## Keeping Ahead Of The Race for Food

| Year | Acres (Millions) | Bushels (Billions) | Yields (Bu/A Avg.) | Population (Millions) |
|---|---|---|---|---|
| 1930 | 86 | 1.7 | 20.5 | 122 |
| 1950 | 72 | 2.8 | 38 | 151 |
| 1969 | 54 | 4.6 | 83.9 | 200+ |
| *Corn → Grain* | *On 36% Less Land* | *161% More Bu.* | *309% More Yield* | *For 64% More People* |


# A Man For FOUR Seasons

**Few KNOW Him**
**Millions OWE Him**
**THANKS**

**. . . Page 2**


# Better Crops WITH PLANT FOOD

**NUMBER 3—1970** **25 CENTS**

**ON THE COVER,** we see a story equal to any moon trip man will ever take. The figures have been rounded out for rapid digestion.

This year's blight emphasizes the remarkable story behind this 40-year trend. There have been blights before . . . droughts before . . . insects . . . gremlins too numerous to mention. But look at the trend!

The sciences of medicine have prolonged life. The sciences of energy have removed the drudgery from it. But the Man for Four Seasons has sustained it. Who is he? See page 2.

# Tips For Fall Potashing

**A VETERAN AGRONOMIST** once got up in a meeting on fertilization and started talking about fall "potashing"—back when the idea was new.

He had spent his lifetime studying the remarkable effects of potash on most major crops. So, he did not hesitate to suggest fall "potashing." Why?

**1—I plan to fall plow my corn ground this year. What about broadcasting potash before plowing?**

Good idea. Better than discing after plowing, because most disced K stays near the surface to leave plants high and dry for K in dry summer weather. Plowdown puts it deep in the moisture zone for better uptake between rains next summer.

**2—Will I lose the K?**

No, except on very sandy soils. The soil attracts K like a magnet attracts a nail. You won't lose potash to ground water.

**4—Harvesting takes most of my time. Labor's short. Who'll run a stalk shredder . . . who'll plow or chisel?**

Some farmers get men with full-time jobs in town who want extra work. One to run a stalk shredder 4 hours a day, another to plow or chisel 4 hours, later in the day. They should keep pace with your harvesting and your dealer's fertilizer spreading. At the harvest's end, your stalks should be shredded, fertilizer on, and ground tilled.

**15—I will follow winter small grain with soybeans next year. Can I put on enough potash this fall for both crops?**

Yes. And the soybeans will thank you. They too often get little or no fertilizer at seeding. Also, they seem to like residual fertility. *REMEMBER:* You're fertilizing for TWO crops. You can maintain a two-crop soil with FULL fall fertilizing.

**17—Some say I should topdress potash on my alfalfa this fall. Why?**

Consider what EACH TON removes: 50-60 lbs. $K_2O$! Top growers put on about half the need in fall, half after first cut in spring. For 6 tons/A, this means about 500 lbs. 0-1-4 ratio this fall on a soil medium or less in K.

**For complete kit of Fall Potash Tips, write Fall K Fertilegrams, American Potash Institute, 1649 Tullie Circle N.E., Atlanta, Ga. 30329**

**Better Crops**
**WITH PLANT FOOD**

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# A Man For FOUR Seasons

**A BETTER CROPS Profile**

**Based on two addresses:**
**"Improving Our Agronomic Image"**
**Presidential Address**
**By Dr. Werner Nelson to the American Society of Agronomy**

**"Future of the Industrial Agronomist"**
**By Dr. W. K. Griffith**
**To Northeast ASA Meeting**

**HOW MANY PEOPLE** outside agriculture know what an agronomist is?

Ask your friends where their meat or bread comes from.

The supermarket, of course!

The next time a friend introduces an agronomist to a local lawyer or businessman as being from the agronomy department, listen carefully.

"Why, I didn't know the university had an **astronomy** department."

You heard him right. **Astronomy!**

**WHY IS AGRONOMY NO** better known—when the agronomist contributes to man's very survival?

He helps feed the world through scientific advances in food production.

He tackles many crises caused by the population explosion—pollution, food and

## THE AGRONOMIST

**LONG-TIME CHAMPION** of an abundant environment.

**Conserving Water** . . . to sustain the earth.

**Building The Soil** . . . to insure greater crop yields.

**Improving Croplife** . . . to feed more and more people.

**Facing The Future** . . . to keep us free from famine.

water quality, and, of course, food shortages.

His science—agronomy—is the prime ingredient in the struggle to balance the ecological systems.

Yet, he seems to be obscure—when he should be leading.

He seems to hesitate—when he should charge.

He seems to be defensive—when he should be aggressive.

Demands for his services expand slowly, when they should be exploding.

Time will solve this image problem, because agronomy will emerge as a profession controlling the survival of us all.

Yet, many agronomists would rather not be called an agronomist, but a soil physicist or geneticist, etc.

Is this short-sighted? Wouldn't it be better to be part of the WHOLE picture in order to gain recognition for agronomy?

Take the industrial agronomist, for example. He is not a special agronomist. Yet, some pigeonhole him in their minds.

He differs from university and government agronomists only in his employment. He has the same type of training. He works on many of the same problems.

To our knowledge, no distinctions are made for industrial mathematicians, industrial accountants, or industrial biologists.

Promoting the idea of separate identities in agronomy serves no useful purpose—the jobs are too large, the stakes too high.

The big job for agronomy in the future will not be done by research agronomists, industry agronomists, extension agronomists, or government agronomists.

It will be done by ALL agronomists.

Why? Because so many different groups need his know-how:

- **The building industry and local governments need him.**
  . . . to help select and design building sites . . . create safe disposal systems for garbage and sewage . . . locate highways, airports, shopping centers, housing developments, water sheds . . . and advise on zoning factors that involve the environment.
- **The recreation industry needs him.**
  . . . to help design and maintain successful turf areas, golf courses, athletic fields, resort lakes, and other recreational facilities.
- **The food processing industry needs him.**
  . . . to help insure fuller quantity and quality in their products.
- **The fertilizer, lime, and pesticide industries need him.**
  . . . to develop and promote the profitable use of their products—in a way that is sound and safe and profitable for the farmer.
- **The seed industry needs him.**
  . . . to help in the important business of developing new, more productive hybrids and varieties.
- **The farm equipment business needs him.**
  . . . to test and advise on new production equipment and practices and to make forecasts on cropping patterns 10 to 20 years ahead.
- **The feed industry needs him.**
  . . . to consult on quality aspects, production practices, and future trends.
- **Many other businesses need him.**
  . . . to bring his agronomic training to diagnostic firms, farm management outfits, banks, irrigation companies, and publishing firms.
- **The farmer—most of all—needs him.**
  . . . to help translate the latest production knowledge into a profitable enterprise.

**THERE IS NO SHORTAGE** of work for agronomists. Production agriculture calls constantly for *agronomic adjustments*.

**1—Who will** solve the new puzzle of minimum tillage and sod seeding? The agronomist. Why? To save labor, water, and soil.

**2—Who will** find ways to get full potential out of new seed or the new two-eared hybrids? The agronomist. How? Through continuous trials with row spacing, planting dates, nutrient levels, etc.

**3—Who will** test new chemicals for best method and time of application? The agronomist. Why? To develop safer handling of better chemicals by a pollution-scared public.

**4—Who will** keep fertilizer technology rolling? The agronomist. How? By testing new materials—constantly searching for best application methods, time, and equipment . . . then trouble shooting in the field to make sure OTHER factors do not penalize the values of good fertility.

All these roads lead to one goal: Higher yields that benefit the farmer. When yields go up, costs per unit go down until potential profits rise.

To get these yields, the farmer needs more and more feed, seed, plant food, pesticides, and agronomic services, including plant and soil tests. He must buy most of them.

Yet, our morning paper will headline rising food prices—but rarely mention that farm families spent nearly $40 BILLION last year to pay for production.

It will headline the handful of farmers Uncle Sam pays (in 6-figure checks) not to raise certain crops—but rarely mention that the cellophane bag containing carrots costs three times what the working farmer got for the carrots inside.

It will headline the 16% of our income that goes for food—but rarely explain that is only half what Europeans use out of their income.

Even so, farmers keep plodding . . . trying new methods . . . reaping higher yields from proven ones.

In one state's 10-acre-corn contest, farmers with 150 bu/A reported using the high-yield package (soil tests, early planting, narrow rows, pesticides, and top fertilizer rates) much more than those with 80 to 120 bu/A.

In another state's 5-acre corn club, farmers with 150 bu/A or more boosted their return to labor and management $100 per acre over the low yielders. Such management on a 100-acre corn field would have meant $10,000 EXTRA for a job well done.

The agronomist is in the middle of this progress—in fact, behind it with his shoulders pushing.

**YET, A DANGEROUS GAP** in applied research—the kind of research production agriculture needs—looms on the horizon.

"Dangerous" is not too strong a word. Today's abundant food supply came from yesterday's research. Tomorrow's supply depends on farmers getting the fruits of *continued* applied research by agronomists.

Farms grow larger every year. Larger farms usually mean more efficiency, more profits. To insure this efficiency, they need the services of professional agronomists.

Farm accounting and management decisions are already being streamlined by computers. And agronomists use this tool to pinpoint the ultimate value—or fault—of each practice they "sell" the farmer.

Tomorrow—as today—the professional agronomist will carry one conviction to each farm: What is best for the farmer is best for the country, its economy, its ecology, and its people.

The agronomist is one of the world's most important scientists. Yet, he remains obscure, almost unknown to an urban-pregnant nation.

**CAN HE IMPROVE HIS IMAGE?** Yes . . . in many ways:

- **Through a top-quality news service** out of the American Society of Agronomy headquarters . . . to feed the press agronomic stories with real human interest meat in them.
- **Through TV and Radio Tapes** . . . to tell the story of man and his food . . . prepared by professional writers working with scientific authorities . . . not only for popular TV and radio presentations, but also for kinescope use with educational groups in high school, college, 4-H, etc.
- **Through white or position papers** . . . to "tell it like it is" on timely issues of the day . . . pollution, food potential, etc. . . . issued annually by one or two authorities . . . for nationwide coverage.

- **Through clear teaching aids** . . . for junior and senior high schools . . . to help attract young people . . . many in urban areas from which more and more agronomic manpower will come in the future.
- **Through service club presentations** . . . that dramatize agronomy for community leaders . . . in Rotary, Kiwanis, Lions, etc.
- **Through career visuals** . . . slide sets, movies, brochures . . . to attract the best not only from high schools, but also from biology and science departments of land-grant colleges, liberal arts colleges, and junior colleges.
- **Through compelling exhibits** . . . to attract people to agronomy's key missions . . . key achievements . . . manned by personable students whose understanding and enthusiasm add a winning dimension to the exhibit.
- **Through popular articles** . . . written for popular publications, not scientific journals . . . not for colleagues or superiors, but for the public . . . emphasizing what agronomic FINDINGS mean to people in general.
- **Through bumper stickers** . . . carrying clever ideas down many highways . . . such as, "you are following an agronomist" or "Agronomy, the profession that feeds the world."

There are as many ways to tell the story of agronomy as there are stories to tell.

What would happen if each member of the American Society of Agronomy started telling the story today—7,400 communicators enthusiastically spreading the word?

Enthusiasm is the key . . . that and the evidence to work with . . . and the courage to speak out.

Not everyone can be an electrifying speaker or an inspirational writer. But everyone can latch on to some key facts —proof—and broadcast them whenever the chance comes. And there are many chances every week!

In 1930, not many years ago, it took 85 million acres of land to grow 1.75 billion bushels of corn to feed 122 million people.

Last year 54 million acres grew 4.5 billion bushels to feed 200 million people!

**OR 161% MORE bushels on 36% LESS land for 64% MORE people!**

How? Through 309% greater yields—from 20 bu/A in 1930 to 83 bu/A average in 1969.

They didn't come out of the university's **astronomy** department! Then let's tell it —like it is! **THE END**

# Tips For Fall Potashing

**(Order Fall K Fertilegrams Bottom Cover 2)**

**11—Will fall fertilization work for two silage crops each year on the same acreage—corn or sorghum in summer, small grain in winter?**
Yes. But don't forget: Fertilize enough for BOTH crops. Nitrogen goes on EACH crop. All P and K can go on in fall or spring. Again, remember what big K users silage crops are. Use ENOUGH P and K for both crops.

**13—What about applying K on well managed grass pastures in fall?**
Fine. High-nitrogen programs on grass pastures can bankrupt your soil's potash account. A strong fall potash program will prevent this and insure continued high yields and quality.

**14—I know soybeans like to eat at the "second table"—or carryover fertility. Will fall potash application work well with them?**
You bet. Especially when you get ENOUGH on. And fall is the time. *REMEMBER:* A 60-bu/A bean crop contains nearly 85 lbs. $K_2O$ *just in the beans.*

# Will Fertilizer BOOST Soybean Yields?

L. M. WALSH & R. G. HOEFT
UNIVERSITY OF WISCONSIN

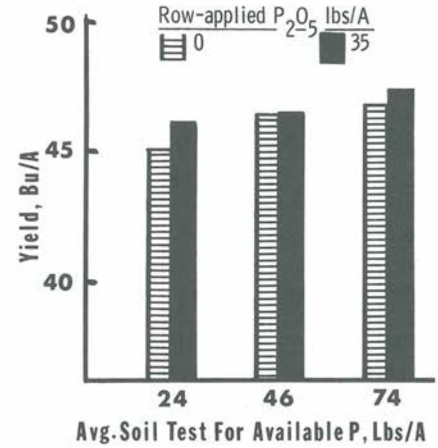



**FIGURE 1—Increasing soil test P and row-applied $P_2O_5$ improved soybean yields little.**

**• "Soybean yields in Wisconsin can be pushed up 20%—or 5 to 6 bushels per acre—with potash applied in the row." From University press release.**

**EVERYONE FERTILIZES** corn—but many farmers do not fertilize soybeans, at least not enough.

Much controversy still exists over using P and K on soybeans.

Some people feel soybeans respond to inherent high fertility (high soil test levels), but not to direct fertilization.

Others believe beans will respond to both soil test and applied P and K.

To investigate this problem, 1969 Wisconsin research sought optimum soil test and applied P-K levels on a deep, prairie soil (Plano silt loam) in southern Wisconsin.

Different rates of P and K were broadcast to 30′ x 60′ plots from 1959 through 1963 to establish different soil test levels. **Figures 1, 2, 3,** and **4** show average soil test levels and the row fertilizer treatments.

Corsoy beans were planted in 30-inch rows during the first week of May and thinned to a uniform stand of 8 plants per foot of row.

**WHAT ABOUT PHOSPHORUS? Figures 1 and 2** show the average soil test levels for available P (Bray $P_1$) ranged from 24 to 74 lb/A. At each soil test level, either 0 or 35 lb/A of $P_2O_5$ was row-applied.

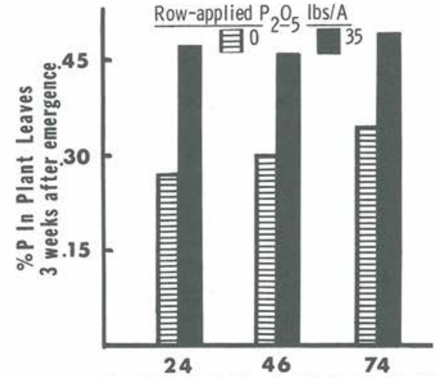



**FIGURE 2—P% in plant leaves rose markedly from using row $P_2O_5$, only slightly from increasing soil test P.**

Increasing soil test P and row applied P boosted yield only 1-2 bu/A.

P concentration in plant leaves rose markedly from using row P, only slightly from increasing soil test P.

But more P in the leaves did not increase yield significantly.

So, a medium soil test—about 25 lbs. available P/A—and a plant tissue concentration of about .25-.30% P seems sufficient to produce optimum yields.

Increasing soil test P or concentration of P in the plant above these levels did not improve yield.

**WHAT ABOUT POTASSIUM? Figures 3 and 4** show the effect of K.

Average soil test levels for available K ranged from 167 to 219 lbs/A. At each soil test level, either 0, 35 or 70 lbs. $K_2O$/A was row-applied.

Increasing soil test K and row-applied K both improved yield significantly—from about 40 to nearly 50 bu/A—or about 25%.

Row-applied K increased yield some even at the highest soil test level. Most research indicated no response when the soil tests 200 lbs. K/A or greater.

Soybeans grown on colder soils in the northern part of the Corn Belt may possibly require higher levels of soil test K.

Increasing soil test K and row-applied K also boosted K concentration in the plant leaves, markedly. So, about 2.2% K in the plant leaves early in the growing season seems necessary for optimum yields.

This yield predication equation was calculated from the results of this trial:

Y (yield, bu/A) = 35.8 + .06 K applied + .04 K soil test.

The correlation coefficient for this equation was highly significant (r = .51**).

Only soil test K and applied K were included in the equation. Phosphorus was not included because neither the soil test nor applied P affected yield significantly.

This predication equation indicates that under the conditions of this experiment, yields would increase 0.06 bu/A for each pound of applied K, and 0.04 bu/A for each 1 lb/A increase in the soil test K.

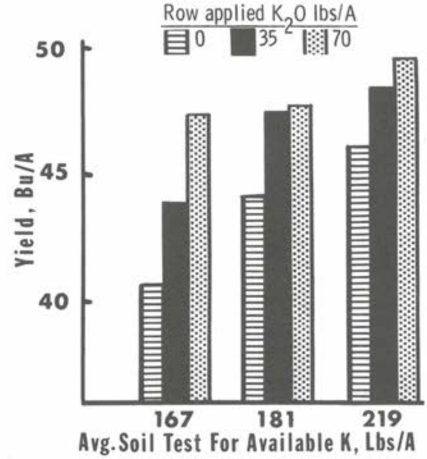



**FIGURE 3—Increasing soil test K and row-applied $K_2O$ improved soybean yields significantly.**

**IN SUMMARY.** This trial supports a medium soil test for available P—about 25-30 lb/A—to produce optimum soybean yields.

It supports a high soil test for available K—200 to 220 lb/A. Soybeans can be expected to respond to both direct application of $K_2O$ and improvement of soil test levels for available K. **THE END**

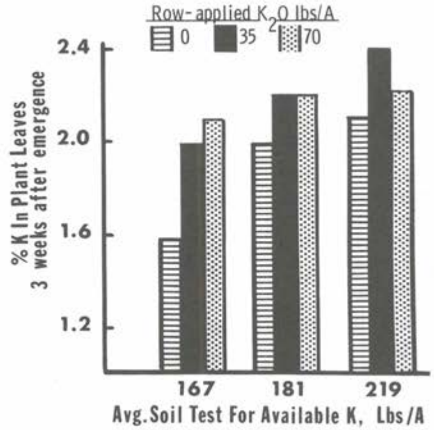
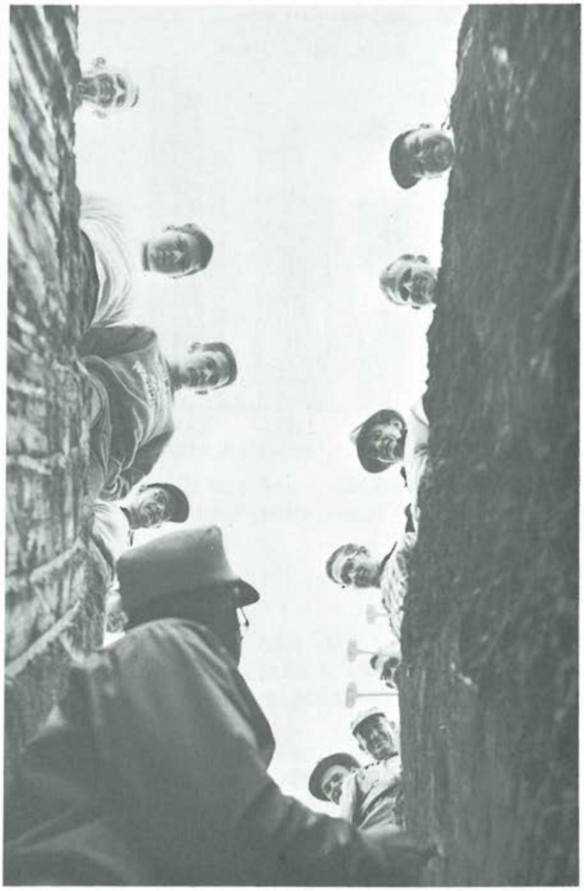



**FIGURE 4—Increasing soil test K and row-applied $K_2O$ also boosted %K in the plant leaves markedly.**



# TWO-way Street

JAMES H. EAKIN
**PENNSYLVANIA STATE UNIVERSITY**

**A well-known Pennsylvania specialist has gained the wisdom to conclude: "After kicking around Pennsylvania for more than 20 years, it has become clear that I've learned more from farmers than they've learned from me."**

**IT HAS ALWAYS BEEN** frustrating to know farmers plant all the way from 80 to over 160 alfalfa seeds on every square foot of land across an acre.

This results in zero plants to almost 160 per square foot. Uniform stands have been our biggest hang-up in high alfalfa yields and other forage species. If you don't have the plants, you don't have the yield.

I learned much about consistent alfalfa stands from a Pennsylvania Dutch Amish friend. He had 7 tons/A yields last summer (1969).

I've never seen him fail to come up with perfect alfalfa stands. He supports 45 dairy cows plus young stock on just about that many acres.

His answer to good stands rather shocked me.

"Good stands," he said, "start with fall plowing."

The only crop we fall plow for is sugarbeets. There's a parallel here. Sugarbeets are among the hardest crops to achieve full and consistent stands. So is alfalfa.

He fall plows, levels the land slightly, and lets the seedbed freeze, thaw, and settle over winter. Just before spring planting, he goes over the field lightly with a spiketooth harrow and band seeds the alfalfa. His stands are nearly perfect.

**WHAT ABOUT BAND SEEDING?** The Ohio Experiment Station people came up with the band seeding idea in the early fifties.

Little did they know how much that practice would influence forage crop production. No practice has contributed more to full stands and high yields.

Band seeding is best in a cold, wet spring when young seedlings struggle for enough phosphorus to stay alive. It places that tiny seed precisely at the right depth.

Band seeding was originally intended to place the seed close to, but not in contact with plant nutrients. Even if the fertilizer is absent, band seeding achieves better than average stands compared to other seeding methods.

**RIGGING THE DRILL.** We first started attaching rubber hoses—and later steel ribbon hoses—from seedbox to an attachment directly on the disk boot.

Farmers convinced us this was not permanent enough on small, and/or stony fields. Constantly raising and lowering disks wore out the device.

In spite of our objections, farmers mounted a board in front of the drill step and directly behind the disks. Next, they drilled holes in the board to receive the hoses.

We told them their idea wasn't as good as ours because on side hills the disks plus fertilizer application would be altered enough to offset advantages of band seeding.

Their device hadn't read our circular—fortunately. It worked very nicely.

They have also found the discharge end of the tube should be about 10-11 inches behind the rear cutting edge of the disk.

Some keen observers also noted band seeding was not effective when the discharge tube was too high from the bottom of the disk furrow.

Many alfalfa fields in our state are planted on windy days. If the seed drop is too far, the wind will take it away from the fertilizer band.

**EVOLUTION OF A SYSTEM.** One of my farmer friends near Lebanon made a


**"The Ohio Experiment Station people came up with the band seeding idea in the early fifties. Little did they know how much that practice would influence forage crop production. No practice has contributed more to full stands and high yields."**

sharp comment some years ago. It called for an answer.

He noted alfalfa plants feed in a certain manner . . . and fertilizer, when applied to soils, also reacts with the soil in its own manner . . . so there must be a system of fertilization which both physiologically and chemically is best for the alfalfa plant.

Of course, the system would have to be economical, he insisted.

In the next couple of years we instituted an alfalfa fertilization system on about 40 farms. This has since spread statewide and is working very well.

The system is based on two **musts:** (1) The soil pH must be between 6.5-7.0. (2) The potassium level of the soil must be at least medium.

Since our soils are quite low in phosphorus, that would be a big item to consider. We plowed down 0-200-0 to solve that.

We wanted the phosphorus deep where it belonged in moist soil. Also, phosphorus doesn't leach hardly at all. The plow down seemed logical chemically and physiologically.

The alfalfa was generally started by band seeding with 20-60-20. Today we don't use companion grain crops, but spray a herbicide to control broad-leafed weeds and annual weed grasses.

**WHAT ABOUT MAINTENANCE?** The phosphorus needs were now under control for at least three years, and in some cases, up to five years.

Since alfalfa responds well to top-dressed potassium, we maintained high production by applying 0-0-120 after the first crop was removed and another 0-0-120 after the last crop.

Later research ruled out split application because of added labor. So, today, all potassium is usually applied after first cutting.

After 13 years of wringing out this system of alfalfa fertilization, one must admit nothing succeeds like success.

**THE INNOCUOUS BUG.** I once heard a farmer say, "It's a poor field of alfalfa that won't feed a few leafhoppers." Yet, the devastation a few potato leafhoppers can bring to an alfalfa field is unbelievable.

Alfalfa weevil is a bad insect, but I believe the leafhopper does more damage. It is one of the weak links in our systems approach to alfalfa production.

Farmers will invariably ignore this little beast, but always spray for the weevil.

When alfalfa is 4-6 inches tall in second or third cutting, it pays to make ten sweeps with an insect net. If you average only one insect per sweep, get out the sprayer because you have an infestation!

This volatile little insect obviously does not have to be present in large numbers to be a menace to alfalfa production.

**CUTTING MANAGEMENT** of alfalfa has changed over the years because total management has changed.

In other words, the 41-day cutting schedule has now become a 35-day schedule as vigorous wilt-resistant types replaced Grimm alfalfa and other old-timers.

Of course, balanced nutrition helped keep the alfalfa more vigorous and so did insect control.

Since alfalfa is grown to feed animals, they have responded to the higher protein levels and lower fiber content.

**A PACKAGE APPROACH.** Our imaginative farmers and University personnel are getting around to the "systems" approach to crop production.

With our knowledge of the plant and its total environment, nothing need stop us from consistently producing high quality feed for livestock and high quality food for a burgeoning population.

**THE END**

**Want Reprints? Many Do**
**Make Your Plans On Page 18—Write Us Today**

# Start Coping Now!

To help cope with southern corn leaf blight and certain other diseases in 1971, Dr. E. W. Palm, University of Missouri Extension Plant Pathologist, advises:

1—Early harvest in 1970. Stalk rots are coming in rapidly and field losses may be high in some areas.

2—Clean fall plowing in 1970 where soil conditions permit. The stalks harbor the disease organisms. Plowing them under to decompose helps.

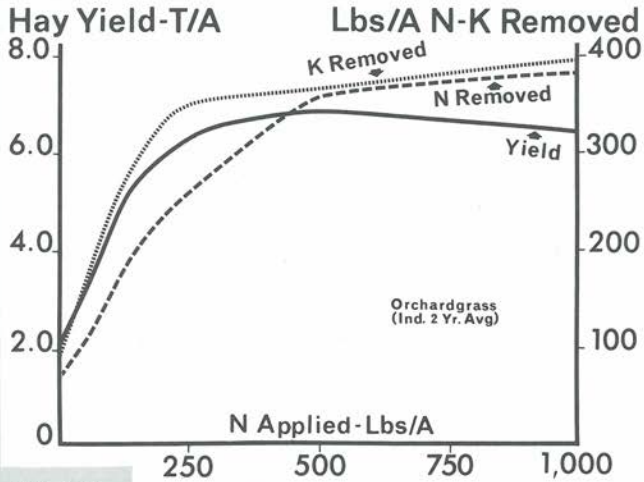
3—Early planting. Plants that mature earliest are likely to suffer less from diseases. This spotlights fall fertilization and tillage. If early planting is not possible, consider alternate crops such as soybeans or sorghum.

4—Tolerant seed rather than non-resistant seed whenever possible.

5—Optimum fertilization. It is important to have plants growing rapidly and without stress from nutrient deficiencies.

6—Apply fungicides in fields which justify extra expense.

# Nitrogen Fertilization Increases YIELDS and N-K REMOVAL by Orchardgrass




C. L. RHYKERD, K. L. WASHBURN
AND C. H. NOLLER
**PURDUE UNIVERSITY**

## It Pays To Be REMOVAL Conscious

**FORAGE CROPS** remove more nitrogen and potassium than they do any other elements.

In fact, orchardgrass may demand twice as much N-K from the soil as it does all other elements.

The K level thought adequate for forage crops has increased in the past few years. Recent research data indicate N-K ratio in forage grasses may be close to 1:1.

**Table 1. How N Fertilization Affected Orchardgrass Hay Yields (12% Moisture)**

| | Pounds N Per Acre Per Year | | | | | |
|---|---|---|---|---|---|---|
| Year | 0 | 62.5 | 125 | 250 | 500 | 1,000 |
| | | | Tons/Acre | | | |
| 1967 | 2.1 | 3.2 | 4.0 | 5.1 | 5.6 | 5.3 |
| 1968 | 1.9 | 3.6 | 5.9 | 7.2 | 7.8 | 7.5 |
| **Average** | **2.0** | **3.4** | **5.0** | **6.2** | **6.7** | **6.4** |

* **Acknowledgment**—This research was financed in part from a trust agreement between Purdue University and Normandy Farm, New Augusta, Indiana; Mr. and Mrs. Herman C. Krannert, owners.

The N and K contents of high yielding forage crops are usually found to be 2 to 4 percent, depending on soil, fertilization rate, and cutting frequency.

**A NITROGEN STUDY** was initiated in 1966 on the Agronomy Farm at Purdue University, to determine orchardgrass response to N fertilization under high management level.

On April 8, 'Potomac' orchardgrass (Dactylis glomerata) was seeded with oats. At seeding time, 305 lbs. of 25-25-0 per acre was broadcast on the Chalmers silty clay loam.

The original pH was 5.8 and lime was applied to correct acidity. The P soil test was 105 (high) and the K test 195 (medium).

Rate of N plots was established on the orchardgrass in early spring of 1967. Ammonium nitrate was broadcast at rates of 0, 12.5, 25, 50, 100 and 200 lbs. actual N per acre **per harvest.**

The first N application was in early April. The following four applications followed each hay harvest. Nitrogen was not applied after the last harvest.

Thus, annual N rates actually totaled 0, 62.5, 125, 250, 500, and 1,000 lbs. per acre.

**P AND K FERTILIZATION** started in 1967—100 lbs. P (229 pounds $P_2O_5$ per acre) and 300 lbs. K (360 pounds $K_2O$ per acre) broadcast on August 9.

Because of high yields in 1967, P and K rates were doubled in 1968 to replace the large amounts of plant food (especially K) removed by high yields.

Thus, 100 lbs. P and 300 lbs. K per acre were applied on April 6 and again on July 23.

**CUTTING MANAGEMENT.** Orchardgrass is one of the first grasses to head out in spring. Its stems do not elongate as a rule after the first cutting.

These traits made it possible to get 5 cuttings each year at about 5-week intervals.

**WEATHER DATA.** Climatically, the 1967 growing season was considered relatively cool and dry for Indiana—with the third driest June and July on record, the coolest July and August in 88 years of recorded weather data.

The 1968 growing season had warmer temperatures with more rainfall. April and May had slightly above average temperatures with below average moisture. June temperature ran below average, but rainfall totaled almost 4 inches above average.

**RESULTS IN FIGURE 1** show the average hay yields (12% moisture) and total N and K removed by orchardgrass for the two-year period. Hay yields for 1967 and 1968 appear in **Table 1.**

In 1968, orchardgrass increased from 1.9 tons/A with no N to nearly 8 tons/A with 500 lbs. N/A.

The amount of N and K removed also increased up to 500 lbs. N/A and then remained at about the same level when N was increased to 1,000 lbs. per acre.

At rates below 500 lbs. N/A, the crop removed a little more K than N.

**IN CONCLUSION.** Orchardgrass yields were increased 3 to 4 times by adding N.

At high fertility levels, orchardgrass removes N and K from the soil at a nearly 1:1 ratio.

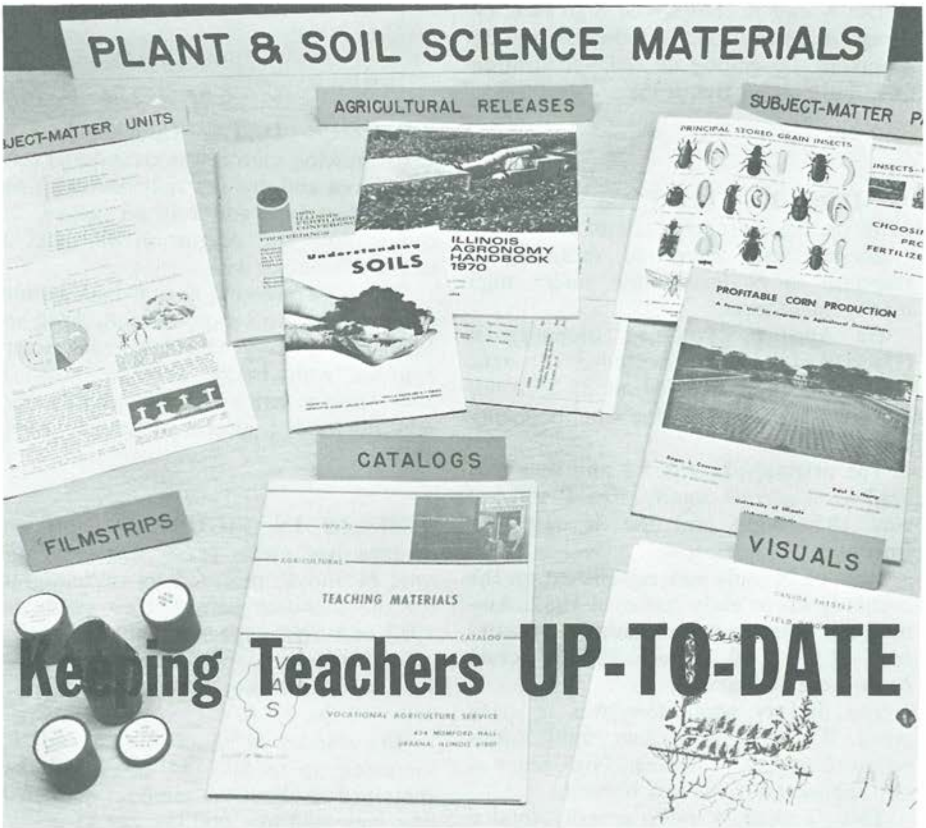
N content ran lower than K below 500 lbs. N/A, probably because N was deficient.

This experiment showed two things:

(1) Forages remove very large amounts of N and K and in nearly equal quantities.

(2) High yielding forages will deplete the soil of nutrient elements to a much greater extent than grain crops where the straw or stover is returned to the soil.

**THE END**




# Keeping Teachers UP-TO-DATE

J. W. MATTHEWS AND ROGER COURSON
**UNIVERSITY OF ILLINOIS**

**EVERYONE STRUGGLES** to keep up to date in agriculture these days. Teachers of vocational agriculture always need teaching aids that are accurate, up-to-date, and specific to the needs of their students.

The University of Illinois College of Agriculture is meeting this demand through its Vocational Agriculture Service.

VAS serves about 450 Illinois high schools and 23 Illinois junior colleges that offer agriculture programs. And last year it sent materials to 612 schools in 46 other states and 10 schools in 7 other nations.

Begun in 1938 with one man, VAS now serves teachers through 8 professionals, 6 clerical and technical persons, and about 20 part-time employees, chiefly college students preparing to become vo-ag teachers.

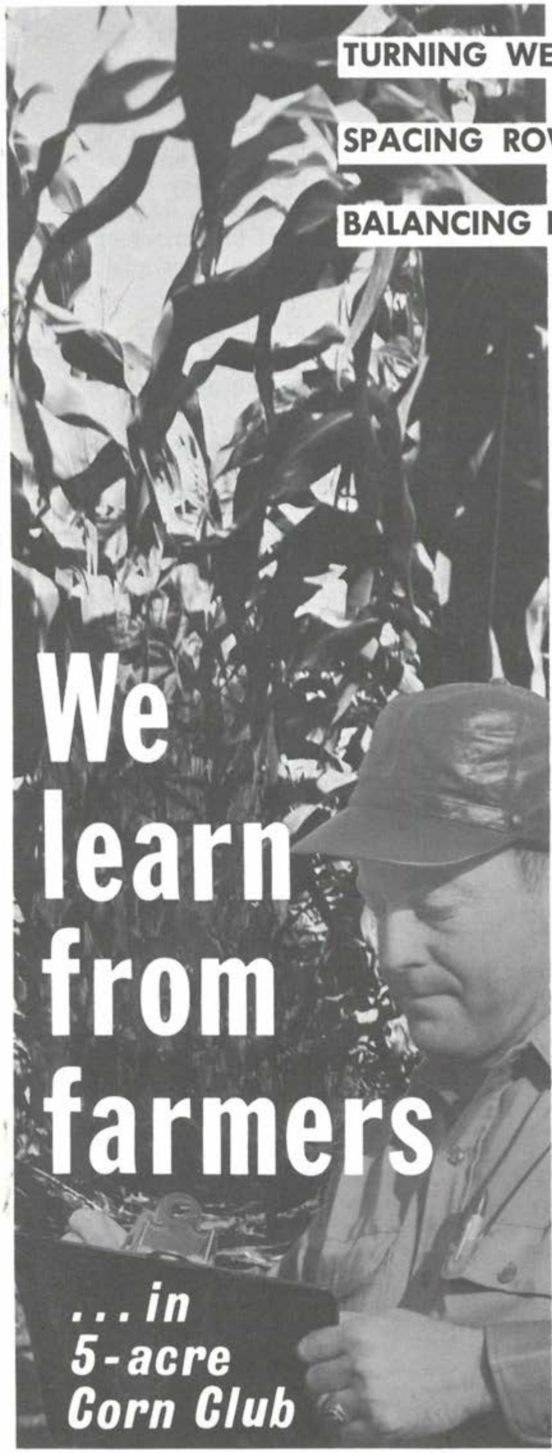
VAS has three basic jobs to do: (1) Prepare and distribute teaching materials geared to high school and adult students, (2) Keep vo-ag teachers abreast of new developments in scientific agriculture, (3) Serve as liaison between teachers at the College of Agriculture.

**THE VAS CATALOG** offers nearly 500 aids—from filmstrips and tape recordings to agricultural releases and subject-matter packets. The "lesson size" subject matter pamphlets make up the basic student text material in Illinois agriculture classes.

**TURNING WEED CONTROL INTO BUSHELS**

**SPACING ROWS WITH RIGHT POPULATION**

**BALANCING FERTILITY FOR TOP RETURN**



# We learn from farmers

## . . . in 5-acre Corn Club

JOSEPH H. MCGAHEN
**PENNSYLVANINA STATE UNIVERSITY**

**THE ELECTRONIC FARMHAND** has come to Pennsylvania's 5-acre Corn Club program.

It's giving participating farmers facts agronomists could only dream of collecting a few years ago—before computers were born.

Tomorrow the computerized 5-acre Corn Club, working with our computerized soil testing lab and other University programs, may help perfect agronomic recommendations going to Pennsylvania farmers.

The program depends on one thing common to all top farmers, *good records*. Penn State Extension Service developed a check list club participants can record—from each production item to final harvest results.

The club attracted 150 farmers in 1968, when the program added a budget analysis service. It helped swell the club to 241 participants in 1969.

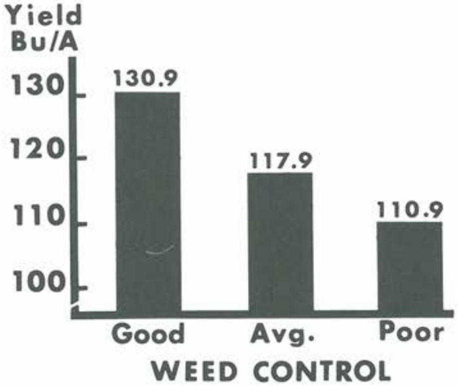
We have just scratched the surface in summarizing available data. But some agronomic trends can already be seen.

The 1968 yield champion, Glenn Thomas of Lititz, reached 206 bushels . . . 1969 champion, Roy Bubb of Muncy, 204 bushels per acre.

All contestants averaged 129.6 bushels per acre in 1968, 127.8 bushels in 1969. And 213 of the 391 farmers averaged over 125 bushels per acre in the two years, 68 farmers over 150 bushels.

What practices paid these above-average corn growers? Does better management mean higher yields, more profit?

**WHAT ABOUT WEEDS?** The 187 farmers recording good weed control last year averaged 130.9 bushels per acre. The six with poor weed control paid 20 bushels per acre for it. **Figure 1** tells the old story of bushel robbery by weeds.




**WHAT ABOUT ROW SPACING?** The 30-inch rows gave best yields to the 1969 Pa. Corn Club—15 bu/A MORE corn than the more popular 38-inch row, as **Table 1** shows.

**Table 1. 1969 Pennsylvania Corn Club Row Spacing Summary.**

| Row Spacing Inches | No. Farmers | Avg. Yield Bu/Acre |
|---|---|---|
| 20 | 1 | 103.8 |
| 28 | 2 | 134.2 |
| **30** | **26** | **140.0** |
| 32 | 11 | 132.5 |
| 34 | 17 | 125.3 |
| 36 | 52 | 131.7 |
| 38 | 93 | 124.9 |
| 40 | 39 | 121.5 |

**WHAT ABOUT POPULATION?** Top yields depend greatly on how well we match plant population with variety and management level. The 12 top-yield growers of 1968 and 1969 averaged 181 bushels per acre from 23,570 plants per acre, average.

All growers averaged about 19,700 plants per acre. Plant population extremes and uneven stands do not get top yields.

**WHAT ABOUT FERTILITY?** Good soil fertility starts with a soil test and knowledge of the cropping history.

High soil tests save money on the fertilizer bill. Low tests alert the farmer to add enough nutrients to reach his goal.

**Table 2** shows corn yields rising as potassium levels rise from applied plus available K indicated by soil test.

**Table 2. Corn Response to Applied Plus Soil Test Potassium (1969 Pennsylvania 5-Acre-Corn-Club)**

| Total $K_2O$ Applied & Soil Test Lbs./Acre | Number Farmers | Yield Bu./Acre |
|---|---|---|
| 0—299 | 49 | 123.3 |
| **300—599** | **145** | **127.7** |
| 600—up | 47 | 133.8 |

**Tables 3 and 4** show how important N-K teamwork really is. Lowest yields came from high nitrogen-low potassium treatments, highest yields from high N-high K treatments. Lodging declined as potassium level rose more in balance with nitrogen rates.

Such difference occurred both years and at all three selected nitrogen levels. The difference increased as nitrogen increased. Farmers with 20% of their plants in the ground will harvest 95 rather than 120 bushels per acre—a sure difference between profit and loss.

**Table 4. Corn Yield Response to Selected N-K Levels in 1969.**

| Applied Category* | Average Yield | Percent Lodged |
|---|---|---|
| High N—Low K | 117.8 | 19.7 |
| High N—Med. K | 127.8 | 14.3 |
| **High N—High K** | **135.7** | **8.6** |

* Pounds per acre for each category corresponds to Table 3.

**Table 3. Average Corn Yields From Selected Nitrogen-Potassium Levels. (Combined 1968-1969 Results)**

| Applied* $K_2O$ Levels | Applied Nitrogen Levels (Lbs./A)* 0-99 | 100-174 | 175-249 | 249-up | Average |
|---|---|---|---|---|---|
| Lbs./A | Bushels per acre | | | | |
| 0-75 | 123.5(36) | 126.5(72) | 124.7(33) | 123.2( 9) | 125.2 |
| 76-150 | 124.5(13) | 126.5(73) | 128.9(70) | 133.2(21) | 128.2 |
| 151-up | —— | 128.9(13) | 134.6(24) | 137.1(27) | 134.6 |
| Average | 123.8 | 126.8 | 129.0 | 133.4 | |

( ) shows number of farmers in that category. * Manure credit added to applied figures.

**Table 5** shows farmers getting 9 bu/A MORE corn from the higher phosphorus rates.

**TABLE 5—Corn Yield Response to Selected Phosphorus Levels in 1969**

| Applied* $P_2O_5$ | Yield |
|---|---|
| Lbs/A | Bus/A |
| 0—60 | 125.3 |
| 61—120 | 126.6 |
| 121—180 | 129.8 |
| 181—up | 134.4 |

* Manure credit added to applied figure

**WHAT ABOUT PROFITS?** Do high yields from such practices pay dividends?

**Table 6** tells the story—$100 MORE per acre returned to labor and managemnt of high-yield farmers, or $10,000 on a 100-acre corn field.

**TABLE 6—Labor and Management Returns (1969 Pennsylvania 5-Acre-Corn-Club)**

| Yield | Number Farmers | Returns |
|---|---|---|
| Bu/A | | $ per acre |
| 60—90 | 11 | 11.75 |
| 91—110 | 19 | 43.14 |
| 111—125 | 38 | 56.31 |
| 126—150 | 71 | 82.24 |
| **151—up** | **21** | **111.52** |

**THE END**

# Tips For Fall Potashing

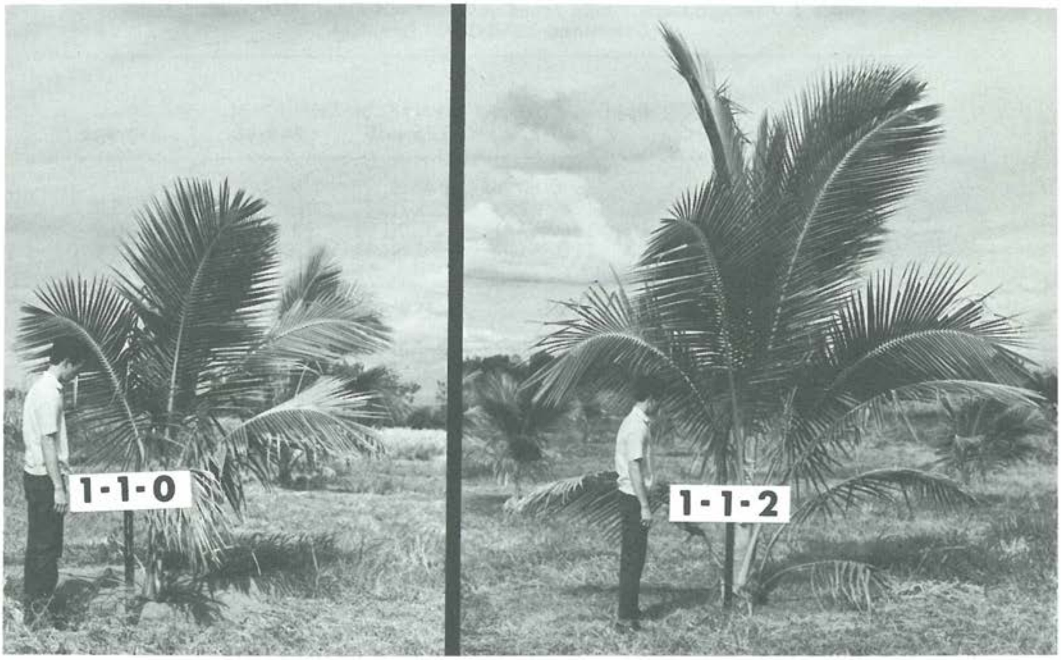
**(Order Fall K Fertilegrams Bottom Cover 2)**

**12—What about spreading potash this winter?**

O.K. if you pass the **IF** test. O.K. IF your fields have a good crop residue cover . . . IF your land is reasonably level . . . IF your soil has no more than a thin snow cover. Residues reduce surface movement. Fertilizer melts through snow to move slowly into the soil. The soil grabs K like a magnet. You are then ready to till early in spring.

**18—I seeded my alfalfa alone this spring, got a good stand, and have taken two harvests this year. I was told to use an 0-1-1 ratio at seeding time. Should I come back with this ratio this fall?**

No. Alfalfa needs relatively more P than K at seeding. But K is the key after the stand is up. Unless your soil is very low in P, consider 0-1-3 or 0-1-4 ratio this fall. **THE END**




# Coconuts NEED Potassium

**A von Uexkull report shows . . .**

**COCONUT PRODUCTS** contribute more than any other crop to the economy of the Philippines, but they could contribute much more.

Coconut trees now produce 30 to 34 nuts per tree—or three times LESS nuts than they could produce with proper fertilization.

And proper coconut fertilization means mainly potash, a belief unanimously held by coconut authorities.

The statements by noted authorities in the panel on the right were made some years ago when little research evidence was available from the Philippines.

Recent scientific results from cooperative work by the Bureau of Soils, the U.N. Special Fund Project and the Philippine Coconut Research Institute have supported these statements.

Young coconuts planted three years ago with proper potash fertilization have shown tremendous growth. The potash trees will start bearing 4-5 years after planting, the no-potash trees 7-9 years after planting.

Adult palms at the Philippine Coconut Research Institute at Bago-Oshiro treated with 1.7 kg of Muriate of Potash and 1.5 kg Sulphate of Ammonia produced in



the average of three years an additional amount of 11.4 kg of copra per tree.

In 1968, palms receiving no potash averaged 10.4 kg copra per tree, while neighboring palms receiving 1.7 kg muriate of potash averaged 24 kg copra.

With a stand of 100 to 156 palms per ha (depending on spacing), potash would increase copra production by 1,360 and 2,220 kg/ha respectively.

Potash also affected the size of the nuts. Without potash, eight nuts were required to make a kg of copra. With potash less than 4.5 nuts were required, thus lowering the costs of copra making.

Potash application can greatly improve the earnings of coconut planters.

It must be stressed that the soil in Davao is considered to be rich in potash. So, potash responses can be safely expected in nearly all coconut districts of the Philippines.

But even if we would assume much smaller responses than those in Davao, it would still be very profitable to make use

# Scientists Agree

**FOR COCONUTS GENERALLY:**

- **Among nutrient deficiencies, potash is most often found in the coconut.**
- **Coconut soils rarely possess large potassium reserve that palms need when they fruit freely . . . and removal of potassium usually exceeds restitution of available K.**
- **Potash makes the plant more drought hardy and disease resistant.**
- **Potassium influences all production: Earliness of bearing, number of inflorescences and female flowers, proportion of fruits set, number of nuts and weight . . . resulting in more copra per tree.**

**Extracted from reports by K. P. V. Menan and K. M. Pandalas of Central Coconut Committee, India, and Y. Fremond, R. Ziller, and M. deMuce de Lamothe of France.**

**FOR COCONUTS IN PHILIPPINES:**

- **Potassium is by far the most important nutrient for both young and bearing coconuts.**
- **There is no doubt if good cultural practices and adequate fertilization were carried out, coconut yields of 75% of the acreage not infested by Cadang disease could be increased to levels now in India and Ceylon.**
- **Correct fertilization should also boost copra weight per nuts 50%.**
- **To increase yield of bearing trees yielding less than 60 nuts per tree per year, supply only muriate of potash in most areas—a recommendation supported not only by Philippine data, but also by Ceylon work.**
- **Using only muriate of potash should be economical and give a high return on investment.**

**Extracted from reports by R. G. Lockard and J. C. Ballaux of FAO and B. A. Azucena, Jr. of the Bureau of Soils, Philippines.**

of potash as a "yield raising tool" for coconuts.

Conservative estimates indicate that under average conditions of the Philippines, one ton of applied potash would produce two to three tons—or $400 to $600 worth—of copra.

What other investment could bring such return? Then why do farmers not make more use of this possibility?

- **Farmers are not aware of how potash affects coconuts.**
- **It usually takes more than a year from the start of fertilizer before a yield increase becomes clear.**
- **In the first year, this effect will be only on the size of the nuts (weight of the copra) and farmers tend to overlook this fact.**
- **It usually takes 2½ years before the full effect of potash becomes evident in number and size of nuts.**
- **Since most farmers are short on cash and cheap credit is not available, financing fertilizer cost is a problem for the average farmer.**
- **Potash fertilizer is currently hardly available to the farmer, even if he were willing to use it.**

In Ceylon, where several years of intensive research have proved the advantages of fertilizer beyond any doubt, the government has introduced a "Coconut Fertilizer Subsidy Scheme." It covers 33⅓% of the fertilizer cost for estates (over 8 ha) and 50% for small holders.

If coconut growers were properly organized in the Philippines, even outside help could be obtained, helping both individual growers and the national economy.

**THE END**

**WHAT ABOUT REPRINTS?**

**Can you use reprints of any articles from this issue?** **See Page 18**

# Fertilizing Irrigated POTATOES

C. J. OVERDAHL AND C. P. KLINT
**UNIVERSITY OF MINNESOTA**

**FERTILIZING POTATOES** on sandy soils under irrigation has often been done successfully in the following way:

Annual applications of 1,000 lbs. per acre of 8-16-16 in the row, 700 lbs. of 0-0-60 broadcast before plowing, and 100 or more pounds of supplemental nitrogen sidedressed. Some growers also sidedress with NPK.

This has been continued for perhaps 10 years, now raising questions quite different from a decade ago.

University of Minnesota soil tests report phosphorus readings (Bray's No. 1) up to 200 lbs. of adsorbed P per acre and up to 600 lbs. per acre of exchangeable K.

Potato farmers practicing the fertility above usually have soil tests exceeding these values.

Four years of field trials at many sites have sought answers to current questions about fertilizing irrigated potatoes.

- **What should annual potash rate be when K tests are very high?**

When soils tested 600+ in exchangeable K down to 12 inches, experiments

**Editor's Note:** For a detailed report of these trials, request Soil Fertility Trials on Potatoes, Soil Series No. 85, Soil Science Department, University of Minnesota, St. Paul, Minnesota 55101.

showed that there was no response from either row or broadcast potash for two years. The extent of the K test beyond the 600 lbs. was not determined.

By the third year the soil test had dropped to 435 lbs. exchangeable K where no potash was applied. That year 150 lbs. $K_2O$ in the row boosted yield about 100 cwt, but there was no further increase where a total of 500 pounds of $K_2O$ was applied (broadcast and in the row).

In the fourth year both row and broadcast potash increased yield. By this time, soil test K on the untreated plot had dropped to 285 lbs. exchangeable K, a relatively rapid draw down.

The 500 lbs. potash treatment annually had maintained a soil test of 600+.

Adequate nitrogen and phosphate were added to all plots.

Once soils have been built to a level of at least 400 lbs. exchangeable K, it appears 200 to 300 lbs. $K_2O$ per acre would maintain them. Soil testing should be used to keep an eye on them.

- **On new land testing medium or low K, what potash applications will bring K test up to desired level?**

When soils test low or medium K, it takes very high applications to bring the test up to 600 lbs. exchangeable K per acre.

Yields increased with rising potash applications up to 500 lbs. $K_2O$. **Table 1** and **Figure 1** show how increasing annual potash treatments changed potassium soil tests.

- **How do high potassium rates affect magnesium levels in potatoes grown on acid soils? If magnesium is needed, how much?**

From treatments shown in **Table 1**, the potassium content in the petiole increased as potash treatments increased, but the magnesium content declined.

**Figure 2** diagrams this from 1969 data after 4 years of the annual treatments.

The sharpest magnesium drop in the petiole occurred with 150 lbs. $K_2O$ applied yearly in the row.

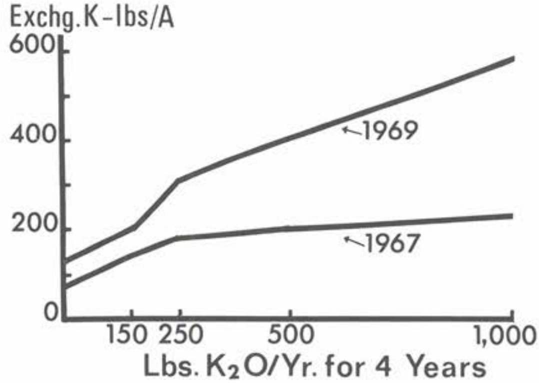



**FIGURE 1**

**Table 1. Potassium soil test changes after 4 years according to annual treatment and compared with initial soil tests.**

| Annual Rate $N+P_2O_5+K_2O$ lbs/A | (Exchangable K in pounds per acre) 1966 (initial) | 1967 Spring | 1969 Spring |
|---|---|---|---|
| 200+150+0 | 130 | 80 | 130 |
| 200+150+150 | — | 150 | 210 |
| 200+150+250 | — | 180 | 310 |
| 200+150+500 | — | 200 | 420 |
| 200+150+1000 | — | 230 | 600 |
| Avg. pH | 5.4 | 5.4 | 5.5 |
| Avg. P test lbs/A (Bray's No. 1) | 17 | 26 | 70 |

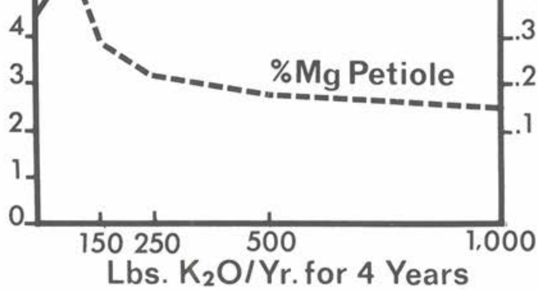



**FIGURE 2**

**Table 2. Phosphorus and potassium recommendations for potatoes on irrigated mineral soils.**

| | Potassium (K) soil test (lbs./A) | | | | |
|---|---|---|---|---|---|
| | 0-100 | 101-200 | 201-300 | 301-400 | over 400 |
| Phosphorus (P) soil test (lbs./A) | Plant nutrients (lbs./A) $P_2O_5+K_2O$ | Plant nutrients (lbs./A) $P_2O_5+K_2O$ | Plant nutrients (lbs./A) $P_2O_5+K_2O$ | Plant nutrients (lbs./A) $P_2O_5+K_2O$ | Plant nutrients (lbs./A) $P_2O_5+K_2O$ |
| 0-20 | 200+500 | 200+400 | 200+300 | 200+150 | 200+75 |
| 21-100 | 150+500 | 150+400 | 150+300 | 150+150 | 150+75 |
| over 100 | 75+500 | 75+400 | 75+300 | 75+150 | 75+75 |

**Table 3. Nitrogen recommendations for potatoes on irrigated mineral soils.**

| | Nitrogen recommendations (lbs./A) Previous crop | | | | | |
|---|---|---|---|---|---|---|
| | Small grain, corn, potatoes, sugarbeets, idle acres | | Alfalfa, clover, fallow | | Soybeans | |
| | Maturity | | Maturity | | Maturity | |
| Manure applied | Late | Early | Late | Early | Late | Early |
| 0 | 200 | 150 | 150 | 100 | 180 | 130 |
| 10 T/A | 150 | 100 | 100 | 50 | 130 | 80 |

Tables 2 and 3 are taken from Special Report No. 1 entitled "Guide to Computer Programmed Soil Test Recommendations in Minnesota" by W. E. Fenster, C. J. Overdahl and J. Grava.

At a different site testing above 600 lbs. K from earlier very high potash rates, experiments showed no response from magnesium applications. Magnesium sulfate was applied in the row with rates per acre ranging from 0 to 75 lbs. magnesium.

Broadcast rates up to 300 lbs. per acre of magnesium as magnesium sulfate or up to 8,000 lbs. per acre of dolomitic limestone had no significant effect on yield or magnesium content in the petiole during any of the 4 years of the trials.

Most petiole samples showed magnesium content at about .20%, but some samples were as low as .12% magnesium. Although symptoms had occasionally been observed on these fields before the trials, no magnesium deficiency symptoms were observed on the plots where the trials were run. So, conclusions are difficult to draw.

- **Is phosphorus as important as potassium on these soils?**

When phosphorus soil tests run in the medium range on coarse textured soils, potato yields from this element are as high as from potassium.

Even where soils tested very high in P, row-applied phosphorus gave much better growth than untreated plots—especially when soil temperatures remained cold through April and early May.

Most of the growers plant by mid-April. Annual rates of 150 lbs. $P_2O_5$ per acre in the row should meet most situations on these soils.

Phosphorus should never be omitted, but with very high P tests (above 100 by Bray's No. 1 P test) 75 lbs. $P_2O_5$ should be adequate.

- **How much nitrogen should be applied for most profitable results?**

Sandy loams or coarser soils are nearly always deficient in nitrogen.

Early maturing varieties require less nitrogen than the long-season crops. Rates of 150 lbs. nitrogen per acre on early varieties and 200 lbs. per acre on longer season varieties are recommended for most situations. They depend on such soil management practices as manure treatments or legumes immediately preceding the potatoes.

Time nitrogen applications to prevent leaching. In some cases, it can be applied through irrigation systems.

Usually about 75 lbs. is applied with the starter and the remainder from 2 to 4 weeks later to insure minimum leaching.

- **Summary and recommendations**

Four years of field trials with irrigated potatoes on loamy sands and sandy loam soils indicate intensive fertilization need not be continued indefinitely.

Broadcast applications can be discontinued for 2 or 3 years when row applications are continued and K tests exceed 400 and P tests exceed 100.

With no potash applications, soil test K dropped rapidly. After four years, tests dropped from 600+ to less than 300 lbs. exchangeable K per acre.

Where soils were medium or low in fertility, it takes very high applications (i.e. 500 lbs. $K_2O$ annually) to bring soils to a desired level.

On acid soils, high row applications of potash (150 lbs. $K_2O$) or high annual broadcast treatments (500 lbs. $K_2O$) clearly reduce magnesium content in the potato petioles. Although our trials lacked magnesium response, neighboring areas clearly showed magnesium deficiency could be a problem. Small amounts of magnesium in the row fertilizer will insure against magnesium deficiency.

Phosphorus response was evident each year. Since potatoes use phosphorus inefficiently and cold April-May temperatures retard uptake further, row phosphorus should always be applied.

Nitrogen applications on irrigated sandy loams or loamy sands are very important. Rates should vary with short or long season variety and with past management.

**THE END**

## STOP—LOOK—LISTEN

**IT WAS A "LATE" SPRING** again in many areas this year. Even with the generally abundant supply of fertilizer, a number of farmers could not get the fertilizer they wanted during the few short weeks of the active spring season.

We have to keep in mind that there are the same number of work days in April and May when the farmer was planting 100 acres of corn as when he is now trying to plant 500 acres. Big farmers use larger equipment—that is one way. The other way is to move some jobs ahead to the fall.

Agricultural economists at Purdue have shown that **the most important time during the year** to utilize all labor and machinery to the full is in the fall as soon as harvest starts. This means mobilizing all forces in getting all possible spring jobs done in the fall—such as fertilizer spreading and fall plowing or chiseling where feasible. It may even mean hiring extra labor or custom machinery in order to take advantage of the good fall weather.

**What will be your program?** Noble Usherwood

# Potash Needs GROWING

RAYMOND G. WARD AND PAUL L. CARSON
**SOUTH DAKOTA STATE UNIVERSITY**

**HISTORY HAS A MESSAGE** for us. Soil test summaries tell the soil fertility history of an area—sometimes a whole state or county, sometimes a township or just a field.

We in South Dakota recently completed a summary of soil tests on samples received from 1953 to 1967. Let's look at what we learned about potassium.

**K SOIL TEST SUMMARY.** The large differences in available potassium surprised us—especially in a state long considered low in available phosphorus and high in available potassium.

Potassium recommendations are made for forages and row crops when the soil test (ammonium acetate method) is less than 250 lbs. K/A.

**In certain soil associations of eastern South Dakota, a high percentage of the soil samples tested medium or lower K—below 250 lbs. K/A.**

**K SOIL TESTS ARE DROPPING** each year. Extreme eastern South Dakota showed greatest need for added potassium on row crops and forages. Current data show the rest of South Dakota reasonably well supplied with available K, with local exception.

After finding many samples in the low-medium ranges, we wondered if availability had changed with time. We chose two 5-year periods to evaluate changes in K levels—shown in **Figures 1 & 2.** We selected five counties showing greatest number of K tests in the low and medium ranges.

The second 5-year period showed 9% more low-medium K, 8% less very high K tests.

Although P tests are not shown, they also declined in value. The second 5-year period showed 3% more low-medium P (6-25 lbs. P/A), 3% less high P (over 40 lbs. P/A).

Obviously K availability is declining faster than P availability. In these areas, South Dakota farmers should be applying more P and K.

**APPLIED K INCREASED** yields on eastern South Dakota soils testing mostly low-medium K. Corn field trials evaluated the need for potassium in 1962 and 1963.

**Table 1** tells the 1962 story. Two of the experiments had low K soil tests (50-150 lbs. K/A). Row-applied K (25 lbs. K/A) increased corn yields 10 bu/A at these two sites. At these same sites, row-applied P increased corn yields 8 bu/A, while N produced a 5 bu/A increase.

The K soil test from the other 6 sites fell in the medium (150-250 lbs. K/A)

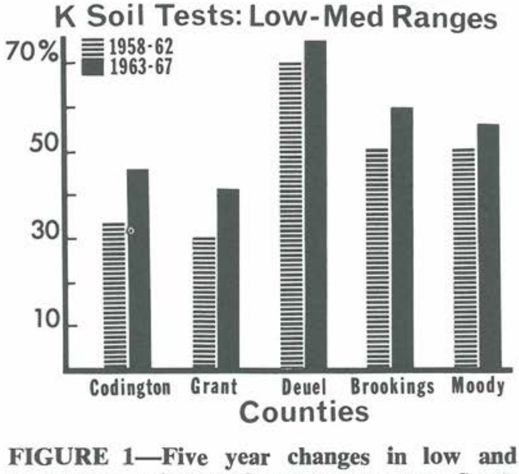



**FIGURE 1—Five year changes in low and medium K soil tests from some eastern South Dakota counties.**

range. Row-applied K did not boost yields here. But row-applied P did boost corn yields 10 bu/A and N 4 bu/A.

Four corn experiments were conducted in 1963 in the same area on sites ranging from 139 to 282 soil K, but averaging 225 lbs K/A.

**Table 2** shows the corn yield responses.

Row-applied K increased corn yields 3-4 bu/A. Added K on the low test soil (139 lbs/A) increased yields no more than the other sites. This contrasts with 1962 when no response was obtained to added K on medium K soils. Applied K increases yields on medium K soils only in certain years.

Applied N increased corn 17 bu/A average in 1963. Row-applied P increased it 2-3 bu/A.

Row-applied K on low K soils usually increase corn yields, it appears—shown by row-applied K boosting yields very well on two low K soils in a year when medium K soils showed no response to applied K.

Row-applied K on medium K soils will increase corn yields in some years.

**MOST SMALL GRAIN TRIALS** have been conducted further west on high K soils.

But **Table 3** shows 3 years work (1966-68) with barley at one location in Codington County (N.E. South Dakota) where row-applied K increased barley 2 and 5 bu/A average for 15 and 30 lbs. row-applied K/A, respectively.

The largest yield increase—8 and 13 bu/A for the 15 and 30 lbs. K/A, respectively—occurred in 1967.

These K soil tests were low-medium. There was a good yield response to an application of N and P in all three years.

This yield data shows row-applied K fertilizer will increase barley yields in some years, none in others.

An average yield increase over a period of years is needed to determine the feasibility of K applications on barley and other small grains.

Under conditions similar to the Codington County location, some K applied in the row will produce a good return.

**THE END**

**Table 1. Influence of Starter Fertilizer With and Without Potassium on the Yield of Corn. (Data from 1962 Corn Trials)**

| Treatment N+P+K Lbs/Acre | | Bu/A of Ear Corn Soil K Levels: Low | Medium |
|---|---|---|---|
| Check | | 36 | 53 |
| 10+13+0 | Starter | 44 | 64 |
| 10+13+25 | Starter | 54 | 62 |
| 60+13+0 | Starter | 49 | 66 |
| 60+13+25 | Starter | 59 | 67 |
| No. of Locations | | (2) | (6) |

**Table 2. Potassium Influence on Corn Yields at Four Locations in 1963.**

| Treatment N+P+K | Bu/A of Ear Corn |
|---|---|
| Check | 64 |
| 60+0+0 | 81 |
| 60+0+16 | 85 |
| 60+9+0 | 84 |
| 60+9+16 | 87 |

**Table 3. Effects of Potassium on Barley Yields for Three Years at a Location in N.E. South Dakota.**

| Treatment N+P+K Lbs/Acre | Bu/A Barley Grain 1968* | 1967* | 1966** | Ave. |
|---|---|---|---|---|
| Check | 35 | 42 | 22 | 33 |
| 60+20+0 | 48 | 68 | 33 | 50 |
| 60+20+15 | 49 | 76 | 32 | 52 |
| 60+20+30 | 49 | 81 | 35 | 55 |
| K Soil Test | 187 | 191 | 147 | 175 |

* Primus Variety.
** Larker Variety.

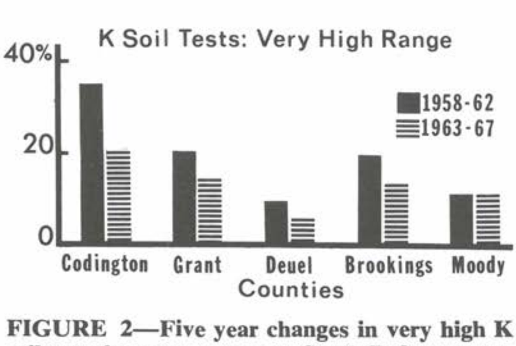



**FIGURE 2—Five year changes in very high K soil tests from some eastern South Dakota counties.**

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# How Much Does K STRENGTHEN Grass Blades?

**POTASSIUM IS ESSENTIAL** for growing turfgrasses, but scientists differ on amount for best growth.

R. L. Goss found turfgrass receiving 325 kg/ha had better color and growth qualities than turf receiving 0 and 162 kg/ha.

High potash levels in the plant have increased disease resistance. This has been widely demonstrated. Potash has also affected structure of the plant. An overabundance of potash has produced greater stiffness in leaves, M. H. Ferguson found.

More frequently, it has been reported that potassium-rich grass was less likely to wilt and would withstand heavy foot-traffic better than potassium-deficient grass.

We conducted this experiment as part of an investigation concerned with effects of K nutrition on growth and appearance of Merion Kentucky bluegrass in the greenhouse.

The object was to evaluate a tensile tester as a quantitative means of measuring foliar tensile strength attributed to potassium nutrition.

**MERION KENTUCKY** bluegrass was sown on November 16 at the rate of 1.0 kg per 100 m² on the surface of 20.3 cm plastic pots containing a Bridgehampton silt loam adjusted to a pH of 6.5.

Potassium tested very low in this soil (less than 40 ppm K) by the Morgan soil test.

Superphosphate had been incorporated in the soil at the rate of .73 kg per 100 m².

Nitrogen was applied when needed at the rate of .24 kg per 100 m² in the form of ammonium nitrate to give a total 2.9 kg of N per 100 m² per year.

Treatments consisted of a control and 3 potassium levels—0, 1.95, 3.9, and 7.8 kg of K per 100 m² respectively.

On March 17, potassium treatments were begun: Three split applications spaced 6 weeks apart, using $K_2SO_4$ as the source. This source of K was used since previous work by W. E. Adams, et. al. had shown no effect of the associated anion with respect to either forage yield or K content. Both N and K were applied in solution form.

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**WE USED A RANDOMIZED** complete block design with 4 replications. We subjected all data to one-way analysis of variance treatment and used D. B. Duncan's Multiple Range Test to determine significant differences between means.

Average daily temperature in the greenhouse was 25 C, with a range from 21 to 41 C. Average nightly temperature was 15.5 C, with a range from 11 to 23 C. The investigation was conducted under conditions of natural photoperiod.

We cut the grass 3.8 cm high biweekly, beginning March 10. We used Model CRE Constant-Rate-of-Extension Tensile Tester (produced by Scott Tester, Inc. of Providence, R.I.) to measure tensile strength of grass blades.

For each test, 5 uniform blades were selected from fresh clippings of each treatment and placed together (side-by-side) between the tensile tester clamps spaced 2.54 cm apart.

A constant rate of pull was applied and stress-strain data were recorded on a chart. The recorder was adjusted to 5% of instrument capacity to take advantage of the full span of the force divider and to obtain thereby the desired degree of accuracy for this experiment.

Four replications of a 5-blade sample for each treatment were measured on fresh tissue on April 7, May 5, May 19, and June 30.

Average tensile strength per sample of five Merion Kentucky bluegrass blades grown under four levels of K was obtained on four different dates.

**TABLE 1 TELLS THE STORY.** Tensile strength values obtained on the first two dates generally increased with higher K treatments. But these increases were not significant because of considerable variation between replications.

**The authors may have opened a vital research door to turfgrass. Using a tensile tester, they measured how much potassium affects the foliar tensile strength of Merion Kentucky Bluegrass. They emphasize further work is needed for more facts. But they may have pointed one way toward stronger turfgrass.**

On May 19 and June 30 tensile strength increased only through the 3.9 kg level of K. Tearing force declined slightly at the next higher K increment.

K treatments increased average leaf strength, as the overall treatment means show. Then what about the loss of strength with highest K level on May 19 and June 30? This was traced not to potassium, but to relatively high light intensity and somewhat higher temperatures in the greenhouse.

To measure foliar tensile strength more meaningfully in turfgrass research, we need more sensitive instruments.

Further research is needed to verify (1) the use of the tensile tester as a means of measuring foliar tensile strength and (2) the effect of potassium on foliar tensile strength of bluegrass.

Data from further research might well support the theory that tensile strength helps tell a turf's ability to withstand abuse. **THE END**

**TABLE 1. Average tensile strength (per sample) of five fresh blades of Merion Kentucky bluegrass grown in greenhouse under four potassium levels.**

| Treatments | Dates | | | | |
|---|---|---|---|---|---|
| | **April 7** | **May 5** | **May 19** | **June 30** | **Mean** |
| | Tensile Strength in g[1] | | | | |
| **0 kg K/100 $m^2$** | 631 | 595 | 613 | 595 | 608 b |
| **1.95 kg K/100 $m^2$** | 722 | 622 | 640 | 690 | 667 b |
| **3.90 kg K/100 $m^2$** | 754 | 536 | 708 | 735 | 733 a |
| **7.80 kg K/100 $m^2$** | 808 | 776 | 645 | 708 | 734 a |

[1] Average tensile strength of 4 replications. Values followed by different letters are significant at the 5% level.

**BIFOCALS**

**S.W. Martin**

# ". . . but they

If you want to see human nature at work in the raw, write a column somebody happens to read.

**From one side:** "Your outlook, coming loud and clear, must complicate your life . . . especially in the mob at the shrines created for and by the Dr. Fogmosts you pictured . . . be careful, the 'system' is loaded with Fogmosts and Chicago courts."

**From the other side:** "That BIFOCALS writer is a flunky. I knew he would write 'establishment' stuff. He sure pleased the 'system' with that junk about ag students and their teachers not following the revolutionists."

I was raised in what some people sarcastically call the "Bible Belt" of the South——sarcastically, that is, until their lives reach that bowl of soup in the twilight, waiting alone in their rocker for the broth to cool and wondering how in the world they could ever have chuckled over their middle-age-cocktails at people who take their Bible seriously.

Nearly everyone tries to "improve" on his raising. I am no exception—but, perhaps, a bigger failure at it than most.

In what way?

In believing too early and too long that "higher" education could solve all of man's problems.

In believing the university, for example, represented the summit of civilization—a community in which everyone treated everyone else in a most civilized way . . . a stimulating place . . . of the finest minds and manners and dreams and achievements . . . of sterling characters and the most generous spirits.

**What naivete!**

It takes years of living to realize that civilized manner and achievement and character do not come from higher education.

Nothing can be more venomous, more uncivilized than a soft-spoiled suburban brat or a self-centered cow barn jockey stuffed with two or three college degrees that specialized him into a title-conscious penquin strutting his specialty constantly before leadership that can advance him, but seldom before people who need his help and know-how.

Perhaps Billy Graham was right when he told a stadium full of soul-hungry people that his travels into the world's great learning centers had rarely found an understanding of the Book he teaches to equal that of a bent little woman he once met deep in the mountains above Knoxville, Tennessee.

Unschooled though she was, her understanding amazed the man whose lessons have attracted more people in person than any teacher in recorded history.

And you can bet she studied that Book! Not for degrees or prestige or salary, but for understanding—the kind of understanding all the university budgets and foundation grants in America cannot purchase.

What was her secret? I don't know—but it may have some-

# had a carpenter."

thing to do with a phrase an old newspaperman once used in a Sunday editorial.

"What is this 'Nazarean wisdom' you mention," I asked him.

"I don't know exactly," he replied. "But I do know men who have it are not the men they were born."

My history map shows that Nazareth was a very small community in a rural county of farmers and fishermen and village folks.

Badly in need of a Rural Development Program, no doubt.

Unfortunately, they had no legislature to appropriate tax money for university-trained professionals to serve them and their county.

But they did have a carpenter—a man with remarkable teaching talent, who showed uncommon interest in the unsophisticated, the unknowing, and the unpossessors of his county.

He held no university degrees, no credentials, no membership in any society or club, no titles to anything—indeed, nothing to command the people's attention, let alone their respect.

But he had a Plan—to the villagers, it could easily have been an Urban Development Plan, to the country people a Rural Development Plan.

Although he had never taken any courses in educational psychology or methodology, this carpenter introduced two new teaching methods to get across his Plan—very revolutionary for his day:

**Parables** to make his lessons crystal clear to the common people whom the intellectuals had long scorned.

**Dialogue** to encourage the masses to question his teachings and thus learn more deeply by participation.

He reinforced his teachings with extraordinary skills—healing the sick, raising the dead, changing water into wine, feeding thousands from a handful of bread and two fish.

His Plan started with a project he called repentance. This didn't bother the establishment too much.

But after he threw some sharp money changers out of the public temple, the leadership started looking for ways to shut him up—and do away with him, if necessary.

They managed it, though the judge in the case washed his hands of the whole thing.

And after his execution and burial, this carpenter did what no other man has ever been able to do. He escaped from the grave.

Ever since then, men have tried to put his Development Program to work—in rural and urban areas—with little success.

Some say the time may soon be ripe for it. Some say it will never work.

Some say it is a do-gooder scheme backed by clever communists.

Some say it is a capitalistic opiate to keep the people appeased.

A few say the carpenter will return with magnificent legions to make it work next time.

Just when? They won't say—out of Bible Belt faces that seem strangely assured in a very unsure age.

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