and in turn this is in equilibrium with the combined fraction. Thus it is determined by the needs of the intracellular reactions in so far as the body is able to adjust it. The average value is between four and five me. per liter. This is only a tenth that of sodium. A discussion of its fluctuations under various conditions is given by Farber and coworkers (53).

Potassium Higher in Red Cells than Plasma of Blood

In the red cells, with their work of transporting oxygen, we find the concentration to be twenty-fold that of the plasma. The shifts are according to those outlined when discussing metabolism.

In brain and nerve the same high intracellular concentration and shifts with activity are found. Shanes notes (150): "The potassium shifts are in the proper direction and of the correct order of magnitude to account for the negative and positive after-potentials in terms of potassium accumulation or depletion in the extracellular space." Again, any interference with oxidative processes, such as asphyxiation, causes a loss from the cells (127, 162). High concentrations cause nerve block (77) and here, again, its relation to sodium is pointed out (37). This may be a protective mechanism since the resultant muscular activity might increase the potassium in the serum to the danger point. Lack of potassium appears to play an important role in spastic spinal paralysis. Two cases (10, 12) have been reported in which oral therapy gave dramatic improvement.

The skeletal muscles contain the largest amount of the body potassium and have been discussed in connection with general metabolism, deficiency, and toxicity.

The organ with the shortest cycle of activity and recovery, the heart, shows some of the first and most marked effects of alterations in availability of free potassium ions. The cardiogram records heart action and gives us, in the absence of organic lesions, a very rapid check on these changes. Lewin and Criep (103) conclude, "All deficiencies of potassium were detected by the electrocardiogram before they reached levels causing symptoms or signs of such deficiency." Excesses are also shown by the same method (42, 102). Many have used this instrument as a clinical guide and, with due regard for its limitations, it is of value. Others (148) have considered it of little value because of the lack of correlation with plasma, total, or myocardial concentrations. It summates the potentials of the reactions involved in the formation and breakdown of intracellular potassium complexes giving the energy for heart action. Other causes of alterations in these reactions would also be recorded. Acetylcholine forms one of these complexes (85) and shows an optimum for potassium ions at 5.4 me. per liter. This is slightly higher than the average noted above, for plasma.

Blood pressure changes are another phase of this response to plasma potassium concentration, going down as it is reduced, even to hypotension (140). Simultaneous reduction of sodium prevents this hypotension (62). These effects on blood pressure are also observed in man (132).

Potash Deficiency Affects Heart

Heart lesions result from potassium deficiency (64) and the lesions produced by certain hormones are secondary to it (39). These form earlier and are far more permanent than those of the kidney or skeletal muscle (31).

In congestive heart failure both the intra- and extra-cellular compartments show potassium derangement (156). Although sodium and potassium are frequently considered high in the plasma, treatment with potassium may give striking results (87). Cort and Matthews (35) report several cases showing a decrease of sodium retention to almost balance and its reappearance in an increasing urinary volume,

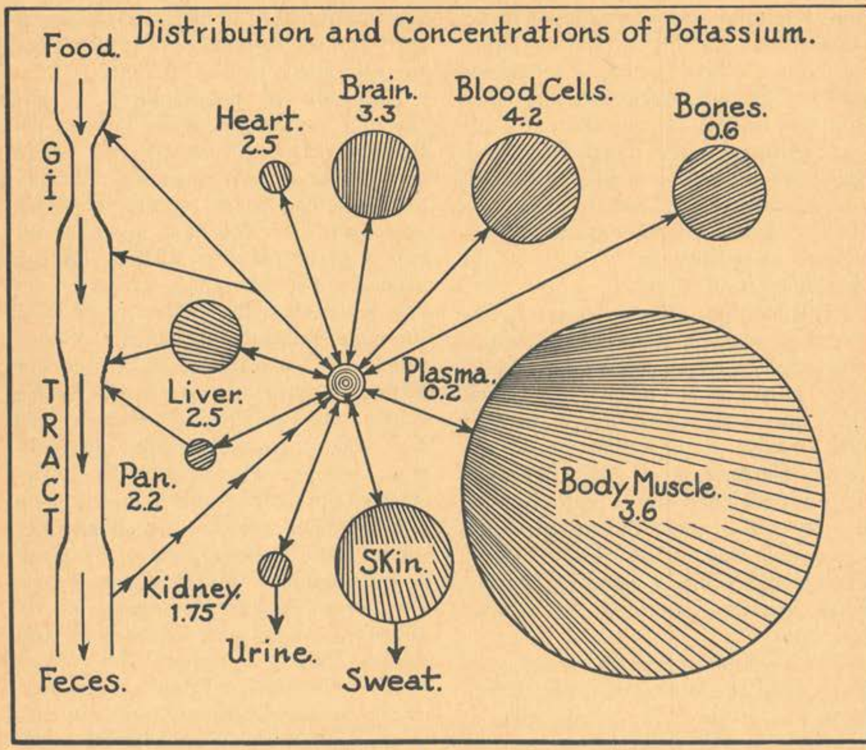

Fig. 1

an immediate shift from a negative to a positive potassium balance, while the plasma potassium remained almost constant and the plasma sodium increased by a third. These changes, with the correction of the edema, indicate that potassium was being taken up by intracellular compounds and was no longer osmotically active.

Other involvements with the heart include a local excitant action from locally liberated potassium (79), and cardiospasm reportedly caused by hypopotassemia (9). The cardiospasm may have been the result rather than the cause. Bacchus (7) reports cardiac mass being reduced by potassium chloride administration. Toxicity of digitalis is reduced by potassium therapy (107, 125, 174).

There is no evidence of storage of potassium as such in the liver (86) but there is considerable movement in and out. When food materials accompany it, the liver increases in size with increases in water, potassium, acid-soluble phosphorus, and glycogen (54). Glucose alone will cause a transfer from the plasma to the liver. This has been used to combat excesses in the plasma. Stewart, et al. (159) report a severe loss of potassium when liver function is disturbed. When function is reestablished, the loss is replaced. In cirrhosis of the liver, potassium has aided in recovery (4) but in later phases of the disease the deficit is not correctible (1).

This relation to carbohydrate is better understood from a study of yeast metabolism. In 1934 Lasnitzki and Azörényi (100) demonstrated stimulation of yeast growth by potassium and magnesium. The following year they (101) extended the work to include the rate of alcoholic fermentation. Later Rothstein and Haege (142) studied it more intensively and found that potassium retention was proportional to the carbohydrate stored, starvation depleting both. When glucose is fermented without growth, potassium is taken from the media during the early uptake of sugar and released as it is changed to alcohol or acid. This holds for both yeasts (135) and bacteria (14). Most of these workers consider this uptake of potassium to be part of the phosphorylation reactions.

Consideration of the pancreas includes its control of carbohydrate metabolism. A recent symposium (130) gives most of its features. Verzár (164) found that potassium is utilized with glucose in the formation of glycogen. Gardner, et al. (67) report potassium deficiency causes high glycogen in liver and muscle during the early stages, followed by its disappearance. They consider this a part of a chronic alarm reaction involving the adrenal hormones.

The injection of insulin causes a decrease in plasma and cerebrospinal fluid potassium levels (11). This effect is enhanced by the inclusion of glucose. It can lead to hypopotassemia which is part of insulin shock. This balance of glucose, insulin, and potassium is being used in treating the diabetic patient (25, 36, 134). To summarize these, the lack of utilization or storage of sugar leads to potassium accumulation in the plasma, unless there are excessive losses from vomiting. Many of the diabetic symptoms are due to this accumulation which may be the immediate cause of death in diabetic coma. Upon insulin administration the plasma concentration falls and deficiency develops unless corrected. Potassium should be given some time after insulin, never before. Glucose may be used to combat hyperpotassemia, otherwise potassium should be used with it in amounts indicated. Serum potassium determinations have been suggested, along with glucose determinations, as a measure of the effectiveness of therapy (2). The cardiographic changes reflect the potassium alterations (82). These considerations hold for the ketogenic as well as for the glycogenic type of diabetes (5).

Excretion of potassium is largely through the kidney, particularly in deficiency states. Normally this organ can excrete sodium or conserve it completely as conditions require; but with potassium there is a basal loss of about half a gram per liter (108). During experimental deficiency, urinary level was lower than the plasma level (57), showing reabsorption by the kidney tubules. This reabsorption was greater during the replacement period. Anuria is the only complete conservation and is a serious contraindication to potassium therapy. Hyperpotassemia is frequently the fatal feature of anuria. On establishment of diuresis, hypopotassemia should be anticipated (16). Faulty renal tubular function causes excessive potassium losses by decreasing reabsorption (45), acidosis develops, and dietary intake is reduced by nausea (146). In this condition a large part of the muscle potassium is lost but that of the kidney shows an increase (59). This may be a protective mechanism to keep the kidney functioning as long as possible. Associated with it we find kidney enlargement (60).

The kidneys regulate the fluid and electrolyte balance of the body (19) and in disease this balance is lost (172). The Yale workers (33) have recently shown that potassium is necessary for this control and that citrate and possibly other organic anions are excreted to conserve chlorides when necessary. Ammonia is excreted when base conservation is required.

Another route of excretion is through the skin. Here a high potassium to sodium ratio is found (14) and may be related to heat prostration caused by excessive perspiration.

Special Conditions

The devitalization and destruction of tissue by mechanical, chemical, or thermal means completely disrupts the

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The Benedict Farm—1952-1956

By F. T. Tremblay

Washington Cooperative Farmers Association, Seattle, Washington

"WITHOUT the Five-year Plan we started on in 1952 we wouldn't have been able to survive under farming conditions which have existed for the last few years." Such was Brad Benedict's comment when we visited his thriving dairy enterprise in Whatcom County, Washington, in the summer of 1956. Looking over his lush green fields and watching the cattle feed knee-deep in forage, it was hard to believe that this was the same rundown farm that was picked for the Pacific Northwest Soil Improvement Committee project several years ago. Under the able guidance of County Agent LeVern Freimann and his committee of farmers and government and industry technical men, the Benedicts have realized a lifelong ambition to operate a successful dairy enterprise.

When the Committee selected the farm in 1951 for demonstration purposes, it consisted of four fields on two major soil types. Field A consisted of 14 acres of old sod on an acid peat soil; Field B consisted of a little over 10 acres of plowed peat soil; Field C, 14 acres, and Field D, 16 acres, were sandy upland soils of about pH 5.5 where an unimproved pasture was struggling to produce forage. There was no doubt that this farm was in trouble unless it could be radically changed to meet the new challenges of modern farming. The Committee set forth with considerable enthusiasm to plan a mode of operations to get the farm improvement plan under way.

It was decided that Field A should be used to carry the herd until new seedings could be established on the uplands. Consequently a fertilizer containing 30 lbs. N, 60 lbs. P_2O_5, and 60 lbs. K_2O was applied in March to increase the yield of pasture on the old peat sod. A supplementary application of 30 lbs. nitrogen was used later in the season to provide additional forage. Brad commented later that if the farm improvement plan had done nothing else but demonstrate how this old sod would respond to fertilization, it would have served its purpose. Five years later, this old sod is still pushing out excellent yields under the new fertility program.

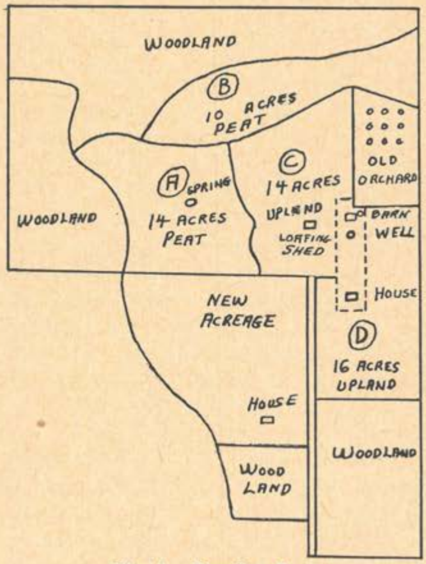

Fig. 1. Benedict Farm 1956

Basic Seeding and Fertility Program

The standard recommendation for seeding irrigated pastures in western Washington is to use orchardgrass (10 lbs.) and ladino clover (2 lbs.). Consequently after applying the standard fertilizer recommendation for a new seeding, 30 lbs. N, 60 lbs. P_2O_5, and 60 lbs. K_2O, a cultipack type seeder was used to seed down this mixture on Field D in April. This field was cut for silage in July and was ready for permanent pasture early in August. Supplemental nitrogen applications were made to this field in July through the irrigation system.

One of the big problems on the farm was to get sufficient forage of one type or another until the ladino-orchard field was ready. Since production of a certain amount of hay was also a prime requisite of the program, it was decided to seed Field C to red clover (6 lbs.) and ryegrass (8 lbs.). Prior to seeding this field a basic 30-60-60 fertilizer mixture was applied broadcast and harrowed in. An additional 30 lbs. nitrogen was applied about six weeks later. Field C was a lifesaver as far as producing forage was concerned. In the first three months of the program it was used for silage, temporary pasture and cut for hay.

Field B was seeded to oats at the rate of 125 lbs. per acre and an initial application of 25 lbs. N, 50 lbs. P_2O_5, and 50 lbs. K_2O was used. An excellent crop of oat silage was harvested from this field.

Irrigation Requirements

The average annual precipitation in the area surrounding the Benedict farm is about 34″. During the months of July and August it receives only about 1″ of rainfall. Thus during these peak months of production, natural soil moisture is not capable of producing crops on these sandy upland soils.

Fortunately water is not far from the surface in this area. Brad and Barbara Benedict were able to use their own equipment and ingenuity to start the well-digging operation, and it was finished up by a local well-drilling outfit. The cost of the well was about $500. About $2,400 worth of irrigation equipment was bought to irrigate the upland soils. Until just recently this one well has been their only source of water. During the recent dry years they have found need for additional water to cover the pastures on the peat soil, and were able to make use of a natural spring near Field A. Consequently a supplementary gasoline motor and pump were set up and with some extra mainline and laterals Brad has been able to irrigate a good section of the peat area. He now irrigates 60 acres as compared to 30 acres at the beginning of the program.

Brad normally irrigates one acre at a setting, about eight hours a set and three sets a day. His method of irrigating on the porous sandy upland soils is less water and more often, as compared to the peat soils which can be loaded up with water and will hold it for a much longer period of time.

Equipment Required

One of the big problems in setting up a demonstration farm such as this was to handle the large increases in forage with a minimum amount of work and equipment. While the Benedicts informed us that they were never able to keep their own labor to a minimum, and that good hard work was necessary to keep the program rolling, they have gotten by with a minimum of equipment.

When the program started they had little more than a tractor, disc, and harrow. In order to handle the production of forage, they found it necessary to invest in a field chopper and wagons, side delivery rake and mower, blower complete with motor, and the irrigation equipment we have mentioned before. At the beginning of the program they also bought a fertilizer spreader. While they do not get 100% efficiency out of the spreader, because it is used only in the spring of the year, it has become a community spreader and the Benedicts lend it to their neighbors, who are able to prolong its usefulness.

In addition to the above equipment, the Benedicts have also built a milk house and a large loafing shed, where

Fig. 2. The Benedict herd on orchardgrass-ladino clover pasture (Field D).

hay is also stored. The original upright silo on the farm holds about 60 tons of silage. At the beginning of the program they used a pit silo to hold the excess silage. At the present time they are using a stack silo, and within a short period of time will install a self-feeding bunker silo with a cement bottom.

By the use of equipment and with occasional help from the neighbors Brad has been able to get by with a minimum of outside labor. At the present time they employ neighbor boys of teen age to help them throughout the summer. When the herd increases to 40 head or more Brad anticipates getting a hired man.

Many things have happened to the Benedicts during the years 1952-1956.

Fig. 3. The irrigation system in Field D.

TABLE I.—STATISTICAL DATA ON THE BENEDICT FARM FROM 1952-1956.

	1951	1952	1953	1954	1955	1956
Cultivated acres	54	54	54	60	60	80
Av. No. of cows	14	16	24	25	27	30
Butter fat per cow	280	349	391	390	385	435*
Total milk	84,056	121,330	174,306	194,200	215,900	262,100*
Lbs. milk per acre	1,557	2,247	3,228	3,236	3,598	3,274
Silage	49	123	340	350	412	360
Hay	26	34	30	25	25	50
Pasture (cow days)	1,342	3,573	5,676	6,960	8,648	10,800

* Estimate

They have had to change their operations to meet changing conditions and have had to solve basic problems as they arose. One of the unfortunate things that happened to the program during the second year was the procurement of 12 additional stock that gave very unsatisfactory production on the heavy forage diet. Nearly all of these animals had to be culled out and replaced. At the present time the Benedicts have a nice crop of young stock with which to make replacements when necessary and to build up the size of the herd.

As a whole the statistics look good (Table I). The number of cows has increased, and very substantial gains in butterfat and milk production have been realized. A ninefold increase has been obtained as far as the number of cow days on the pasture is concerned. A similar increase in silage production has been obtained. All the statistics are not in the data sheet. For instance, in addition to the 30 head of milk cows in 1956, the Benedicts have 8 head of heifers and 35 young stock.

While the 1956 figures look good, they are not nearly what they should be, because last year's devastating fall killed off much of the ladino clover in the pastures and heaved the ground, causing considerable damage to the grass roots. The killing effects of the

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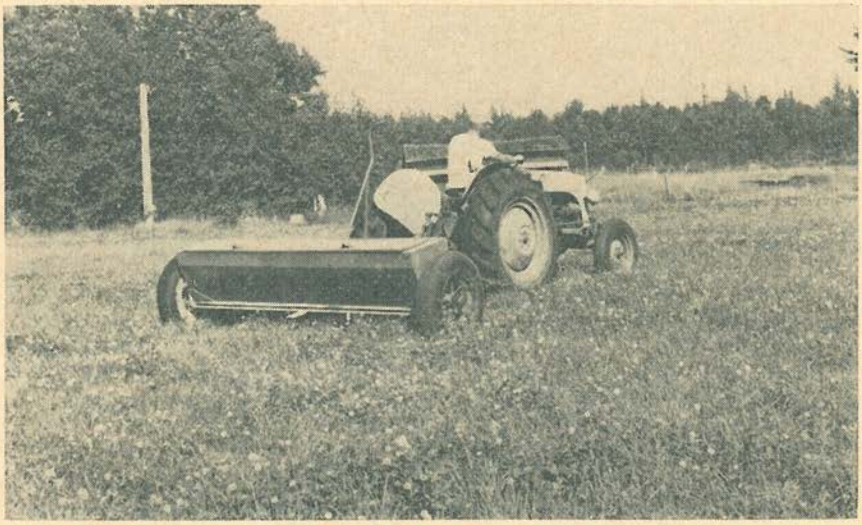

Fig. 4. Brad Benedict applying fertilizer.

Limestone—a Problem Again

By H. J. Snider

2294 N. Union Street, Decatur, Illinois

IN the early part of the present century, clover failures began to present a serious farm problem. The various experiment stations were just getting on their feet and were able to look into the matter. Then came the need to educate farmers to lime their land that they might be able to again grow clovers.

This was a tremendous task in that early day. In 1906 Illinois farmers used only 122 tons, about three carloads, of limestone on their land. This tonnage was infinitesimal compared to the amounts needed on the several million acres of acid soils in the State. Ten years later Illinois farmers had been induced to use in a single year 94,000 tons of ground limestone. Then came the war years and the call for greater farm production. The next 10 years brought the annual amount up to 800,000 tons of limestone.

Low Point Occurred in 1932

The 10 years ending 1935 brought a decline to 380,000 tons used in a single year (1935). The low point was in 1932 when only about 165,000 tons were used on Illinois farms.

In 1945 Illinois farmers used 4,290,000 tons of limestone. This increase continued through 1946 when over 5.5 million tons were used in one year. From this point there has been a decline. By 1954 the amount used in a single year had dropped to 2,614,000 tons.

The acreage of alfalfa in Illinois has coincided somewhat with the tonnage of limestone used. In 1909 there were reported 18,000 acres of alfalfa in the State and by 1920, around 100,000 acres. In 1935 the total was 500,000, and the number varied around half a million up to 1948 when such crop records were no longer available. Sweet clover acreage had a more spectacular rise than did alfalfa. In 1919 there were reported 48,000 acres of sweet clover and by 1937, nearly a million. The acreage has varied around a million acres up to 1948 when such data on this legume were no longer available.

The decline in the use of limestone comes at a time when soil testing has reached a high point. In 1943 the Illinois Soil Testing Service, under the direction of Professor A. U. Thor, tested 50,000 acres of farm land and there was only one testing laboratory in the State. Twelve years later (1954) there were added 83 Farm Bureau laboratories for testing soils in various counties and in addition there were 50 commercial firms with equipment and trained personnel. In 1954 more than 1,685,000 acres of farm land were tested for limestone requirements and also for the need of phosphate and potash. In spite of this only 2,614,000 tons of limestone were used in 1954.

12 Million Acres Need Lime

On the basis of tests in various Illinois counties, it is estimated that there are more than 12 million acres of acid soils which are badly in need of limestone. This is 48% of the total arable land in the State. The lime-deficient acres are those requiring 2 to 5 tons to correct the acidity. These results indicate that Illinois farms need an additional 30 to 40 million tons of limestone. This amount would take care of the very acid land but does not

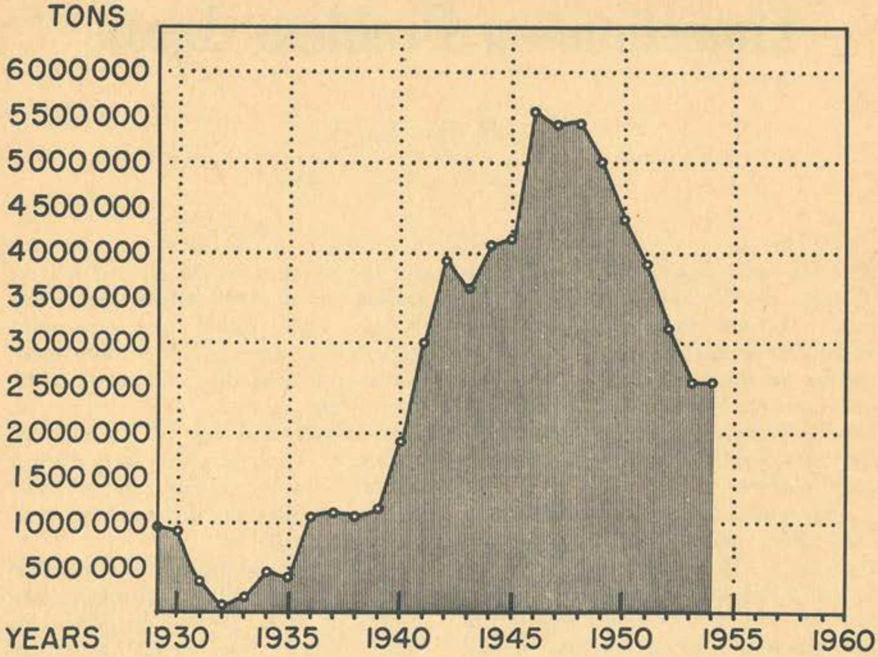

Fig. 1. This chart shows the tons of limestone used on Illinois farms from 1930 to 1954 inclusive. Is the decline from 1946 to 1954 only temporary and will the curve again swing back to the higher levels?

include the acres in need of 1 to 2 tons an acre.

At the rate limestone is being added, many acres of land already treated will be in need of additional lime before the total acreage is covered. Professor Stanley A. Barber at Purdue University presents results showing that 1.5 and 3-ton applications maintained a high level of production for 10 to 15 years. These results indicated that where smaller amounts are used, additional lime would be profitable after 10 to 15 years had elapsed. Where a 12-ton application was used, high acre returns were maintained for 20 years, and after 25 years this heavy application was still able to give reasonably good acre returns.

The question arises, have farmers found limestone applications to be less profitable than other forms of soil treatment of this nature? In some Illinois field tests on light-colored soils very much in need of lime, phosphate, and potash, these materials gave the following annual acre returns: limestone $18.25, phosphate $5.65, and potash $17.00 an acre. These values represent an average of 8 years in a rotation of corn, soybeans, wheat, legume-grass hay. On the more productive dark-colored Illinois soils the acre returns were as follows: limestone $15.30, phosphate $7.80, and potash $7.15 an acre each year. These results indicate that limestone has a high profit rating when compared to phosphate and potash.

It could hardly be expected that a fertilizer dealer or agent would insist on selling a farmer limestone before he would sell him fertilizer although such a transaction might eventually be to the advantage of both parties. The Ohio Station in its Agronomy Handbook has this to say: "Plots receiving limestone only, produced larger yields of all crops than did the plots receiving

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SOIL—An Expandable New England Resource[1]

By C. L. W. Swanson

Soils Department, Connecticut Agricultural Experiment Station, New Haven, Connecticut

ALMOST everyone is familiar with Horace Greeley's advice in 1859 when he said, "Go west young man." There is more to this admonition that is not so generally known—"and grow up with the country."

We had a frontier then, a vast resource of exploitable resources. The venturesome thing to do was to go West. A fortune and in many cases your life were at stake. Our hardy pioneers went forward. We all know what they did and that they succeeded well.

Now we have no frontiers. But frontiers aren't so important now, for we can just about make our good earth to order.

Natural Advantages of West No More

From the conservationist's viewpoint the natural advantages existing when the West was young are no more. Soil-wise this is especially true. Our soils in the breadbasket area in the Midwest aren't as fertile as they once were. Fertilizers are a recent innovation there, especially in the western Corn Belt.

I am not very old but even in my boyhood days on the farm in northwest Iowa, no one ever thought of

[1] Presented at the 123rd quarterly meeting of The New England Council, Poland Spring, Maine, at a symposium on "Greater Utilization of Our Natural Resources" June 15, 1956.

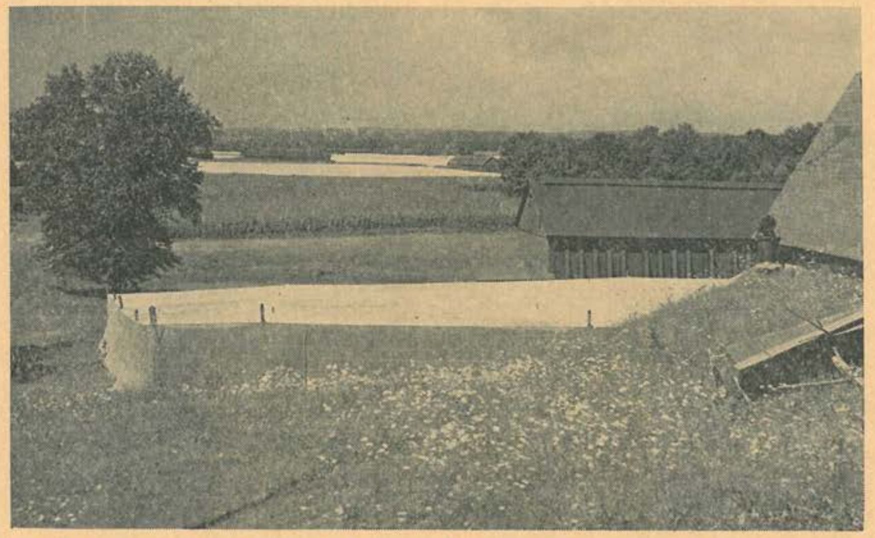

Fig. 1. Growing shade tobacco under cheesecloth tents in the Connecticut Valley is an example of intensive agriculture in New England.

using fertilizer. They didn't think they needed any. The soils had been farmed only about 75 years and fertility-wise they were in pretty good shape. Furthermore, you couldn't buy fertilizer in the local store even if you wanted to.

Fertilizers in those days meant manure. The more demonstrative person would hold his nose to indicate the pungent odor coming from a manure pile. Few knew then that the gas causing this odor would some day be produced commercially and piped into the soil. Today, in traveling through the Corn and Cotton Belts, it is a common sight to see anhydrous ammonia applied as a gas to the soil by pipes attached to the cultivator shovel.

Concepts on Soil Fertility Changed

The fact that our concepts on soil fertility have changed is helpful to New England's agriculture. We used to depend first on the fertility of the soil, and second, on commercial fertilizers as a last resort for improving yields. New England's soils are naturally infertile, that is, infertile in the sense that we cannot produce bumper crops without using commercial fertilizers, hence the great agricultural hegira westward about 1870. Now forward farmers to boost yields are using fertilizers every year to supplement whatever natural fertility there may be in their soils. Soils don't have to be naturally fertile to produce, as once thought.

Marginal Land Needs Redefining

Along with our new concepts of soil fertility and management, we need to redefine what we mean by "marginal land." Marginal land from a soils viewpoint in its present connotation refers to the natural fertility in the soil. If it doesn't have much natural fertility, it is marginal land.

Today, whether or not land is marginal depends more on physical rather

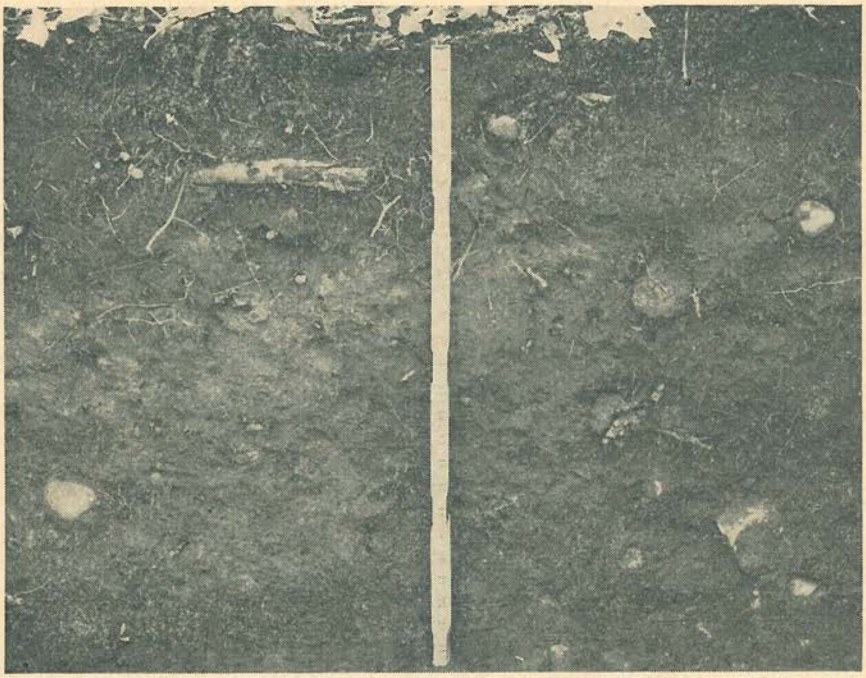

Fig. 2. Cheshire fine sandy loam—a typical profile in New England. As much as 20% of the soil consists of material larger than 2 mm. in diameter.

Fig. 3. Dairying is an important farming enterprise in New England.

than chemical factors—such physical factors as stoniness, thin profile, erosion, droughtiness, slope, etc. Physical factors are often limiting to the point that supplying the fertility in chemical form in conjunction with proper soil management will still not give fertile, productive soils.

Without fertilizers, many of our soils in New England would be in the marginal land class. The original topsoil produced under the prevalent forest is only 2 to 4 inches thick. Not only is the topsoil thin, but it also is naturally infertile. Organic acids and high rainfall have leached our soils of plant nutrients such as calcium, magnesium, and potassium. Actually, the upper part of the subsoil has been incorporated with the topsoil to make a "man made" topsoil.

In the Corn Belt, however, there are deep topsoils and "built-in" natural fertility. In New England, the fertility is "built into" the soil. However, many of the Corn Belt soils are now having fertility "built into" them by the use of fertilizers.

In being able to build in fertility, we can use our soils harder for the Nation's good. It means, too, that New England's soils can be used more intensively. Actually, since fertilizers have been used longer in New England than in other sections of the country, studies show that these soils in many cases are more productive now than they ever were. Some of the plant nutrients have been added in such large amounts that they have accumulated in the soil.

High Value Crops in New England

High income per acre crops such as tobacco, vegetables, and grass are grown in New England. If one uses the 1950 census data as a base, the intensive nature of our agriculture is evident. When the states are ranked in order of average gross income per acre from farming, the first five and the tenth are in the Northeast. The top states are New Jersey leading with $161 per acre, then Delaware, Connecticut, Massachusetts, and Rhode Island fifth with $84. California and Iowa are next, being tied with $58 per acre. Pennsylvania ranks tenth at $51.

According to the Federal Reserve Bank of Boston, in 1955 New England farmers fared better than other farmers in the Nation. Cash receipts were up 8% over 1954. This compares with a 2.6% decline for the United States as a whole.

Favorable Factors in New England

The high productive capacity of our New England soils certainly is not related to their natural fertility. Several factors to account for this are evident. Productive scientific agriculture has to be practiced. In order to produce, fertilizers are used liberally. As much as 200 pounds of nitrogen, 120 pounds of phosphoric acid, and 200 pounds of potash per acre are applied annually to shade-grown tobacco in the Connecticut Valley. With the analyses ordinarily used, this amounts to about 3,500 pounds of fertilizer.

Relative abundance of water is another factor favoring New England. Rainfall averages from 35 to 40 inches in the northern section to 45 to 50 inches a year in southern New England. In only a few areas have the water tables been lowered by pumping, as in irrigated areas in the Far West. Since sprinkler-type irrigation is generally used for supplemental purposes, land does not need to be leveled as in the Far West.

Evaporation is much less in New England, being about 30 inches during May to October compared with as high as 65 inches in the Plain States. These high evaporation rates in the irrigated areas mean applying more water, which adds to the cost of crop raising.

In New England, no salts accumulate in soils as in the Far West. Generally the soils are more porous. Rainfall or irrigation waters are not impeded in their downward movement by soil swelling, closing the soil pores. Usually the dry area soils are high in sodium salts which on wetting disperse soil colloids, causing soil swelling.

With lowered soil organic matter incident to continued cultivation, soil structure has probably deteriorated more in the Corn Belt. The majority of soils in the breadbasket area are fine-textured, thereby being more favorable for development of poor structure. Generally little organic matter is returned to the soils and they become poor physically. Although we have structure problems in New England, on our sandy-textured soils they are not as acute as on the silty, clayey soils in the Midwest.

The fact that our soils are sandy-textured and low in clay has other advantages. In most any other section of the country, one can drive down a dirt road and virtually get lost in the dust, especially if following another car. With most of our soils having less than 10% clay, there isn't much fine material to fly around. Also, our research shows that we don't have the sticky kind of clay. This means a cleaner, neater looking countryside—something for which New England is noted. Perhaps the low clay content of our soils is something our development people should advertise as another reason for coming to New England.

Unfavorable Factors

Some say that cities are using up our land. They are. Good agricultural land is being used for industrial and home sites. Land adjacent, as good for either use, is oftentimes left idle. Just because our good agricultural land is being used up by industry and by home-owners is no reason for it to continue.

According to a study made by the Soil Conservation Service [2] 15,000 acres of land suitable for cultivation are converted to non-agricultural uses in New England each year. This is over 23 square miles a year, and it does not represent the total conversion.

Why should we be concerned about this? As cultivable land shifts to other uses, and as food demands increase,

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[2] D. A. Williams. Fact sheet; conversion of cultivable land to other uses. Soil Conservation Service. Processed. 1955.

Southern Agriculture Moves Into High Gear

By T. S. Buie

Soil Conservation Service, Columbia, South Carolina

FOR many decades the economy of the Southeast was geared to cotton—a crop planted and cultivated with one-row equipment, fertilized with no more than 300 to 400 pounds of low-grade fertilizer per acre, and picked by hand. As long as this situation existed, our agriculture moved in low gear—at a pace comparable to that of a slow-walking mule pulling a plow alongside a row of cotton, followed by a man who was in no more of a hurry than the mule. It made little difference how many acres of cropland there might be in a farm. Whether 25 or 1,000, it was organized into units of approximately 25 acres, each tended by a man and his family using a single mule and one-animal equipment.

The range of crops was extremely limited and consisted mostly of cotton for cash or to pay debts, a few acres of corn and oats for animal feed, and patches of peas, potatoes, and other miscellaneous food crops for the family. We thought we used a lot of fertilizer when in the early decades of this century the Carolinas and Georgia together used about three million tons—mostly for cotton—and that amounted to almost one half of the total used in the United States.

A Change Has Come

But changes have come about in the agriculture of the Southeastern States

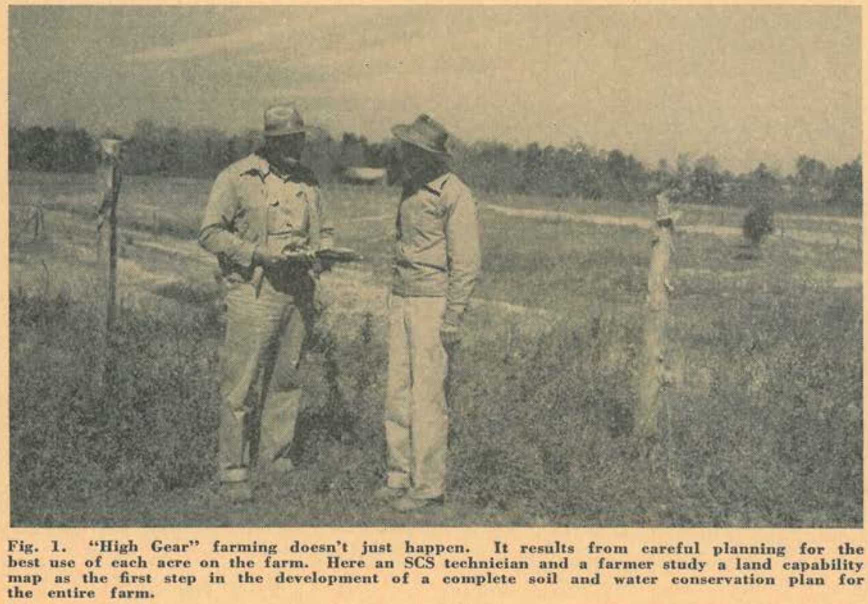

Fig. 1. "High Gear" farming doesn't just happen. It results from careful planning for the best use of each acre on the farm. Here an SCS technician and a farmer study a land capability map as the first step in the development of a complete soil and water conservation plan for the entire farm.

within the past 20 years, changes so great that even most of us who live here do not fully comprehend their meaning. We have not yet fully realized the "higher gear" in which our agriculture now is operating. Many seemingly unrelated factors have worked to bring about these changes—such things as the boll weevil, increased production of textiles other than cotton, movement of people from farm to factory, mechanization of agriculture, increased use of commercial fertilizer, better understanding of proper land use, the adoption of sound soil and water conservation practices, the introduction of new crops and improved varieties of old ones, and other technological developments, many of which have become normal farm practice.

As one travels along the highways at the legal speed limit, or even above, there are many scenes which bear evidence of these changes, things like grassed slopes instead of barren, washed-away hillsides, newly constructed fences behind which graze sleek herds of cattle, abandoned tenant houses bulging with hay, and farm ponds to provide water for livestock, irrigation, and wholesome recreation.

Not too many years ago row crops were considered the basis of Southern agriculture, and the worth of every farm was reckoned by the number of acres of cotton or in certain sections tobacco or peanuts. Now, however, it is not unusual to find farms on which no cotton, corn, or other row crop is being grown.

The pride and joy of a Southern farmer often was his "spanking" pair of well-matched mules. But today many a farmer will tell you that he has but one old mule on the farm and keeps him only because of what he has done and possibly to plow the garden.

Probably these changes in Southern agriculture are due as much to the introduction of grass into our system of agriculture as to any one thing. Grass, despised by Southern farmers as a devouring enemy and fought by them from dawn to dusk every day through many long hot summers, now is being planted, cultivated, and—of all things—fertilized, with liberal amounts of complete fertilizer and supplemental nitrogen. Who ever would have thought that Southern farmers would buy Bermuda grass stolons, set them out with tender care, and apply more fertilizer per acre than they ever put under cotton!

Cotton Then—Grass Now

We cannot properly evaluate the place of grass in the South today unless we recognize and appreciate the significant role cotton played for more than a century in the economy of individual farmers and of the area as a whole. Early in the South's agricultural development, cotton assumed a position of dominance and for many years served, and served well, the entire nation. During the 75 years from 1865 to 1940 this crop not only dominated Southern agriculture, but it had a marked effect upon the economy of the entire country. The value of cotton exports from the United States during these years (omitting the war years of 1915 to 1920) almost exactly equaled our favorable trade balance during the same period.

Throughout the years many agricultural leaders urged diversification, a shift to livestock and crops other than cotton. But for the most part their advice went unheeded. It was unheeded largely because there was no ready market for anything but cotton. And the seemingly ever-increasing demand for the fleecy staple caused it to overshadow all other crops. Also, the abundance of labor made a shift to other less labor-consuming activities inadvisable. Still another reason why our Southern farmers were unable to turn to a grassland type of agriculture was that they had no productive grasses adapted to their hot summers. All conditions favored cotton, and cotton was grown.

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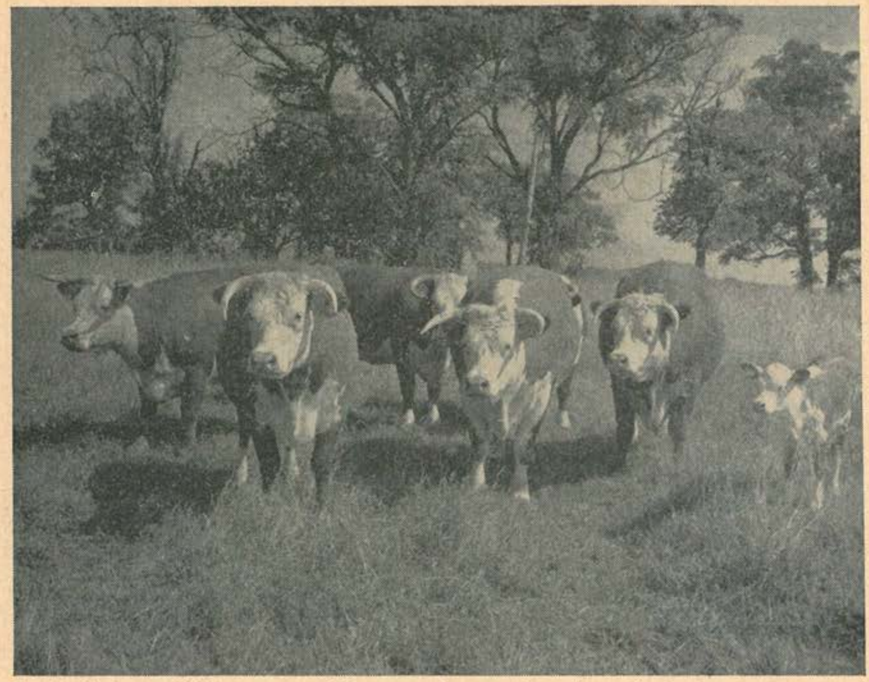

Fig. 2. Sericea and fescue are enabling many farmers throughout the South to move toward a "High Gear" type of agriculture.

Fig. 3. For high-quality vegetables, many truck growers are finding supplemental irrigation not only advisable but necessary.

Fig. 4. Trees and pasture, or pecans and clover, is all the legend needed for this picture taken in South Carolina.

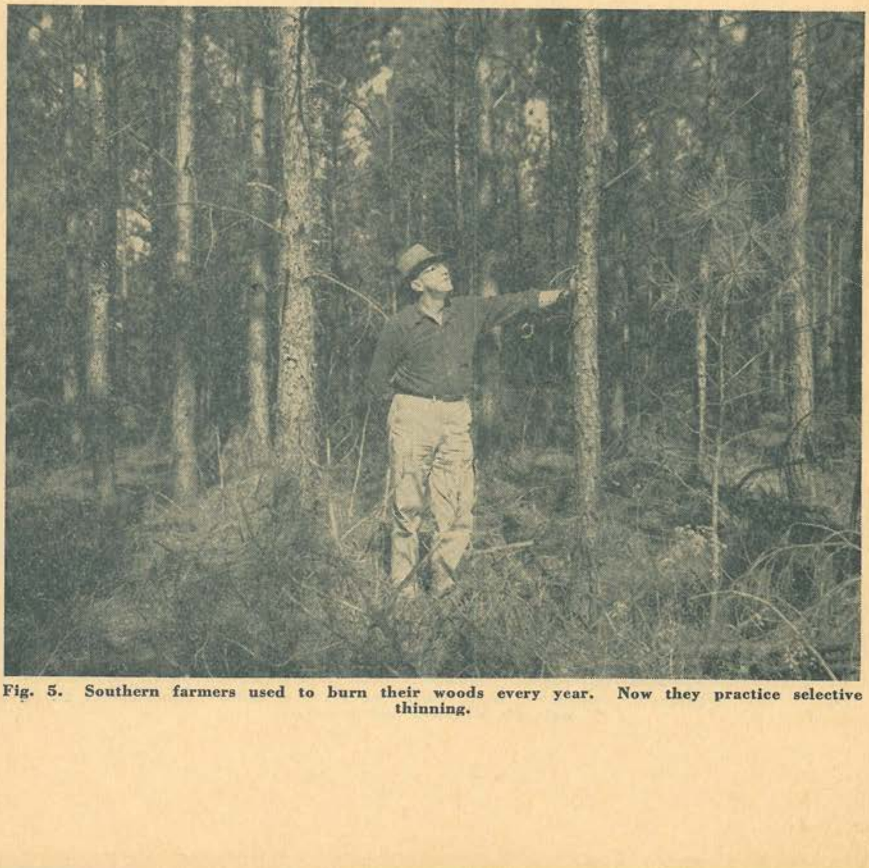

Fig. 5. Southern farmers used to burn their woods every year. Now they practice selective thinning.

Fig. 6. Southern orchardists are fast learning that the best and most modern way to grow peaches and other fruit is on the contour.

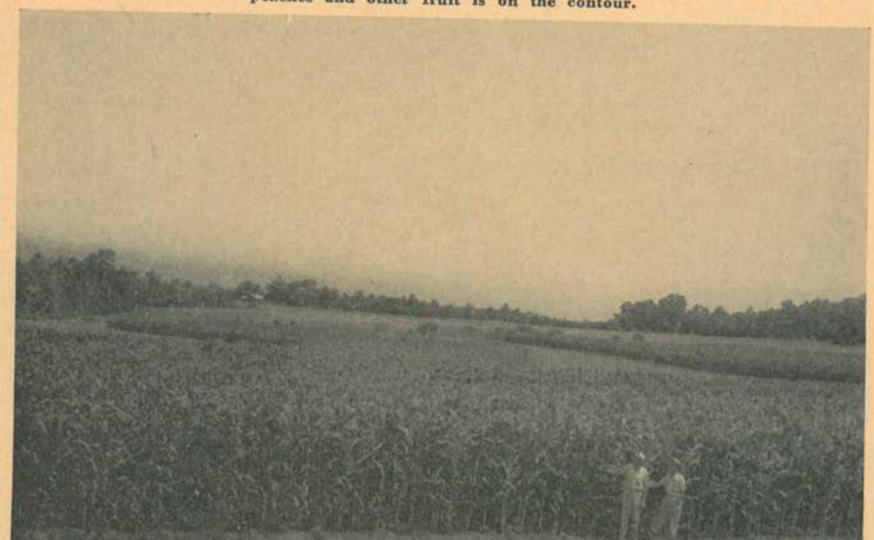

Fig. 7. Farmers who use plenty of fertilizer and good conservation practices no longer apologize for low corn yields.

Fig. 8. For generations Southern cotton farmers fought grass from "kin to kaint"—all day long, every summer. Now they plant it.

Fig. 9. Tobacco farmers find that it pays to raise their crops on land which has been in sod for three or more years.

The Editors Talk

Our Cover Picture

The bunch of bloom at the left in the cover illustration of this issue is pretty, but it's starved. The foliage is hairy vetch, and it is starved for potash. The bunch at the right of the illustration is from healthy, well-fed plants.

Since the leaflets are so small, it takes close examination to see the rolling and marginal firing which are typical of potash starvation. These symptoms are somewhat similar to the potash-deficiency symptoms on soybeans and a number of other legumes. The small leaflets first show a chlorotic condition around the margins, which is followed by the rolling and in the late stages the typical marginal firing.

The vetch at the left received only basic slag as a fertilizer. Many Southern farmers use only basic slag at planting time and wait until the vetch is plowed under on cotton land to apply the potash. It is felt that this is a mistake since the potash is needed for producing good vetch and would produce more cotton if applied under the vetch. Some farmers apply potash under the vetch and then a complete fertilizer at cotton planting time.

The crop is drought-resistant and especially suited to sandy or sandy loam soils, but it grows well on nearly all productive soils if well-drained. A soil test should be made prior to planting and the necessary fertilizer applied as recommended.

There are many species of vetch that are important to American agriculture. All are annuals except hairy, which may be treated either as an annual or biennial depending upon its use. It also is the only winter-hardy species and is commonly used for fall seeding north of the areas of the other species, which are primarily adapted to regions with mild winter temperatures such as the Southern States, the Pacific Coast, and the Coastal Plain area along the Atlantic seaboard.

Vetch will fit into many rotations. In the Southeast it can be used as a winter crop and followed by summer hay, pasture, or other crops. Hairy vetch is similarly used in the North.

The most important uses of vetch are for cover, green manure, and soil improvement. All vetches, however, make good hay, silage, pasture, and soiling crops. Probably the greatest use of vetch is for green manure. In the South it makes up a major part of the green-manure and cover-crop acreage of that region. For pasture, the vetches alone or in mixture with small grains or ryegrass provide winter and early spring grazing. They stand trampling and are well suited for pasture. Seed of several varieties is produced in the United States, but much seed is imported from Europe. The seed is used as one the ingredients of ground poultry feed, which frequently is an outlet for surplus stocks.

Vetch makes a high-quality hay that compares favorably with alfalfa. It is high in protein and ash content and somewhat lower in crude fiber. As silage it compares favorably with corn, although it is lower in energy content. Both the hay and silage are relished by cattle, horses, and sheep.

Grandpa Had to Give In

From "The Agricultural Situation" published by The Corn Belt Farm Dailies, we are borrowing for our readers the following interesting comment on farm mechanization:

"Remember not so many years ago how Grandpa used to pooh-pooh those mechanical gadgets when they first started appearing on the farm? How he used to chuckle to himself when the wheeled monstrosities would get hopelessly mired down in the mud or slip off in the ditch and have to call for help? And how he resisted, even after machines had put the skids under the equine-work era, the fact that his team of big bay horses couldn't pull the dickens out of any old tractor any day and do twice as much work, besides?

"Somehow, he could never see farming taking on mechanical dimensions, and somehow, a motor's roar and exhaust fumes never quite went with a field of golden grain or sod to be 'busted.' Yes, Grandpa was wrong, in things, even if the husky bays had no peer for nobility and beauty. He would be aghast, perhaps, at what has happened. Scarcely a bay or sorrel in serious harness to be found, and Junior wouldn't know a fetlock from a hamestrap or singletree.

"Yes, machine power on the farm is here to stay, and the extent and breadth of it even amaze us moderns when we reflect on it. One authority puts the value of machinery on the farm today at $17.7 billion, and says that this is $10 billion more than the net investment in the steel industry and five times the investment in the automobile industry. Tractor power capacity, he says, is 13 times greater than all the water power in the country.

"Even Grandpa would have to admit 'that's some pumpkins.' It's power, to be sure, and it gets things done in a day or two that Grandpa and his handsome bays couldn't fathom in a month of Sundays. Not as colorful as the bays, perhaps, but more effective. And that's what counts these days."

"NO other word than *revolution* describes the changes that have occurred from the farming methods of only a few years ago. The Department of Agriculture provides a whole host of services which help bring the fruits of this agricultural revolution to those who produce and those who consume our farm products. The meat we ate today was inspected by the Department of Agriculture to assure its wholesomeness. The farmer who produced it had access to our research on breeding, nutrition, sanitation, and management. He undoubtedly used our market reporting service. He may have consulted his county agricultural agent on problems of disease control or balanced rations. All of this means greater efficiency, better food, and a rising level of living.

"But it means that today's farmer is a businessman. He has problems of using capital wisely, problems of maintaining a skilled labor force and meeting its cost, and problems of cost of goods purchased. In addition he has all the problems centered around a biological industry that is affected by too much rain or too little, by hail, or frost, or insects, or disease. And he has the price problems that haunt the producer of raw materials, that cause his prices to change most sharply, and catch him—as now—in a squeeze between prices that have dropped and costs that have not.

"Our agricultural practices of only a few years ago are now almost ancient history—because change has come so fast. Anyone who now farmed with prewar methods, prewar efficiency, and prewar machines would be almost doomed to failure. And in the years ahead, if our agriculture remains dynamic, the same would be true for anyone who continued today's methods unchanged."

—Secretary of Agriculture Ezra Taft Benson.

Season Average Prices Received by Farmers for Specified Commodities *

Crop Year	Cotton Cents per lb. Aug.-July	Tobacco Cents per lb.	Potatoes Cents per bu. July-June	Sweet Potatoes Cents per bu. July-June	Corn Cents per bu. Oct.-Sept.	Wheat Cents per bu. July-June	Hay [1] Dollars per ton July-June	Cottonseed Dollars per ton July-June	Truck Crops ....
Av. Aug. 1909–July 1914....	12.4	10.0	69.7	87.8	64.2	88.4	11.87	22.55	....
1930..........	9.5	12.8	91.2	108.1	59.8	67.1	11.06	22.04	....
1931..........	5.7	8.2	46.0	72.6	32.0	39.0	8.69	8.97	....
1932..........	6.5	10.5	38.0	54.2	31.9	28.2	6.20	10.33	....
1933..........	10.2	13.0	82.4	69.4	52.2	74.4	8.09	12.88	....
1934..........	12.4	21.3	44.6	79.8	81.5	84.8	13.20	33.00	....
1935..........	11.1	18.4	59.3	70.3	65.5	83.2	7.52	30.54	....
1936..........	12.4	23.6	114.2	92.9	104.4	102.5	11.20	33.36	....
1937..........	8.4	20.4	52.9	78.0	51.8	96.2	8.74	19.51	....
1938..........	8.6	19.6	55.7	69.8	48.6	56.2	6.78	21.79	....
1939..........	9.1	15.4	69.7	73.4	56.8	69.1	7.94	21.17	....
1940..........	9.9	16.0	54.1	85.4	61.8	68.2	7.59	21.73	....
1941..........	17.0	26.4	80.8	92.2	75.1	94.4	9.70	47.65	....
1942..........	19.0	36.9	117.0	118.0	91.7	110.0	10.80	45.61	....
1943..........	19.9	40.5	131.0	206.0	112.0	136.0	14.80	52.10	....
1944..........	20.7	42.0	150.0	190.0	109.0	141.0	16.50	52.70	....
1945..........	22.5	36.6	143.0	204.0	127.0	150.0	15.10	51.10	....
1946..........	32.6	38.2	124.0	218.0	156.0	191.0	16.70	72.00	....
1947..........	31.9	38.0	162.0	217.0	216.0	229.0	17.60	85.90	....
1948..........	30.4	48.2	155.0	222.0	129.0	200.0	18.45	67.20	....
1949..........	28.6	45.9	128.0	214.0	124.0	188.0	16.50	43.40	....
1950..........	40.1	51.7	91.7	173.0	153.0	200.0	16.70	86.50	....
1951..........	37.9	51.1	163.0	304.0	166.0	211.0	19.50	69.30	....
1952..........	34.6	49.9	198.0	338.0	153.0	209.0	19.95	69.60	....
1953..........	32.3	52.2	78.1	244.0	148.0	204.0	17.45	52.60	....
1954..........	33.6	51.4	123.0	216.0	143.0	214.0	17.35	60.30	....
1955									
September...	33.77	51.5	71.3	142.0	124.0	192.0	15.55	43.70	....
October......	32.83	55.0	72.3	144.0	114.0	194.0	15.75	43.50	....
November...	32.42	52.5	82.9	168.0	109.0	194.0	16.05	44.30	....
December....	31.19	57.2	80.7	203.0	115.0	195.0	16.55	45.00	....
1956									
January.....	30.67	51.3	99.4	199.0	116.0	195.0	16.55	45.50	....
February....	31.00	35.4	114.0	198.0	118.0	195.0	16.45	46.20	....
March.......	31.64	....	134.0	209.0	120.0	197.0	16.15	46.80	....
April........	32.50	....	172.0	217.0	132.0	203.0	16.25	46.90	....
May........	31.96	54.0	219.0	231.0	139.0	200.0	16.15	47.30	....
June........	32.29	51.0	265.2	290.5	142.0	193.0	15.05	47.40	....
July.........	32.36	48.0	311.4	348.7	143.0	190.0	14.85	49.00	....
August......	31.13	50.1	140.0	217.8	145.0	193.0	15.25	51.00	....
September...	32.50	53.4	100.0	191.0	143.0	195.0	15.95	47.60	....

Index Numbers (Aug. 1909—July 1914 = 100)

Crop Year	Cotton	Tobacco	Potatoes	Sweet Potatoes	Corn	Wheat	Hay	Cottonseed	Truck Crops
1930..........	77	128	131	123	93	76	93	98	128
1931..........	46	82	66	83	50	44	73	40	107
1932..........	52	105	55	62	50	43	52	46	100
1933..........	82	130	118	79	81	84	68	57	90
1934..........	100	213	64	91	127	96	111	146	94
1935..........	90	184	85	80	102	94	63	135	116
1936..........	100	236	164	106	163	116	94	148	108
1937..........	68	204	76	89	81	109	74	87	114
1938..........	69	196	80	79	76	64	57	97	96
1939..........	73	154	100	84	88	78	67	94	98
1940..........	80	160	78	97	96	77	64	96	122
1941..........	137	264	116	105	117	107	82	211	138
1942..........	153	369	168	134	143	124	91	202	178
1943..........	160	405	188	235	174	154	125	231	270
1944..........	167	420	214	216	170	160	139	234	236
1945..........	181	366	205	232	198	170	127	227	240
1946..........	263	382	178	248	212	209	141	319	217
1947..........	257	380	232	248	336	259	148	381	262
1948..........	245	482	222	253	201	226	155	298	253
1949..........	231	459	184	244	193	213	139	192	232
1950..........	323	517	132	197	238	226	141	384	211
1951..........	306	512	233	346	259	239	164	307	269
1952..........	279	499	284	385	238	236	168	309	274
1953..........	260	522	112	278	231	231	147	233	240
1954..........	270	514	176	246	223	242	146	267	228
1955									
September...	272	515	102	162	193	217	131	194	230
October......	265	550	104	164	178	219	133	193	223
November...	261	525	119	191	170	219	135	196	231
December....	252	572	118	231	179	221	139	200	231
1956									
January.....	247	513	143	227	181	221	139	202	244
February....	250	354	164	226	184	221	139	205	244
March.......	255	...	192	238	187	223	136	208	214
April........	262	...	247	247	206	230	137	208	202
May........	258	540	314	263	217	226	136	210	239
June........	260	510	389	331	221	218	127	210	345
July.........	261	480	455	397	223	215	125	217	351
August......	251	501	201	248	226	218	128	226	230
September...	262	534	143	218	223	221	134	211	243

Wholesale Prices of Phosphates and Potash * *

	Superphosphate, Baltimore, per unit	Florida land, pebble, 68% f.o.b. mines, bulk, per ton	Tennessee phosphate rock, 75% f.o.b. mines, bulk, per ton	Muriate of potash bulk, per unit, c.i.f. Atlantic and Gulf ports [3]	Sulphate of potash in bags, per unit, c.i.f. Atlantic and Gulf ports [3]	Sulphate of potash magnesia, per ton, c.i.f. Atlantic and Gulf ports [3]	Manure salts bulk, per unit, c.i.f. Atlantic and Gulf ports [3]
1910–14	$0.536	$3.61	$4.88	$0.714	$0.953	$24.18	$0.657
1930	.542	3.18	5.50	.681	.973	26.92	.618
1931	.485	3.18	5.50	.681	.973	26.92	.618
1932	.458	3.18	5.50	.681	.963	26.90	.618
1933	.434	3.11	5.50	.662	.864	25.10	.601
1934	.487	3.14	5.67	.486	.751	22.49	.483
1935	.492	3.30	5.69	.415	.684	21.44	.444
1936	.476	1.85	5.50	.464	.708	22.94	.505
1937	.510	1.85	5.50	.508	.757	24.70	.556
1938	.492	1.85	5.50	.523	.774	15.17	.572
1939	.478	1.90	5.50	.521	.751	24.52	.570
1940	.516	1.90	5.50	.517	.730	24.75	.573
1941	.547	1.94	5.64	.522	.780	25.55	.367
1942	.600	2.13	6.29	.522	.810	25.74	.205
1943	.631	2.00	5.93	.522	.786	25.35	.195
1944	.645	2.10	6.10	.522	.777	25.35	.195
1945	.650	2.20	6.23	.522	.777	25.35	.195
1946	.671	2.41	6.50	.508	.769	24.70	.190
1947	.746	3.05	6.60	.432	.706	18.93	.195
1948	.764	4.27	6.60	.397	.681	14.14	.195
1949	.770	3.88	6.22	.397	.703	14.14	.195
1950	.763	3.83	5.47	.371	.716	14.33	.195
1951	.813	3.98	5.47	.401	.780	15.25	.200
1952	.849	3.98	5.47	.401	.793	15.25	.200
1953	.878	....	....	.410	.793	15.25	.200
1954	.895	....	....	.405	.791	15.27	.200
1955							
September	.895	....	....	.380	.735	14.00	.193
October	.895	....	....	.380	.735	14.00	.193
November	.895	....	....	.380	.735	14.00	.193
December	.895	....	....	.380	.735	14.00	.193
1956							
January	.895	....	....	.380	.735	14.00	.193
February	.895	....	....	.380	.735	14.00	.193
March	.895	....	....	.380	.735	14.00	.193
April	.895	....	....	.380	.735	14.00	.193
May	.895	....	....	.380	.735	14.00	.193
June	.895	....	....	.360	.720	13.45	.177
July	.895	....	....	.380	.735	14.00	.177
August	.895	....	....	.380	.735	14.00	.177
September	.895	....	....	.380	.735	14.00	.177

Index Numbers (1910-14 = 100)

	Superphosphate	Florida land pebble	Tennessee phosphate rock	Muriate of potash	Sulphate of potash in bags	Sulphate of potash magnesia	Manure salts
1930	101	88	113	95	102	111	94
1931	90	88	113	95	102	111	94
1932	85	88	113	95	101	111	94
1933	81	86	113	93	91	104	91
1934	91	87	110	68	79	93	74
1935	92	91	117	58	72	89	68
1936	89	51	113	65	74	95	77
1937	95	51	113	71	79	102	85
1938	92	51	113	73	81	104	87
1939	89	53	113	73	79	101	87
1940	96	53	113	72	77	102	87
1941	102	54	110	73	82	106	87
1942	112	59	129	73	85	106	84
1943	117	55	121	73	82	105	83
1944	120	58	125	73	82	105	83
1945	121	61	128	73	82	105	83
1946	125	67	133	71	81	102	82
1947	139	84	135	70	74	78	83
1948	143	118	135	67	72	58	83
1949	144	108	128	67	74	58	83
1950	142	106	112	68	75	59	83
1951	152	110	112	72	82	63	83
1952	158	110	112	72	83	63	83
1953	164	...	...	73	83	63	83
1954	167	...	...	72	83	63	83
1955							
September	167	...	...	69	77	58	82
October	167	...	...	69	77	58	82
November	167	...	...	69	77	58	82
December	167	...	...	69	77	58	82
1956							
January	167	...	...	69	77	58	82
February	167	...	...	69	77	58	82
March	167	...	...	69	77	58	82
April	167	...	...	69	77	58	82
May	167	...	...	69	77	58	82
June	167	...	...	66	76	56	80
July	167	...	...	69	77	58	80
August	167	...	...	69	77	58	80
September	167	...	...	69	77	58	80

Wholesale Prices of Ammoniates * *

	Nitrate of soda bulk per unit N	Sulphate of ammonia bulk per unit N	Cottonseed meal S. E. Mills per unit N	Fish, scrap, dried 11–12% ammonia, 15% bone phosphate, f.o.b. factory bulk per unit N	Tankage 11% ammonia, 15% bone phosphate, f.o.b. Chicago, bulk, per unit N	High grade ground blood, 16–17% ammonia, Chicago, bulk, per unit N
1910–14	$2.68	$2.85	$3.50	$3.53	$3.37	$3.52
1930	2.47	1.81	4.78	4.96	3.79	4.58
1931	2.34	1.46	3.10	3.95	2.11	2.46
1932	1.87	1.04	2.18	2.18	1.21	1.36
1933	1.52	1.12	2.95	2.86	2.06	2.46
1934	1.52	1.20	4.46	3.15	2.67	3.27
1935	1.47	1.15	4.59	3.10	3.06	3.65
1936	1.53	1.23	4.17	3.42	3.58	4.25
1937	1.63	1.32	4.91	4.66	4.04	4.80
1938	1.69	1.38	3.69	3.76	3.15	3.53
1939	1.69	1.35	4.02	4.41	3.87	3.90
1940	1.69	1.36	4.64	4.36	3.33	3.39
1941	1.69	1.41	5.50	5.32	3.76	4.43
1942	1.74	1.41	6.11	5.77	5.04	6.76
1943	1.75	1.42	6.30	5.77	4.86	6.62
1944	1.75	1.42	7.68	5.77	4.86	6.71
1945	1.75	1.42	7.81	5.77	4.86	6.71
1946	1.97	1.44	11.04	7.38	6.60	9.33
1947	2.50	1.60	12.72	10.66	12.63	10.46
1948	2.86	2.03	12.94	10.59	10.84	9.85
1949	3.15	2.29	10.11	13.18	10.73	10.62
1950	3.00	1.95	11.01	11.70	10.21	9.36
1951	3.16	1.97	13.20	10.92	10.18	10.09
1952	3.34	2.09	13.95	11.27	9.72	9.16
1953	3.26	2.27	11.04	11.19	7.39	7.09
1954	3.07	2.20	11.50	11.63	9.72	9.85
1955						
September	2.98	2.05	9.30	11.60	6.75	6.53
October	2.98	2.07	9.17	13.01	7.47	7.16
November	2.98	2.07	8.71	13.10	6.14	6.23
December	2.98	2.12	9.21	12.93	5.66	6.00
1956						
January	2.98	2.12	9.43	12.75	5.58	5.58
February	2.98	2.12	8.69	12.15	5.77	5.69
March	2.98	2.12	8.30	11.89	5.92	5.92
April	2.98	2.12	8.31	11.66	5.77	5.71
May	2.98	1.70	8.67	11.80	6.60	6.37
June	2.98	1.56	8.72	11.29	6.37	6.23
July	2.98	1.56	9.37	10.89	6.80	6.37
August	2.98	1.56	9.99	11.26	6.53	6.37
September	2.98	1.56	9.10	11.28	6.68	6.68

Index Numbers (1910-14 = 100)

1930	92	64	137	141	112	130
1931	88	51	89	112	63	70
1932	71	36	62	62	36	39
1933	59	39	84	81	97	71
1934	59	42	127	89	79	93
1935	57	40	131	88	91	104
1936	59	43	119	97	106	131
1937	61	46	140	132	120	122
1938	63	48	105	106	93	100
1939	63	47	115	125	115	111
1940	63	48	133	124	99	96
1941	63	49	157	151	112	126
1942	65	49	175	163	150	192
1943	65	50	180	163	144	189
1944	65	50	219	163	144	191
1945	65	50	223	163	144	191
1946	74	51	315	209	196	265
1947	93	56	363	302	374	297
1948	107	71	370	300	322	280
1949	117	80	289	373	318	302
1950	112	68	315	331	303	266
1951	118	69	377	310	302	287
1952	125	74	399	319	288	260
1953	122	80	315	317	219	201
1954	114	77	329	330	288	280
1955						
September	111	72	266	329	200	186
October	111	73	262	369	222	203
November	111	73	249	371	182	177
December	111	74	263	366	168	170
1956						
January	111	74	269	361	166	159
February	111	74	248	344	171	162
March	111	74	237	337	176	168
April	111	74	237	330	171	162
May	111	60	248	334	196	181
June	111	55	249	320	189	177
July	111	55	268	308	202	181
August	111	55	285	319	194	181
September	111	55	260	320	198	190

Combined Index Numbers of Prices of Fertilizer Materials, Farm Products and All Commodities

	Farm prices*	Prices paid by farmers for commodities bought*	Wholesale prices of all commodities†	Fertilizer material‡	Chemical ammoniates	Organic ammoniates	Superphosphate	Potash**
1930	125	140	126	105	72	131	101	99
1931	87	119	107	83	62	83	90	99
1932	65	102	95	71	46	48	85	99
1933	70	104	96	70	45	71	81	95
1934	90	118	109	72	47	90	91	72
1935	109	123	117	70	45	97	92	63
1936	114	123	118	73	47	107	89	69
1937	122	130	126	81	50	129	95	75
1938	97	122	115	78	52	101	92	77
1939	95	121	112	79	51	119	89	77
1940	100	122	115	80	52	114	96	77
1941	124	130	127	86	56	130	120	77
1942	159	149	144	93	57	161	112	77
1943	193	165	151	94	57	160	117	77
1944	197	174	152	96	57	174	120	76
1945	207	180	154	97	57	175	121	76
1946	236	197	177	107	62	240	125	75
1947	276	231	222	130	74	362	139	72
1948	287	250	241	134	89	314	143	70
1949	250	240	226	137	99	319	144	70
1950	258	246	232	132	89	314	142	72
1951	302	271	258	139	93	331	152	76
1952	288	273	251	144	98	333	158	76
1953	258	262	247	139	100	269	164	77
1954	249	264	248	142	95	311	167	76
1955								
September	235	259	250	132	91	244	167	72
October	230	261	250	134	91	259	167	72
November	225	259	250	131	91	235	167	72
December	223	259	250	131	92	232	167	72
1956								
January	226	259	252	131	92	232	167	72
February	226	259	252	130	92	225	167	72
March	228	261	254	130	92	222	167	72
April	235	261	257	130	92	219	167	72
May	242	264	257	128	85	236	167	72
June	247	264	257	126	82	231	167	70
July	244	266	257	128	82	242	167	72
August	237	267	259	128	82	246	167	72
September	236	266	259	128	82	239	167	72

* U. S. D. A. figures, revised January 1950. Beginning January 1946 farm prices and index numbers of specific farm products revised from a calendar year to a crop-year basis. Truck crops index adjusted to the 1924 level of the all-commodity index.

† Department of Labor index converted to 1910-14 base.

‡ The index numbers of prices of fertilizer materials are based on original study made by the Department of Agricultural Economics and Farm Management, Cornell University, Ithaca, New York. These indexes are complete since 1897. The series was revised and reweighted as of March 1940 and November 1942.

[1] Beginning July 1949, baled hay prices reduced by $4.75 a ton to be comparable to loose hay prices previously quoted.

[2] Potash salts quoted F.O.B. mines; manure salts since June 1941; other carriers since June 1947.

**** Where range of prices for fertilizer material is quoted, average figure is used. The weighted average of prices actually paid for potash is lower than the annual average because since 1926 over 90% of the potash used in agriculture has been contracted for during the discount period.**

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, the State Experiment Stations, and Canada, 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

"Rice Fertilizer Tests, 1954-1955," Agr. Exp. Sta., Univ. of Ark., Fayetteville, Ark., Mimeo. Series 46, April 1956, R. L. Beacher.

"Fertilizing Flue-Cured Tobacco," Ga. Coastal Plain Exp. Sta., Tifton, Ga., Mimeo. Paper 16, Rev. Dec. 1955, J. D. Miles.

"1955 Commercial Fertilizers in Kentucky, Including a Report on Official Fertilizer Samples Analyzed July-December, 1955," Agr. Exp. Sta., Univ. of Ky., Lexington, Ky., Reg. Bul. 128, June 1956.

"Official Report of the Maryland Inspection and Regulatory Service, Feed, Fertilizer, and Lime Issue," Inspection & Regulatory Service, College Park, Md., Issue No. 239, Aug. 1956.

"Fertilizers for Fruit Crops," Agr. Ext. Serv., Mich. State Univ., East Lansing, Mich., Ext. Fldr. F-224, June 1956, A. L. Kenworthy, R. P. Larsen, and H. K. Bell.

"1955 Fertilizer Analyses and Registrations," State Dept. of Agr., St. Paul, Minn., R. E. Bergman.

"Missouri Fertilizer Tonnage Report, January 1 to June 30, 1956," Agr. Exp. Sta., Univ. of Mo., Columbia, Mo.

"Foliar Fertilization of Field Crops," Agr. Exp. Sta., Wooster, Ohio, Res. Cir. 35, Aug. 1956, H. J. Mederski and G. W. Volk.

"Distribution of Fertilizer Sales in Texas, January 1 to June 30, 1956," Agr. Exp. Sta., Texas A. & M. College, College Station, Texas, Prog. Rpt. 1890, Sept. 12, 1956, J. F. Fudge.

Soils

"An Apparatus for Hydroponics Research," Agr. Exp. Sta., Univ. of Conn., Storrs, Conn., Bul. 322, May 1956, F. H. Emmert.

"The Purdue Soil and Plant Tissue Tests," Agr. Exp. Sta., Purdue Univ., Lafayette, Ind., Sta. Bul. 635, March 1956, A. J. Ohlrogge.

"Trace Elements in Missouri Soils," Agr. Exp. Sta., Univ. of Mo., Columbia, Mo., Res. Bul. 553, May 1954, E. E. Pickett and R. H. Dinius.

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Potassium—The Alkali of Life

(*From page* 14)

metabolic processes. Under these conditions Fox and Keston (58) report a large increase in intracellular sodium with a release of potassium in large amounts. This high potassium and low sodium in the plasma has been treated by the administration of sodium salts. Potassium is definitely harmful (141). After this early period of removal of disorganized cellular constituents, including toxic amounts of potassium, we have the reconstruction period. In this period all material must be replaced, a period of possible deficiencies. These periods call for opposite treatments. Natural shifts within the body compensate for local conditions as much as possible (84). Therapy should only assist nature.

In the surgical patient, shock and injury are kept to a minimum and there are generally a few days of preparation. Moore and Ball (123) and others (47, 49, 129) have studied these alterations in electrolytes following surgery and although each case requires individual treatment, most require from one to three grams of potassium chloride per day beginning one or two days after operation. The alkalosis is aggravated by sodium chloride (70, 136).

Another hazard has been introduced by the use of carbon dioxide in anesthesia. Young, et al. (173) have shown in dogs that the administration of carbon dioxide slowly increases plasma potassium. Within minutes after withdrawal, there is a sharp rise which results in cardiac arrhythmias, and frequently, cardiac arrest. This, added to the other potassium alterations in surgery, may account for a number of surgical deaths. Again, balancing with sodium, or better, removal with metabolites, is indicated.

The high potassium requirement in pregnancy, along with the other tissue-building nutrients, has been mentioned earlier. A recent review (90) points out the extensive use of low sodium diets in the toxemias. Garrett (68) considers an adrenal cortical hormone to be the "toxin of eclampsia" and the immediate cause of the morbidity to be the mineral imbalance. He also mentions the renal and hepatic lesions as results rather than as causes. Both hypo- and hyperpotassemia in pregnancy have been considered by Romney, et al. (139). The hypopotassemia produced by the high demand, low intake, and vomiting may cause respiratory failure. It may cause renal failure and result in hyperpotassemia leading to cardiac failure. An involuting placenta may add to the potassium load. Speculation leads one to potassium lack as a possible cause of the toxicity and vomiting and therefore it would be a vicious circle. The work of Lans, et al. (97) tends to bear this out. They treated such patients with intravenous potassium and considered it a "life-saving procedure." Thus, it must be considered along with the other inorganic constituents of the diet, calcium, magnesium, iron, chloride, phosphate, etc.

Potassium Deficiency From Poliomyelitis

Myocarditis is a prominent feature of poliomyelitis. It has been noted particularly with "a turn for the worse" (144). Appel (3) says, "Histologically, the type of myocarditis observed cannot be distinguished from the myocarditis observed in other infectious diseases. Because of this, doubt has been cast on the role of the poliomyelitis virus in the production of the myocarditis." Lesions in the liver, lung, kidney, and muscle were also observed. Potassium deficiency could account for all these lesions. It was found in polio patients by Lans, et al. (96) who considered it secondary to the inability to eat. But treatment with potassium chloride gave them "marked improvement." They concluded that it was frequently the cause of death in these patients. Bower, et al. (21) observed both hypo- and hyperpotassemia while studying the nitrogen and potassium excretion. This is to be expected, depending on the stage of the disease. Hall and Sherman (78) consider the potassium depletion as the cause of many of the symptoms, and of further losses, thus causing a self-perpetuating cycle.

Scobey (149) has pointed out the possibility that some other agent, alone or in conjunction with an infectious agent, might be the cause of the disease. Poisons, such as carbon dioxide, (noted earlier), cyanide, etc., give paralysis and pathology similar to polio. At the same time McCormick (115) raised the same question: infectious agent vs. metabolic disturbance. They both consider dietary and high metabolic demand to be causative conditions. The increased incidence and extension to an older age group point to some factor that has increased in intensity, while the seasonal character has remained the same. Scobey called attention to the large number of names that were used for what appears to be the same disease. Recently, Macrae (110) reported atypical cases in which the virus could not be recovered and antibodies did not increase.

Drought and Potassium Deficiency in Plants

Drought alters the availability of nutrients and, thereby, the metabolism of plants. Many of the drought symptoms of corn and legumes are due to the resultant lack of potassium. Recently (137) this deficiency in barley has been shown to cause putrescine (0.15-0.2%), and possibly other toxic amines, to accumulate in the leaves. The same amines have been reported in urine from cases where potassium deficit is a feature (toxemia of pregnancy, parathyroidectomy and cystinuria). These amines may play a role in disease whether ingested or formed within the body. When ingested they would lead to polio-like symptoms. Whether potassium deficiency prior to the disease, an external toxic agent, or an infectious agent, singly or in combination, is the cause of poliomyelitis has not been proved. No possible factor should be overlooked.

A hint that this balance of alkali metals may be of considerable importance in abnormal tissue growth has recently been given by White and Millington (169). They studied the distribution of a woody tumor on white spruce trees growing within reach of salt water spray. They believe three causative factors to be operating: in order, an insect wound, an infection, and a chemical agent contained in the salt spray. Exceptions to the salt spray locations were near Banff National Park (Canada), Isle Royal National Park, and a section northwest of Lake Superior. If it is the toxicity of sodium in the spray, these exceptions might be in very low potash areas and be subject to the same growths. The possibility of a series of causative factors for other plant and animal tumors must be considered. Also, a causative relation of excess salt (sodium) in human cancer was suggested over half a century ago by Braithwaite (23) a surgeon of Leeds, England.

Summary

The potassium so necessary in fertilization of all our crops has been removed from much of our food. Common salt has been substituted for it. They share most physiological properties but potassium is absolutely necessary for many of the metabolic, energy exchange reactions of the body. Its lack prevents the formation of high energy compounds and causes tissue degeneration. Excess prevents energy release but the tissues remain normal. Optimum body function depends on optimum concentration and balance with sodium and other cations. Disease causes, and is caused by, alterations in these concentrations, and many times it is almost impossible to distinguish cause from effect. The reduction of dietary potassium should be considered as a possible cause, primary or contributory, to many ills of modern man.

Conclusions

1. Potassium plays an irreplaceable role in most energy transfers in the animal body.

2. Due to the relatively low concentration in the plasma, there is a large turnover by the body, necessitating a large and continuous replacement.

3. Due to the removal of potassium and over-balancing with sodium, the modern diet is short of this necessary nutrient. We are operating on a border-line potassium deficiency.

Experience With Row Crops . . .

(*From page* 10)

uary '55. The field was harrowed twice before planting early corn for hogging-off. The severe freeze in the latter part of March necessitated planting the corn over. Two hundred fifty pounds of 4-12-12 per acre were used under the corn, and it was sidedressed with 66 pounds of N per acre. Rainfall was very light during the corn-growing season. Before turning hogs on the field, Mr. Graham estimated his yield to be about 30 bushels hogging-off corn per acre. The hogs had cleaned out corn by July 20 and 100 sheep were put in the 10-acre field at that time to graze the excellent stand and growth of Coastal Bermuda that had come back in the corn. As of October 26, the 100 sheep had not caught up with the grass. The old corn stalks and ridges seen in October were about the only signs left that would indicate the field had been in corn. This farmer was well pleased with his results and planned to plant another 100 acres of Coastal Bermuda in 1956 specifically for use in rotation with row crops.

W. H. Coley in the Lower Coastal Plain section (Altamaha Soil Conservation District) turned a four-year-old stand of Coastal Bermuda on a Lynchburg soil, Class IIw land, with a disk plow. Before planting corn he went over the land twice with a bush and bog harrow. These operations gave him a good seedbed. Approximately 12 tons of air-dry grass residue per acre were worked into the soil, leaving enough on the surface to make it appear that the field was mulched. Two hundred eighty pounds of 4-12-12 per acre were applied at time of planting. Corn came up to a good stand and grew fast. It was sidedressed one time with 47 pounds of N per acre. The corn was cultivated twice with conventional one-row tractor cultivating equipment. Mr. Coley said, "The old dead grass was no problem to me at first or second cultivation. All my neighbors laughed at me from the time I started plowing up the grass until the time their corn started to burn last spring and mine stayed green and growing. My corn never did show any signs of needing rain." This corn was hogged-off. However, Mr. Coley and several of his neighbors estimated the yield to be between 70 and 80 bushels per acre. Before the hogs had cleaned out all the corn, the Bermuda was back to a fair stand.

Corn Following Fescuegrass

Mr. Weber, Manager, Sun Bred Farm in the Flint River Soil Conservation District, planted corn in a field that had been in fescuegrass three years. This Class I land (no limitations in use with good farming practices) was irrigated in order to get enough moisture in the soil to break the land. Several weeks before turning sod with moldboard plow, 150 pounds of N were applied per acre. During the process of preparing the land, 800 pounds of 4-12-12 per acre were broadcast and worked into the soil. The corn was spaced to have a stand of 16,000 plants per acre. Immediately after planting, the field was irrigated in order to bring the corn up and get a good stand. It was irrigated again about time the corn started tasseling. The only problem this farmer had with the 58 acres of corn following fescuegrass was harvesting. Mr. Weber said, "It was hard to get 132.71 bushels of corn per acre through the corn picker."

Corn Following Bahiagrass

J. G. Phillips, Briar Creek Soil Conservation District Cooperator, turned a three-year-old Bahiagrass sod on Class IIs land (dominant limitations unfavorable soil characteristics) with a disk plow in the fall of '54. Eight months after preparing land the soil contained approximately 5.4 tons grass residue per acre. Six hundred pounds 4-12-12 per acre were applied at time of planting corn and soybeans. Crop

Fig. 7. D. L. Pope, Daugherty County, Georgia, Soil Conservationist, discusses peanuts following Common Bermudagrass on John Phillips' farm with Ricardo Qunitinilla from South America. This field produced 1,800 pounds high quality nuts per acre.

TABLE II.—SUMMARY OF CORN FOLLOWING PERENNIAL GRASSES.

Corn following	No. farms	Acres	Average		
			4–12–12 fertilizer lbs./A.	Additional nitrogen lbs./A.	Bushels per acre **
Bahia	5	76	568	63	68
Coastal Bermuda	5	34	330*	55	52
Native Bermuda	3	100	480	72	61
Fescue	4	84	689	117	120
TOTAL	17	294	545	81	79

* 4-8-8 used on one farm.
** Some farmers used early varieties for hogging-off.

was sidedressed with 67 pounds N per acre. Due to the amount of crop residue in the soil, the drought in April did not hurt this corn like it did other corn in the community. This 38-acre field produced 85.9 bushels corn per acre. In August, Bahiagrass was back to a good stand. It was interesting to note that some grass came back from old plants.

Table II gives a summary of farmers' results with corn following perennial grasses.

Cotton Following Perennial Grass

Ed Swearinger in the Upper Coastal Plain section (Ocmulgee Soil Conservation District) went over a six-year-old mixed stand of native Bermuda and fescuegrass on Class I and IIe land four times with a Bermudagrass plow in January '55. Land was turned deep with moldboard plow. Cotton was fertilized with 500 pounds of 4-12-12 and sidedressed with 41 pounds N per acre. These 30 acres of cotton were dusted 10 or 12 times. They produced 1,022 pounds lint cotton per acre. Mr. Swearinger was impressed with his yield, ease in working land, and lack of Bermuda and weeds in the cotton. He reported that cotton in an adjoining 20-acre field received the same treatment except sod, and it produced 472 pounds lint per acre.

In a neighboring county A. L. Pearson produced 25 bales cotton on 16.4 acres following a four-year sod of fescue and white clover.

Peanuts Following Perennial Grass

W. H. Anderson in the Ocmulgee Soil Conservation District turned a four-year-old sod of native Bermudagrass on Norfolk Class IIe land in January '55 for peanuts. Field was harrowed several times to make sure of a good seedbed. An 0-12-12 ferti-

TABLE III.—APPROXIMATE TONS PER ACRE TO PLOW DEPTH OF UNDECOMPOSED AIR-DRY GRASS RESIDUE TWO TO EIGHT MONTHS AFTER TURNING PERENNIAL GRASS SOD.

Sod crops turned	No. farms	Acreage	Approximate tons residue per acre
Bahia	12	132	8.2
Coastal Bermuda	8	69	7.4
Native Bermuda	6	180	6.4
Fescue	1	58	7.4
TOTAL	27	439	7.2

lizer at 166 pounds per acre was used under the peanuts. Nuts came up to an excellent stand. According to Mr. Anderson, the old dead grass was no trouble when cultivating, and there were very few weeds in the crop. This 20-acre field produced 1,800 pounds high-quality nuts per acre. This was not an isolated case of peanuts following perennial grass.

For example, W. H. Knighton in the lower Chattahoochee River Soil Conservation District turned a five-year-old sod of Bahiagrass on Greenville Class I land for peanuts. The sod land contained approximately 8 tons of air-dry grass residue per acre, as compared to approximately 1.5 tons in an adjoining continuous row-crop field. Four hundred pounds 0-14-14 per acre were broadcast before planting. This 17-acre field produced 1,961 pounds of good-quality nuts per acre. Mr. Knighton said, "I like the long-time sod rotation. My land worked good, and it is soft and spongy. I had very few weeds in the peanuts."

Summary

Results of farmers' experiences with row crops following perennial grasses in South Georgia show increased quantity and quality of crops. Last, but not least, they show the conservation of more soil and water.

The Benedict Farm—1952-1956

(*From page* 18)

winter of 1955 were general in Whatcom County and general yields of forages were down considerably for the 1956 spring season. However, by working some additional ladino clover seed into the pasture, fertilizing and watering have made the Benedict's pastures recover to produce good yields as the statistical data indicates.

The over-all results of the program are excellent. The number of cows has been more than doubled. The herd has not only been increased, but the present quality of the herd is excellent. Total milk production has been increased over three times. Butterfat production per acre has been more than doubled. Silage production has been increased about nine times and cow days on the pasture have increased a similar amount. Brad has also intimated privately that the amount of work on the farm has increased considerably. The success of the program has depended to a large degree upon the initiative and willingness of the Benedicts to work.

The results of the fertility and management program on the Benedict farm have had far-flung effects.

(1) Hundreds of farmers looking for practical information have visited the farm and have gone home to apply what they have learned.

(2) This practical demonstration has shown that water, fertilizer, and good management can produce a good net income per acre on badly worn-out soils.

(3) Similar farm improvement plans with farmers in other areas of Washington and Idaho have been started, with very successful results. Pierce County Agent Claude Doran reports: "The Balmer Farm project started in 1953 on a similar run-down soil, which formerly had 30 cows and 15 young stock on pastures that were mediocre for 6-8 weeks only, now is running 60 head of cows and 30 young stock on the same acreage where the pastures are excellent from May through October."

The Dell Hastings Farm Project in Thurston County has had similar results. After using fertilizer and water, County Agent McKay reports, "It is difficult to give you an exact increase in yield, but roughly the farm did not support 5 cows when he started but he now has better than 25 cows averaging

Fig. 5. The Benedict family—Brad, Billy, Barbara, and Jan—walking in clover (Field C).

500 lbs. of butterfat and 12,560 lbs. of milk per cow."

The Sandpoint Farm Demonstration Project in Idaho, sponsored by the Pacific Northwest Soil Improvement Committee, also reports excellent results on the Blaine Marks farm.

(4) The demonstration has shown that present College recommendations are quite adequate to start farmers out on a basic soil- and crop-building program. It has also shown that these recommendations have to be changed to fit the individual farm needs. The original fertility program on the Benedict farm was set up at about an 80-60-60 fertilizer per acre per year. This fertilizer program has been changed to meet the increased requirements of crops and soils. Brad's present fertilizer program on the peat soil is to use 80 lbs. N, 60 lbs. P_2O_5, and 190 lbs. K_2O per year. On the upland soils he is using 110 lbs. N, 70 lbs. P_2O_5, and 80 lbs. K_2O. Brad feels that these increases in fertilizer usage are making him more net income.

The last few years have been difficult ones for the dairy farmer. The Benedicts are no exception. One of the gratifying results of the program is that during these difficult years they have worked out a basic farm plan that will mean money in the bank during the more prosperous years ahead.

Limestone—a Problem Again

(*From page* 20)

fertilizer only. This strongly indicates that limestone truly is 'first aid treatment' for acid soils.

"The largest yields of all crops were from plots that received both fertilizer and limestone."

Illinois field tests show values for limestone and fertilizers on the dollars invested basis. In a chart prepared by Professors A. L. Lang and L. B. Miller limestone when used alone gave $7.46 for each dollar invested and when used with fertilizer the return per dollar invested in lime was $11.21. Each dollar invested in a 6-ton application of limestone over a period of 14 years returned $3.75 more when used with nitrogen, phosphate, and potash than when used alone. Phosphate, 0-20-0, when used with limestone gave a return of $5.07 per dollar invested. When used without limestone, the return was only $2.33 on each dollar invested in superphosphate. Potash, 0-0-60, when used with limestone gave a return of $4.04 per dollar invested in muriate of potash. When used without lime on this land there was a loss of 13¢ per dollar invested. The return for nitrogen in this test was about the same both with and without limestone. These tests were carried out on a light-colored soil which was decidedly acid and low in nitrogen, phosphate, potash, and organic matter.

The need for liming is as necessary as it ever was, and soil tests confirm this along with results from numerous field experiments. Machinery has added greatly to production and to the ease and dispatch of putting limestone on the land. Some folks argue that there is no selling pressure back of limestone and this holds back its use. Others say that the most progressive farmers have their land sufficiently limed and can now hold off on the use of limestone. The other farmers are slower to take hold of the task. The result is the slow-down in the amounts currently being used.

SOIL—An Expandable New England Resource

(*From page* 24)

food production shifts more and more to land less desirable for crop growing. This increases the cost of production and, hence, the cost of food. Increased food costs ultimately mean a lower standard of living with less money left to buy so-called luxuries produced by industry. In our country, food takes about one fourth of our spendable income. In many foreign countries, food takes 30 to 80% and more of the spendable income.

In taking the long-time look, it is obvious we need to do something about this urban sprawl.[3] Just as something was done about erosion control after a long period of inactivity, something needs to be done about the disappearance of our agricultural land. We need urban leaders who can see that land should be used according to its capabilities. Our idea of capabilities should be expanded to include not only agricultural but industrial and other uses.

Other things being equal agricultural use probably should be given priority over other uses. Buildings can be put most anywhere but once land is ruined by buildings, for practical purposes it is ruined forever for agriculture.

We need to think more about our need for food production areas for filling the mouths of our increased population in years to come. At the current degree of farming efficiency, the needs of the 1975 population in this country will require, according to U. S. Department of Agriculture estimates, about 530 million acres of cropland. This is about four acres for every three acres actually available today. But we are already short of meeting the needs of the 1975 human population by nearly 100 million acres.

How are we going to meet these food needs? By producing more per acre and using land which we once thought was too poor in fertility to grow productive crops. This may mean using more land for producing crops in New England.

Since the productive capacity of New England's soils is so high, one wonders if it might not be wise to spend from $25 to $200 for clearing and improving land in New England. Once the land is cleared, there are no further costs for items like irrigation water. Rainfall is

[3] Acknowledgment is made to R. H. Brett for originating the term "urban sprawl."

usually adequate. Research and farm practice have shown that in New England supplemental irrigation increases yields in years with short, dry spells. Since water is generally more available than in some sections of the country, this has not been a deterrent to increased irrigation.

Population Pressure on the Land

With our population increasing at the rate of four persons every minute, and with New England in the most densely populated areas in the United States, some thought might be given to the possibility of using more of New England's soils as one means of increasing our food supply. Nearness to market is another reason for using these soils to their maximum capacity.

It is estimated that from 10 to 20% more of the land in New England could be put into agricultural production. In fact, during the early years of our country, more land than now was producing crops. In Connecticut, for example, land clearing had reduced our forests to about 30% in 1830. Since that time abandonment of farms and pastures has resulted in bringing back Connecticut's forested lands to about 60% of the State's area.

The acreage which could be cleared and improved would vary with the kind of soils present in the area in question. Modern power equipment now makes it possible to clear fields of stones and boulders in a way never before possible. Many areas can now be drained and put into production as the result of improved land drainage techniques and improved knowledge of the management of the soils after they have been drained. Trees have always been cut and they present no problem.

Soil Mapping Information Needed

Just any kind of land should not be put into production. Some soils are too stony or rocky; some are too sandy and droughty. It would be impractical to drain others because of the tightness and impervious nature of their subsoils. Some would be too steep and should be kept in trees for controlling erosion. Even in excluding all these soils having inhibiting factors for economical crop production, many soils which are comparable to those now producing crops are now in trees or idle land.

Modern soil survey techniques bring out desirable relationships of soils for crop production. Also, information from soil surveys show what soils are adapted to the production of given kinds of crops.

Clearing and draining of land for use in increasing the production of crops are, in a sense, exploitation of our soil resources. But this exploitation can be a well-managed one so that every soil will be used to its utmost in producing crops and at the same time be improved in its fertility and productivity. Erosion will be at a minimum. Fertilizers, pesticides, crop rotation, and other management practices will be employed for improved yields.

There are several reasons then why farming activity should increase in New England. We have productive, salt-free soils, abundant rainfall, source of water for irrigation, soils in good tilth, and nearness to market. Possibly the major obstacles are the use of land for other than agricultural purposes, the competition with industry for labor, and high taxes on land.

With all these advantages and with so few disadvantages should we not encourage more agriculture in New England? It probably isn't a better place to farm than any other place, but what does need pointing out is that there are real potentialities for farming in New England. Whether we need this land now or later, we should treat it now so that it can be used in the future.

We have a resource—soil—that is expandable if we use it right. But it becomes expendable with mismanagement.

Southern Agriculture Moves Into High Gear

(*From page* 26)

Fig. 10. Farm ponds, pastures, and pines are enabling many farmers throughout the South to move into "High Gear" as they develop sound land-use programs on their farms.

Many acres have been diverted directly from cotton or other row crops to grass in recent years. Thousands of acres of land now planted to grass were allowed to lie idle for years, abandoned first because of severe soil erosion, the lack of labor, or the low price of cotton. Much of the bottom land which is found alongside all streams of the hilly portions of the South is being cleared and planted to pasture and hay. Some of these areas have not been cultivated previously since it was virtually impossible to clear such land with hand tools and horse-drawn equipment. With the bulldozers and tractors now available to every landowner, it is easy to put such land to profitable use.

Coincident with the expansion of grassland agriculture in the South, and actually a leading factor in the movement, has been the recognition of the need for better land-use practices. The planting of grass on the badly eroded idle land or the poorly drained low-lying areas just referred to is a good example of such improved land use. On-the-ground technical assistance now available to soil conservation district co-operators and other farmers through the technicians of the Soil Conservation Service and other agencies is an important factor in helping to bring about better land use.

Much of the land previously planted to row crops was not suited to such a purpose but there was no better use to which it could be put. Now with new plants, suitable equipment, and a growing appreciation of proper land use, farmers are in a better position to adapt their crops to their land, recognizing the capabilities of both the land and the crop and fitting the two together with good management for maximum production. An increasing number of farmers each year are following the slogan of Soil Conservation Districts: "Each acre of land used in accordance with its capabilities and treated in accordance with its needs."

The application of research findings to our farms has been a tremendous factor in bringing about these changes. The yield of corn has been greatly increased by the use of locally adapted hybrids; new grasses such as Coastal Bermuda have been developed and introduced; better information as to the proper fertilization of crops has been secured; improved machinery has been developed; and in many other ways the efforts of our research workers have brought benefits to our Southern farmers. Better methods of taking this factual and useful information to farmers are constantly being worked out and put into effect by county agents, Soil Conservation Service technicians, vocational agriculture teachers, and other technical workers.

New Problems

The development of a grassland type of agriculture is resulting in many new problems. These are varied and embrace such diverse subjects as the application of the proper kind and quantity of fertilizer, control of specific diseases and insects, elimination of weeds in pastures and hayfields, and adaptation of farm equipment to new jobs such as overseeding of legumes on grassland and the preparation of sod for the succeeding row crop.

There are many developments and changes in the application of fertilizer, for instance. Where professional agricultural workers of a generation ago advised the use of 500 to 800 pounds of complete fertilizer per acre for cotton and tobacco, they now are advising farmers to use this much and more, with substantial amounts of additional nitrogen, for grass. And farmers are finding such applications to be profitable, for both experimental research and farmer experience with Coastal Bermuda and other pasture grasses and legumes show that they respond to high rates of fertilization. In many cases farmers are securing at least a part of the nitrogen needed by the grass through over-planted winter legumes.

Heretofore our farmers have felt that there was no use to which grass could be put except to feed it to animals. Farmers in all the Southern states now are planting grass as a part of their regular rotations, realizing that one of the best uses to which sod may be put is to plow it for a row crop.

This practice is not general as yet, but farmers are fast finding through experience that the best place to plant cotton, corn, tobacco, truck, and other row crops in anticipation of bumper yields is in a field which has been in sod for two, three, or more years. For instance, more than a few farmers of the Bright Leaf Tobacco Belt of the Carolinas and Georgia are finding that grass properly handled has a place in their tobacco rotation. In most cases, so far, where a row crop has been planted on legume or grass sod, it was not the result of a planned rotation but came about incidentally. However, farmers have been so pleased with the results thus secured that quite a few definitely are planning long rotations in which grass and legumes used separately or together play an important part. More research is needed in order that this very worthwhile practice may be made a regular farm activity.

Grass has many advantages when used in a rotation. First, it protects the land and conserves the soil and available plant nutrients while it is growing, and then as it decomposes, organic matter of high quality is added to the soil. Not the least of the benefits is the improvement of the soil structure and a consequent increase in its water-holding capacity.

What of Irrigation?

Irrigation is playing an important part in the changes in agriculture taking place throughout the old Cotton Belt in the mid-Twentieth Century. More and more farmers each year are finding it profitable to apply water to growing crops. It might appear to be unnecessary to practice irrigation where the normal annual precipitation is more than 45 inches. But despite our relatively high rainfall, there are periods almost every year when crops suffer because of drought. So far most of the supplemental water is applied to tobacco, truck, or other specialized crops of high-acre value. However, there are some who feel that irrigation has a place on cotton, corn, or pasture—especially for dairy cattle. This is another subject on which extensive research is needed in order to develop most efficient methods.

The Future?

The countless gullied hillsides and depleted fields so often seen even yet as one travels across the country are mute evidence that a permanent agriculture cannot be built on cotton or any other row crop alone. We tried this for many years, and at last has come the realization that we must have the diversification of which the leaders of another day dreamed and talked, and that this diversification must include a lot of acres in sod.

What we are looking forward to in the South today is the development of a sound agricultural economy which will spread our base of operations to many crops, of which grass is one.

It is not to be expected that grassland agriculture will entirely, or even largely, replace row crops throughout the South, but that the two will fit together in a complementary relationship based on the capability of the land, current economic conditions, the desires and abilities of the individual farmer, and related factors. Within the range of economic conditions, land best suited to cotton, tobacco, corn, truck, soybeans, or peanuts still will be planted to such crops. Grass or grass and legume mixtures will be seeded on land, the capability of which makes such use logical and proper. There is plenty of land on which we can raise all the row crops we need and still have many acres left for grass.

The Southern farmer is not concerned with an agricultural economy based on grass alone but one which will embrace both sod and row crops—each occupying its proper place in our pattern of agriculture.

Agrimetro America

(*From page* 5)

factory prices in times when visible supply seems in excess of current and future demand. Just when he begins to see over the top, some speculative adventurers barge in and upset the apple cart with more output than the market will absorb profitably. There are no restrictions put on such gamblers like certain industries have through laws that require such persons to have proof of convenience and necessity before launching "suitcase farming."

City critics seldom go back to the real reason for farm unrest. Agriculture as a whole, with minor exceptions, is a casualty of the late World War. Vast armies and foreign civilian people had to be fed during a global war. So under such pressure, land under cultivation here increased over 30 million acres in the 1940-48 period. After the Korean war, American farmers lost enough export trade to equal the output of 25 million acres. Home consumption failed to rise with the earning power of consumers at a rate to make up much of the difference, because between 1940 and 1955 consumption of all farm products increased only 7 per cent. Despite the present United States increases in population which amount to over two million per year, it seems that we lack the proper consuming outlet for such basics as wheat, cotton, and rice that had been boosted to fit the grave wartime crisis.

Prescriptions drafted for political purposes which claim to get full parity usually aggravate the surplus situation. But the national public policy hinges quite properly on the thesis that there is a real public stake in securing farm prices that will not lag so far behind the cost of the materials farmers buy. This surely is in the direct orbit of the thousands of non-farm workers who rely on stability in agriculture for their own security and steady employment. To head off a descent by farmers into the bankruptcy chasm, attempts have been and are now being made to improve price support, acreage allotment programs, soil bank and conservation acreage systems, and programs to increase consumption.

IF the cost-price squeeze suffered so widely by farmers is not halted, there will be trouble brewing for the host of workers who manufacture and sell the production and household articles for which the average farmer in normal times is an eager and cash-paying customer. When these workers feel their own cost-price squeeze, it will reflect onward to the more distant and less related industries. Then it will be a vital problem for Agrimetro America and we won't hear so many smart alecs sounding off about the farmer.

Few city critics stop to figure out what this cost-price squeeze really is. But they'll get a taste of it themselves if nothing occurs to reverse the trend. In 1947 gross farm income was $34 billion. Last year it was $32 billion and 900 million. This represents a fall of about 3 per cent. The real trouble is not here so much as it is on the buying side.

In 1947 farm costs and expenses amounted to $16 billion and 800 million. Last year the costs stood at $22 billion and 300 million. Here we had a rise of 32 per cent in farm costs. So we can figure net farm income at $10 billion and 600 million in 1955 compared to $17 billion and 200 million back in 1947. This means a drop of 38 per cent as the net return to agriculture. It has been pointed out that the net income last year was divided between 18 per cent less farm folks than the larger net income of 1947.

Under strong pressure, America's farm mortgage debt has more than doubled in the past 8 years. However, no general alarm is raised on that point. This is because farmers own nearly 40 per cent more equity in land, machinery, buildings, and livestock today than they held in 1947. More than enough to cover all existing farm mortgages is said to be in the shape of farm liquid assets in cash, bonds, and bank deposits.

Now all these facts and figures dished up herein are old, familiar digits and digests for those of us who have slept with the farm program for many moons. Once again we recite them in a place that is not generally read and reviewed by the folks in cities who should be exposed regularly to them. To find a way to humanize these agricultural problems so that the majority of our citizens will understand and accept the truth is a public relations job to challenge the best minds in farm leadership.

IT is a challenge that has been accepted by many farm leaders as they feel the initiative should be taken by agriculture in reaching city minds. Three ways of looking at the situation in the words of responsible men in harmony with the Farm-City Week idea may well be included here.

An officer of the National Grange has this message on the question: "Always keep in mind that Farm-City Week is dedicated to a two-way improvement in understanding. We have something to learn as well as something to tell. Some farmers think that city workers have it pretty soft. Looking at just one side of the city story, they think that only city people have short hours, Saturday and Sunday off, vacations with pay, and no regular daily chores to do. And some city workers think that farmers have all the free food they want, own their own homes, have healthy working conditions, and get guaranteed farm prices.

"But when farm and city people have a chance to get together and learn more of the facts, they find out that many of their previous ideas were wrong. More important, they begin to understand each other better, to the benefit of both. Many urbanites will never know the truth about rural America unless the Grange tells the story."

NEXT let's see what a member of the President's National Agricultural Advisory Committee thinks about it: "I have faith in the good judgment and foresight of the American farmer, who today sees his responsibility to market quality products and the need for conducting in his own industry, alert campaigns of consumer education. Research to get the nutritional facts, followed by advertising and sales effort to place those facts before consumers, will bring more constructive results than all the government-conceived programs combined. As a post-war casualty, American agriculture needs self-help from within more than it needs governmental aid from outside."

Finally, get the attitude of a widely known expert in advertising and public relations: "The public has a fuzzy mind about farming. There are three main reasons why the farmer's relations with his fellow Americans of the cities are not better. First, the public is misinformed about farming and farm problems. Second, faulty farm programs and faulty administration of them breed distrust of farmers. Third, the farmer is not represented at the point of sale, but is totally dependent upon the distributor. In regard to supported prices, agriculture may indeed be defending a folly. Before a sound public relations effort for agriculture can be devised, this question must be resolved."

Other thinkers on the matter believe that the four major farm organizations should get together on a farm program which has as its basis the common welfare, rather than catering to selfish interests. Others want rural high school staffs to arrange for country tours designed to bring bus loads and auto caravans right out among the producers, giving them first-hand impressions of the situation and attitude under which farmers work.

It has also been proposed to get labor unions and lodges to stage farm-city programs, inviting in as many persons from near-by farm areas as possible. It has been suggested that civic clubs ask some of their own members engaged in servicing agriculture or making equipment for farmers to give a talk to impress on city hearers the inter-relationship of all city business with agriculture—and how closely the economics of both groups dovetail into a pattern of progress.

SOME magazines have already done much to illustrate the true picture of life and work on farms. They could do much more. Likewise, someday a corporation with a close tie-in with agriculture will produce a series of television programs in various agricultural centers for the national networks. Already, several agricultural colleges through the extension services are doing enough experimental work of this nature to furnish a basis for the kind of continuous education we need for this tremendous job.

If this effort drags or fails, it will not be for want of media of communication. We have sold other things of far less vital value by utilizing every avenue we have for information and education.

Unity based on understanding and an open mind is all we need ask for in behalf of Agrimetro America.

FREE LOAN OF EDUCATIONAL FILMS

The American Potash Institute will be pleased to loan to educational organizations, agricultural advisory groups, responsible farm associations, and members of the fertilizer trade the motion pictures listed below. This service is free except for shipping charges.

FILMS (ALL 16 MM. AND IN COLOR)

The Plant Speaks Thru Deficiency Symptoms (Sound, running time 25 min. on 800-ft. reel.)

The Plant Speaks, Soil Tests Tell Us Why (Sound, running time 10 min. on 400-ft. reel.)

The Plant Speaks Thru Tissue Tests (Sound, running time 14 min. on 400-ft. reel.)

The Plant Speaks Thru Leaf Analysis (Sound, running time 18 min. on 800 ft. reel.)

Save That Soil (Sound, running time 28 min. on 1200-ft. reel.)

Borax from Desert to Farm (Sound, running time 25 min. on 1200-ft. reel.)

Potash Production in America (Sound, running time 25 min. on 800-ft. reel.)

In the Clover (Sound, running time 25 min. on 800-ft. reel.)

In Canada: The Plant Speaks Thru Deficiency Symptoms
The Plant Speaks, Soil Tests Tell Us Why
The Plant Speaks Thru Tissue Tests
The Plant Speaks Thru Leaf Analysis
Borax from Desert to Farm
Potash Production in America

DISTRIBUTORS

Northeast: Educational Film Library, Syracuse University, Syracuse 10, N. Y.

Southeast: Vocational Film Library, Department of Agricultural Education, North Carolina State College, Raleigh, North Carolina.

Lower Mississippi Valley and Southwest: Bureau of Film Service, Department of Educational Extension, Oklahoma A & M College, Stillwater, Oklahoma.

Midwest: Visual Aid Service, University Extension, University of Illinois, Champaign, Illinois.

West: Department of Visual Education, University of California, Berkeley 4, California.

Department of Visual Education, University of California Extension, 405 Hilgard Ave., Los Angeles 24, California.

Department of Visual Instruction, Oregon State College, Corvallis, Oregon.

Bureau of Visual Teaching, State College of Washington, Pullman, Washington.

Canada: National Film Board, Ottawa, Ontario.

For the Province of Ontario: Distribution Services, Ontario Agricultural College, Guelph, Ontario.

IMPORTANT

Requests should be made well in advance and should include information as to group before which the film is to be shown, date of exhibition (alternative dates if possible), and period of loan.

Request bookings from your nearest distributor.

AVAILABLE LITERATURE

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.

Reprints

3-1-56 Potash in Agriculture
F-3-40 When Fertilizing, Consider Plant-food Content of Crops
S-5-40 What Is the Matter with Your Soil?
Y-5-43 Value & Limitations of Methods of Diagnosing Plant Nutrient Needs
A-1-44 What's in That Fertilizer Bag?
P-3-45 Balanced Fertility in the Orchard
Z-5-45 Alfalfa—The Aristocrat
ZZ-11-45 First Things First in Soil Fertility
T-4-46 Potash Losses on the Dairy Farm
Y-5-46 Learn Hunger Signs of Crops
TT-11-47 How Different Plant Nutrients Influence Plant Growth
AA-6-48 The Chemical Composition of Agricultural Potash Salts
GG-10-48 Starved Plants Show Their Hunger
SS-12-49 Fertilizing Vegetable Crops
BB-8-50 Trends in Soil Management of Peach Orchards
X-8-51 Orchard Fertilization Ground and Foliage
KK-12-51 Potassium in Animal Nutrition
A-1-52 Research Points the Way to Higher Levels of Peanut Production
Y-10-52 The Nutrition of Muck Crops
CC-12-52 The Leaf Analysis Approach to Crop Nutrition
I-2-53 Sericea Is a Good Drought Crop
J-3-53 Balanced Nutrition Improves Winter Wheat Root Survival
K-3-53 Kudzu Keeps Growing During Droughts
N-4-53 Coastal Bermuda—A Triple-threat Grass on the Cattleman's Team
P-4-53 Learning How to Make Profits from Sweet Potatoes
T-5-53 Trefoil Is Different
DD-10-53 Sampling Soils for Chemical Tests
II-11-53 The Importance of Legumes in Dairy Pastures
JJ-11-53 Boron—Important to Crops
MM-12-53 White Birch Helps Restore Potash-Deficient Forest Soils
K-2-54 Soil and Plant Analysis Increase Fertilizer Efficiency
R-3-54 Soil Fertility (Basis for High Crop Production)
U-4-54 Nutrient Balance Affects Corn Yield and Stalk Strength
CC-6-54 Fertility Increases Efficiency of Soil Moisture
EE-8-54 Red Apples Require Balanced Nutrition
FF-8-54 Apply Fertilizers in Fall for Old Alfalfa, Grass Pasture and Timothy-Brome Fields
GG-8-54 Effect of Boron on Beets and Crops Which Follow
JJ-10-54 Principles Involved in Soil Testing
LL-10-54 Relation of Fertilizer to Quality and Yield of Flue-cured Tobacco
MM-10-54 Longer Life for Ladino
SS-11-54 Foliar Application of Plant Nutrients to Vegetable Crops
YY-12-54 Physical Condition of the Soil Affects Fertilizer Utilization
A-1-55 Potash-Deficiency Symptoms
C-1-55 Summary of Ten Years' Work with Complete Fertilizers on Sugar Cane
D-1-55 Nitrogen Use Accentuates Need for Minerals
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L-3-55 Soybean Production in the Southern States
P-3-55 N-P-K for Deciduous Fruit Trees
S-4-55 Greener Pastures Mean Better Living
U-4-55 Fertilizer Recommendations—Burley Tobacco
V-4-55 Planned Nutrition for Canning Tomatoes
W-5-55 The Production of Sugar Beets on Organic Soils
X-5-55 What Is Happening to Our Citrus Soils?
Y-5-55 Pasture Improvement Through Renovation
Z-5-55 Azalea Fertilization
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HH-10-55 Fertilizers Will Cut Production Costs
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B-1-56 Certain Practices Are Important for Successful Pecan Production
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THE AMERICAN POTASH INSTITUTE

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A Few Whinnies

An elderly gentleman with a shy young girl in tow entered a doctor's office, announced they needed blood tests for a marriage license.

The doctor eyed them a moment, then asked, "How old are you?"

"I'm 87," the old man replied. "She's 17."

"What!" screamed the doctor. "Don't you realize that much difference in age could be fatal?"

"Oh, well," shrugged the old gentleman, "if she dies, she dies!"

* * *

Sam had backslid again, and his pastor was upbraiding him for it. "Why didn't you say, 'Get behind me, Satan'?"

"I did say dem very words, parson," Sam explained. "Den Satan he say, 'All right, Sam, I'll git behind. Since we bofe goin' de same way, hit mek no diff'unce who takes de lead.'"

* * *

"I'm not going out with Bill any more. He knows too many naughty songs."

"Does he sing them to you?"

"Well, no . . . but he whistles them."

* * *

A would-be soap-box orator who had reached the argumentative stage sat down next to a clergyman in a street car. Wishing to start something, he turned to the clergyman and said:

"I won't go to heaven, for there ain't no heaven."

The expected rise was not forthcoming.

"I say there ain't no heaven. I ain't goin' to heaven," he shouted.

The clergyman replied quietly, "Well, go to hell, then, but be quiet about it."

"My girl's lipstick seems to have a better taste than other girls'."

"Yeah, doesn't it."

* * *

It was a tough, close-fought game between two bitter intercollegiate football rivals. The pressure got a little too much, a foul was made and the referee penalized the offending team ten yards. The captain bawled out the arbiter with a blistering tirade, finishing off with this rather succinct observation, "I think you stink."

The referee promptly added fifteen yards more to the penalty and called to the captain, "See how I smell from there."

* * *

Wife (reading husband's fortune card): "'You are a leader of men. You are brave, strong-minded and popular with the opposite sex.' It's got your weight wrong, too."

* * *

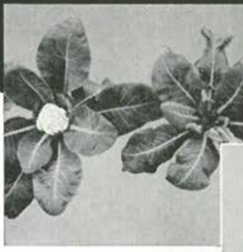
A mother took her seven-year-old daughter to a very progressive, modern school. Among the questions asked was this one: "Are you a little girl or a little boy?"

The little girl answered, "I'm a boy."

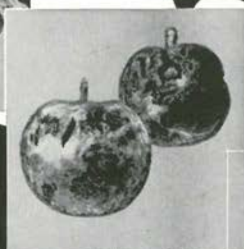
Well, the teacher went on at a great rate, scaring the poor mother to death by saying the child was psychologically confused, that she should be put with the group of problem children, she wasn't quite bright, etc. On the way home the mother said, "Darling, why did you say you were a little boy?"

Her daughter gave her a long look. "Well, when anybody asks me a dumb question I give them a dumb answer."

Cauliflower: left, boron treated; right, brown curd with boron deficiency



Alfalfa yellows and rosetting due to boron deficiency



Apples with external cork cracks, necrotic areas and dwarfed

EXAMPLES OF BORON DEFICIENT CROPS

Tobacco with die-back of terminal bud rolling of upper leaves

When crops need Boron . . . team up and

Economize with Fertilizer Borates

For extra profits, team up with this popular agricultural-grade borax—so rich in boron—so right for crops! This material, your most economical source of boron for agricultural use, is just right for Borating fertilizers or for direct applications. Choose from two grades in either coarse or fine mesh. "HIGH GRADE" contains 44% B_2O_3 (equivalent to 121% Borax). "REGULAR" contains 34% B_2O_3. It will pay you to investigate the economy of fertilizer borate—write for Bulletin PF-3 today!

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