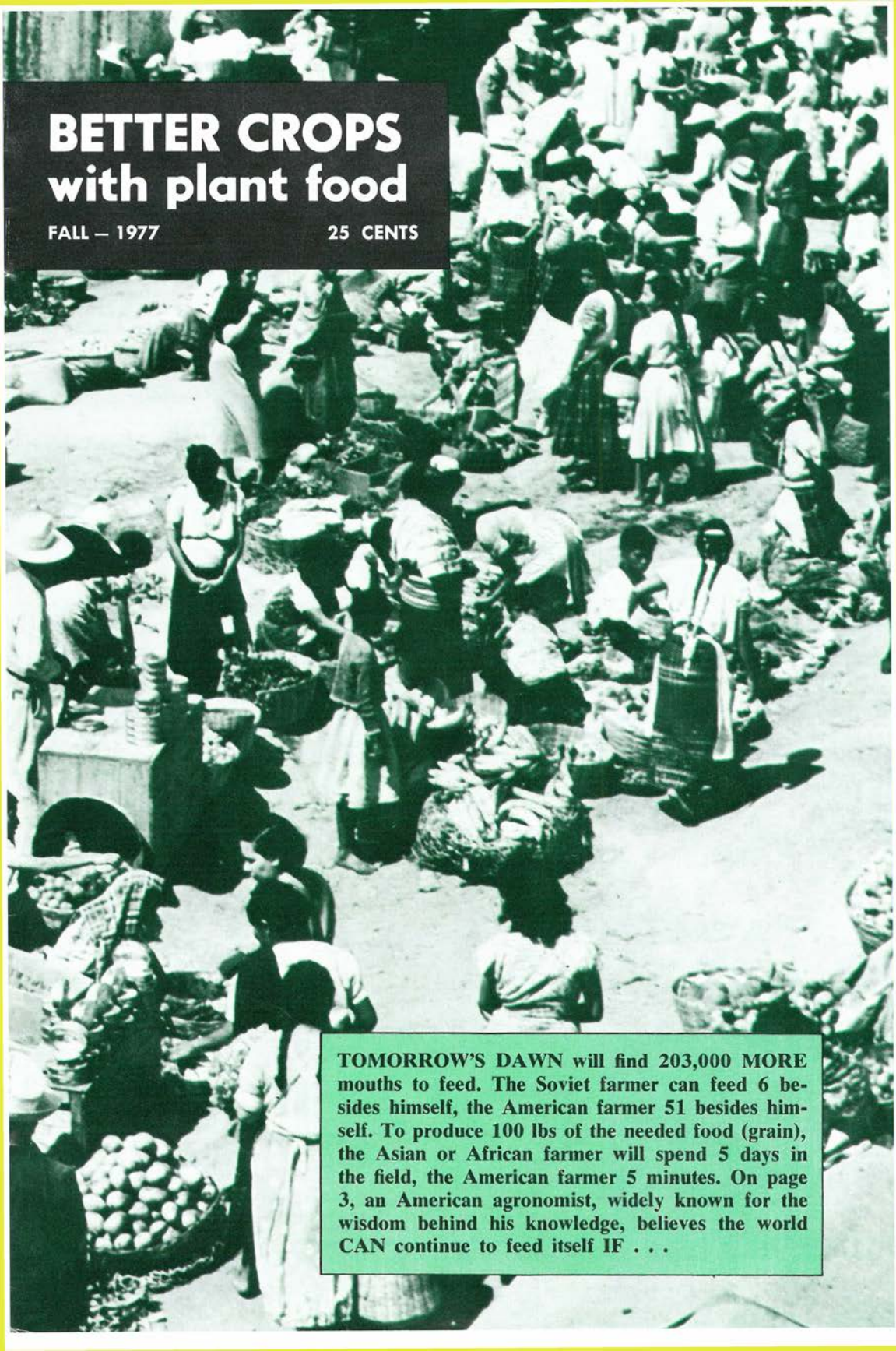
BETTER CROPS with plant food

FALL — 1977 25 CENTS



TOMORROW'S DAWN will find 203,000 MORE mouths to feed. The Soviet farmer can feed 6 besides himself, the American farmer 51 besides himself. To produce 100 lbs of the needed food (grain), the Asian or African farmer will spend 5 days in the field, the American farmer 5 minutes. On page 3, an American agronomist, widely known for the wisdom behind his knowledge, believes the world CAN continue to feed itself IF . . .

Better Crops
WITH PLANT FOOD

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Contents

Feeding a HUNGRY world

"The answer must come from special hearts and minds . . ."

J. FIELDING REED*
FORMER PRESIDENT, POTASH INSTITUTE

GIVE US THIS DAY our daily bread. This is a rather meaningless phrase in the prayer of the affluent American. But it is a genuine plea in many areas of the world.

What is the world food picture today? What will it likely be tomorrow?

It is hard for Americans to consider the world food situation in any way but the most remote sense or from a selfish viewpoint. American labor, the American housewife, the American businessman are likely to protest when food is shipped overseas.

Why? Because domestic food prices rise when America exports food. The average citizen is becoming immune to TV and magazine pictures of starving Asians and Africans. He or she says there's nothing I can do. Why should we feed the world?

The July 1975 National Geographic devoted most of its issue to one theme: "Can The World Feed Its People?"

This issue ran this statement: **"Many are inclined to predict that the day has at last come when the human race must cease to expand its numbers or face inevitable starvation."**

That statement was made in a **1916 issue of National Geographic** which asked, "How Can We Feed The World?"

In 1916, the world faced 1.7 billion mouths to feed each day. In 1977, it faces 3.9 billion. And not long after 2,000 A.D., experts say there will be 7.0 billion mouths to feed each morning.

The earth contains two and a half times more people today than it did in 1916. And these nearly 4 billion people have 20% more food per person than the 1.7 billion had in 1916.

HOW?

Through 61 years of amazing agricultural technology by the developed nations. Can we extend this know-how to other areas?

Remember: Each dawn finds 203,000 MORE MOUTHS to feed. The world will contain 74 million MORE PEOPLE next year.

Remember: Two-thirds of the human population live in the poorest nations. They have the highest birth rate. Four of each five people born

*Dr. Reed delivered this speech to Leadership Georgia 1977.

How high a wall would the United States have to build to keep out the starving people in 2007 A.D.?

next year will be born in a have-not nation.

Just how much can the American farmer produce if he pulls out all stops?

It is often said the American people comprise 6% of the earth's population and use 25% of its resources. It is seldom reported American farmers provide 25% of the world's food supply while comprising a tiny 0.1% of its population.

What an impact U.S. agriculture has had on world food supply—an impact closely related to machines, economics, and the wonders of agricultural research.

How many people realize the Soviet farmer can feed 6 people besides himself, **while the American farmer feeds 51 people besides himself.**

How many realize an Asian or African spends 5 days in the field to produce 100 lbs. of grain, **while the American farmer spends 5 minutes.**

WE ALL KNOW there is a population explosion. The world food problem is a population problem. How big is the population problem and therefore the food problem?

A startling example is Mexico. In recent years, it has averaged 3% population growth per year—an innocent sounding figure. But let this growth rate continue just 100 years and Mexico would contain 1.2 billion people —or 6 times the present U.S. population.

How high a wall would the U.S. have to build to keep these people out —if they are starving in 2077 A.D.?

Today's world people population weighs about 180 million metric tons and the livestock population 925 million tons. With its great livestock population, the U.S. has the equivalent of 2 billion people.

The U.S. supports 100 million cats and dogs. These cats and dogs reproduce themselves almost 7 times faster than humans—3,000 per hour compared to 450 humans per hour.

The world food problem usually has two interpreters—the doomsday prophets and the hopeful planners.

The doomsday prophets point to the population explosion and the failure of population control programs—then predict mass starvation and world destruction.

The hopeful planners try to find some answers and put them into practice.

The doomsday prophets say we must have "a radical redistribution of food from the rich nations to the poor nations." Some go further to say this is not enough—that we must expect to abandon some countries whose prospects for survival are practically zero.

The hopeful planners continue to look for answers—although they may be considered too idealistic by many experts.

WE MUST ADMIT population programs alone do not lower birth rates very much. History has shown small families come when **improved diets, better health, education and employment raise living standards for the bottom two-thirds of a population.**

Doomsday prophets predict mass starvation. Hopeful planners seek answers and put them into practice.

Hunger problems cannot be solved by foreign aid money alone. The developing world must take steps.

Such improvement motivates them toward smaller families.

The large family is an economic asset to the Indian and Asian poor.

Higher living standards come slowly—and with help from others, usually from us Americans. **The United States of America has provided 84% of all the world's food aid over the past 25 years.**

Most of us know the billions of U.S. dollars poured into these nations —often ending up in areas that do not help the poor or hungry. One developing nation spent $2 billion to create the atomic bomb—or 100 times its annual budget for family planning, 200 times its annual budget for agricultural research.

FOREIGN FINANCIAL HELP alone cannot solve the poor's economic or hunger problems. The developing world must take some vital steps itself:

1. It must stress agricultural development—something leaders and political powers have not done adquately.

2. It must reform education—through vocational training programs in the schools.

3. It must encourage innovation—and profits—and success—instead of discouraging such initiative.

4. It must develop realistic, practical marketing systems.

What can the U.S. and other rich nations do?

1. Care enough to be informed. We had better be!

2. Be prepared to share. The U.S. cannot view its food production from a selfish viewpoint any longer.

3. Recognize population control comes WITH and AFTER improved economics, improved diet, and improved education.

4. Help other nations help themselves.

Food supplies will improve gradually—as scientific knowledge and technology progress. I believe the world **CAN** control its population. I believe the world **CAN** feed itself.

But it must decide to do one thing before this can happen—change its priorities.

RADICALLY NEW POLICIES must emerge in both rich and poor nations. The governments of poor, developing nations have a hard time seeing the NEED for agricultural development **when national airlines and modern industrial plants look so much more glamorous than simple farm-to-market roads, bags of high-yielding wheat seed, fertilizer, and rural credit organizations.**

We rich nations are partly to blame. We offer food on easily negotiated concessional terms. Food generosity is often in our best interest—**to dispose of surplus** or **to soothe our conscience** or **to excuse our waste.**

Some of the best minds believe this has done more to sap the vitality of agricultural development than any other single factor.

It has dulled the political will to develop agriculture. It has kept local grain prices at low levels. It has re-

Are national airlines more important than farm-to-market roads, seed, fertilizer, and rural credit organizations?

Few of us can conceive what agriculture might produce if there were profitable markets for its output.

inforced their tendency to neglect local agriculture. **It is easier on their budget to farm the fields of the U.S. and Canada.**

AGRICULTURAL SCIENTISTS have gone a long way in providing production know-how. But it takes more than this.

We have new varieties of high yield grains, the know-how to produce single-cell protein. A 250 acre plant devoted to such food-from-crude could yield as much protein as a million acres of soybeans.

But the real solution, perhaps, is for poor countries to increase production of their crops—AND INCOMES—on millions of small farms. Why? To stimulate economic activity.

The U.S. can provide a buffer. But don't count on us to feed the world.

WHAT ABOUT WATER? Anyone considering world food production must face the water limitations that exist.

Much of the world's land area is dry either most of the time or long enough to limit yields. The problem is not enough water. Much of the earth's visible area is covered with water. And large supplies rest in subsurface water.

The problem is USABLE water—at the right place, at the right time.

It is very expensive to develop agricultural productivity in the developing nations.

For example, if they could harness its glacial waters and rainfall, the 40 million hectares of the Indus-Ganges-Brahmaputra Plain of Pakistan, Bangladesh, and India could be made to yield nearly 20 metric tons of grain per hectare per year—or about 80% of the world's present cereal production.

The cost? High! Some estimate about $50 billion over the next 25 to 30 years. **YET, that $50 billion represents barely 17% of what the world invested in arms and military establishments in just one year—1976.**

ACHIEVING FOOD SUPPLY is not the whole problem. We could gain population control and increase food production and still find malnutrition and hunger in the world.

Why? Because abundances always bring us back to an ancient question: "How can we feed those who are hungry or malnourished because they lack the land, the work, or the money?"

Expanding agricultural production well above population growth never solves the economic problems nor eliminates malnutrition. This is especially true when the people are financially unable to purchase the increased production.

Agriculture might produce far beyond our present concepts, if there were a profitable market for its output.

The world farm industry must learn to plan. The U.S. faces farm surpluses periodically. And perplexed politicians offer no real program or plan.

General Motors could PRODUCE enough cars for every family in the world to own one. General Electric could PRODUCE enough refrigerators for every home on earth. But

One continent could double its irrigated harvested land for less than Vietnam cost the U.S. in one year.

what chaos when they found so many without the money to buy the cars and refrigerators.

So, these great companies PLAN—while the world farm community blunders on.

CAN THE WORLD feed itself in 1980? In 2000? That depends on where we place the priorities. Can the poorer nations feed their people?

China is an interesting example. In 1876-79, drought claimed an estimated 13 million Chinese lives. Today that nation of 800 million people appears to have hunger under control—**using irrigation, high yielding varieties, and fertilizer.**

Most of us do not have the minds to conceive what agricultural production could become IF the human family would spend its money that way.

The indicative world plan said the irrigated harvested land in Asia could be doubled, adding 70 million hectares. But at a cost of $37 billion over a 20-year period.

Where can that kind of money come from? **Well—we spent more than that IN ONE YEAR in Vietnam.** And we reaped misery and poverty and death and desolation. In one year —1976 again—the world spent 7 times that amount on arms and military establishments.

It is the ageless riddle. Starvation in a world of surpluses. WHY? The answer must come from special hearts and minds—of men and women dedicated to peaceful co-existence. A new concept of one world.

Today's world **CAN** forestall famine if it decides to. We can use the marvelous tools science has given us —to feed the world **OR** to blow it up. Let us pray for the right choice. **The End**

REPRINTS OF THIS ARTICLE ARE AVAILABLE. ORDER ON BACK COVER.

NEWS & VIEWS

New Proof

THE INFLUENCE OF fertilizer on crop quality and profits is proved anew each year.

A Kansas flour miller is paying half the farmers' fertilizer bill to fertilize for higher protein.

Nebraska substantially cut cow weight loss on low quality range by adding KCl to range supplements.

Researchers are decreasing disease and damage in soybeans by adding adequate potash.

Helped By Time

THE VALUE OF balanced fertility multiplies with time, as the University of Maryland found with corn.

The **NPK treatment** gave 5 bu/A **MORE** corn than N alone the first year . . . 10 bu/A **MORE** the second year . . . and 43 bu/A **MORE** corn the third year.

Just To Hold

CONTINUOUS CORN requires 120 lb K_2O each year just to maintain the K soil test level on a southern Illinois silt loam soil at the Dixon Springs Agriculture Center.

Agronomists often advise 40 to 50 lbs is enough when just the grain is removed.

Interesting Teamwork

TENNESSEE plant pathologist, Dr. Al Chambers, told the 1977 Southern Soybean Disease Workers Conference about some interesting teamwork between Benlate and potassium.

He said Benlate **WITHOUT** adequate potassium gave poorer foliar disease control and only 2 bu/A increase. But Benlate **WITH** adequate potassium greatly reduced the disease problem and increased yields 5 bu/A.

CHAIRMAN FRAWLEY, who accepted leadership of AMAX International and Chemicals in 1976, is also a Director of Roan Consolidated Mines Limited, of Botswana RST Limited, and of Tsumeb Corporation Limited.

A well known leader in the industry, Mr. Frawley is a native of Troy, New York and a graduate of Albany Business College. Before joining AMAX, he was general manager of the Aircraft Accessory Turbine Department of General Electric Company.

He joined AMAX as corporate controller in 1964 and became vice president for finance in 1967. The next year he accepted additional duties as president of the company's petroleum division. In May, 1968 he became vice president for corporate planning and administration and by 1969 vice president in charge of AMAX Fuels and Chemicals. He accepted his present responsibility in January, 1976.

NEW INSTITUTE CHAIRMAN

John F. Frawley, Vice President of AMAX Inc. with responsibility for AMAX International and Chemicals, has been elected Chairman of the Board of the Potash/Phosphate Institute, it was announced by outgoing Board Chairman **D. R. Gidney,** President of Potash Company of America.

Boyd R. Willett, President of Kalium Chemicals Division of PPG Industries Canada and Vice President of the Chemical Division-International Department of PPG Industries, was elected Vice Chairman of the Board, Mr. Gidney reported.

Outgoing Chairman Gidney welcomed phosphate industry officials to the Board for the first time in the history of the Institute, which has been the research and education arm

OUTGOING CHAIRMAN WELCOMES

FORTY TWO years ago the Potash Institute was launched on a mission of cooperation with official agriculture.

The place, Washington, D.C. The man speaking, Dr. J. W. Turrentine, first Institute president and chemist who had invented a process for vacuum cooling and crystallizing potash salts.

He was making a point to a group very interested in the agricultural usage of potash:

"Gentlemen, potash use depends on the recognition of its function as a plant food, which is agronomic, and the ability of the farmer to buy his need, which is economic in its bearing on a growing, stable market.

"Agricultural usage of potash must be increased on a basis that is sound and profitable to the farmer.

"Consumer betterment is basic in our promotion of potash use. If we did not believe that, we should have

AND VICE CHAIRMAN

of the potash industry since 1935.

Institute President, Dr. R. E. Wagner, said, "Never before have potash and phosphate producers joined hands in such agronomic teamwork to help official agriculture, farmers, and communicators seek scientific needs for phosphate and potash in the world's food production.

"For 42 years, this Institute of agronomic scientists has supported hundreds of university research grants, participated in thousands of field demonstrations and cooperative projects, and distributed millions of communication tools to find and tell agronomic needs for potash. Now it will include phosphate in its pursuit of nutrient truths under modern farming pressures."

PHOSPHATE INDUSTRY

no moral justification as an Institute. We believe the prosperity of the consumer is the best assurance of the prosperity of the producer."

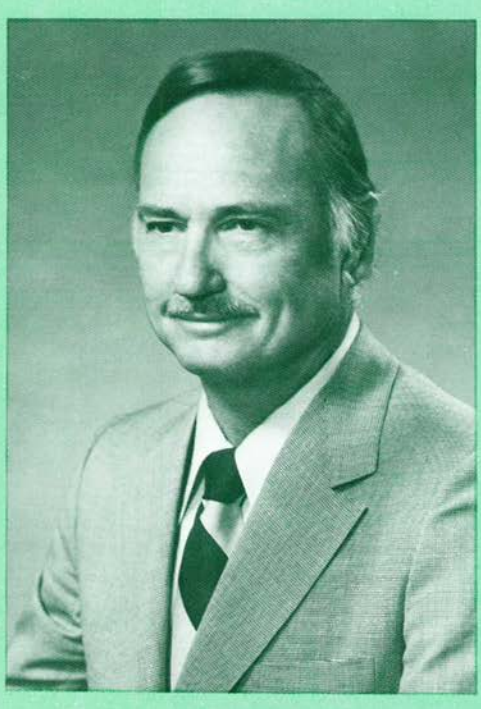
Dr. Turrentine was not speaking to a hall full of official scientists or progressive farmers. He was talking to the Institute's first Board—8 members from potash producers of that day. Realistic businessmen with the job of selling potash.

They accepted his philosophy. Today their Institute still applies scientific integrity to commercial enterprise.

The late famed chemistry writer, E. E. Slosson, once said, "Statements by the potash industry are found so accurate by government officials that they often use them as part of their recommendations."

This is our heritage. We welcome the phosphate industry to it.

Dean R. Gidney, Former Chairman



VICE CHAIRMAN WILLETT, who became Vice President and General Manager of PPG's Chemical Division-International Department in 1973, is also Vice President and Director of PPG Industries Canada Ltd.

A native of Matador, Texas, Mr. Willett is a University of Texas graduate who joined PPG as a young development engineer in the Chemical Division's technical center at Corpus Christi in 1942.

From there he became production superintendent of PPG's Lake Charles, Louisiana, chemical plant in 1946. Nine years later he became manager of operations for STANCHEM Division of PPG Industries in Canada.

In 1961, he accepted the presidency of Kalium Chemicals Division of PPG Industries Canada, a Canadian operation producing potash near Regina, Saskatchewan. Twelve years later he accepted his present responsibility with a company he has spent 35 years helping to build.

Potash Fertilizer Can Boost Wheat Stem Thickness And Strength

even on very high-K soils

EARL SKOGLEY
MONTANA STATE UNIVERSITY

LODGING CEREAL GRAINS often reduce yields and cause losses during harvest.

Potash fertilizers often decrease this lodging and stalk breakage, especially on soils containing low levels of soil extractable K.

But how does potash affect lodging on soils that test high in extractable K? Research shows much benefit may also occur from using potash on certain high K soils—most commonly high K soils where potash also increases crop yield.

The increased yield often occurs when potash is included in a balanced soil fertility program where nitrogen and phosphate are applied at desired levels for high yields.

Benefits from increased stem strength may not always equal benefits from a treatment that consistently adds several bushels per acre.

But stem strength can greatly benefit a grower when it means the difference between a "standing crop" and a "lodged crop." A crop may have the potential for a great yield—but the grower cannot haul "potential" to the bin. When heads are on the ground where the combine cannot pick them up, yields drop sharply.

Losses from strong winds, heavy rains, and light hailstorms may decline when stems can better withstand the buffeting. Potash may put more bushels in the bin under these conditions.

Heads formed on broken stems gen-

TABLE 1—Fertilizers Applied Before Seeding Boosted Winter Wheat Yields On The Stan Huffine Ranch—1976.

Fertilizer Applied lb/A			Grain Yield Bu/A
N	P*	K**	
0	0	0	42.0
40	50	0	48.8
40	**50**	**20**	**54.8**
40	50	40	52.7
40	50	80	50.8
40	50	120	53.0

* To convert P to P_2O_5, multiply by 2.29.
** To convert K to K_2O, multiply by 1.2.

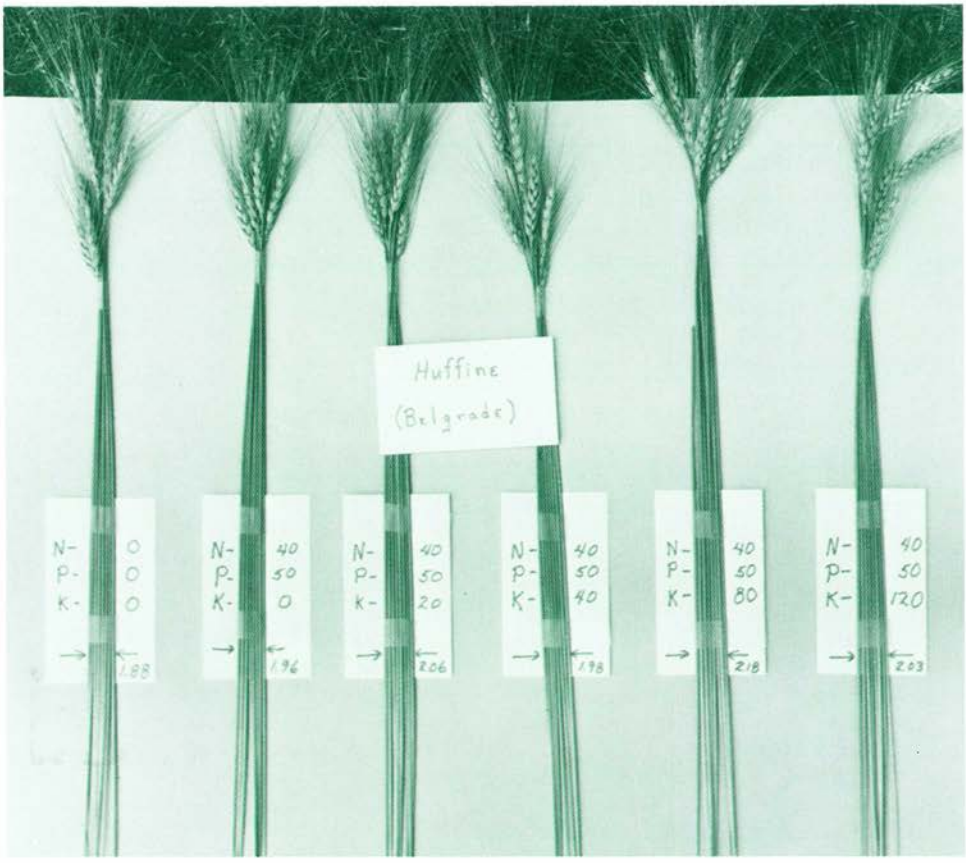


FIGURE 1—Potash Increased Stem Thickness Of The Wheat.

erally have shriveled, poor quality grain as well as reduced yields.

JUST HOW MUCH CAN potash increase stem strength on high K soils?

We measured yield and stem strength in 1976 from a winter wheat experiment established on a dryland site in the fall of 1975. Nitrogen and phosphorus fertilizers were applied as one treatment along with 0 to 120 lb K/A (144 lb K_2O/A). **Table 1** shows the results.

NITROGEN AND PHOSPHORUS increased yield nearly 7 bu/A on this soil—expected since the NO_3-nitrogen content of the soil was only 26.3 lb/A to a depth of six feet in the early spring on the non-fertilized plots. And phosphorus was in the "low" soil test range.

APPLIED POTASH added another 6 bu/A—not expected on a soil testing 580 ppm (1160 lb/A) extractable K in the 0-6 inch depth and 325 ppm (650 lb/A) in the 6-12 inch depth.

The presence of 1,810 pounds of extractable K in the surface foot of soil should, by all imagination, provide ample potassium to the growing crop.

Yet, 20 pounds of potassium included with adequate nitrogen and phosphorus added 6 bu/A to the yield.

Such response on soils testing high potassium has occurred frequently during the past several years in Montana.

Potash fertilizers influence not only yield, but also size and strength of crops grown on "high-K" soils, we

TABLE 2—Fertilizers Increased Size And Strength Of Upper Stem On Winter Wheat At Soft-Dough Stage.

Fert. Applied N-P-K lb/A	Ave. Diam. of Upper Stem mm	Ave. Strength of Upper Stem Relative Break force
0- 0- 0	2.31	37
40-50- 0	2.38	39
40-50- 20	2.50	39
40-50- 40	2.41	42
40-50- 80	**2.62**	**46**
40-50-120	2.54	44

have observed.

In this study, yield response was not related to lodging problems. No adverse weather conditions occurred. The nitrogen rate was not excessive. So all plants stood up well.

But height of plants differed sharply in certain plots after heading was complete and grain was in the soft-dough stage of filling. Plants in one plot in each of the four replications averaged about 4-5 inches taller than plants in all other plots.

The variety of winter wheat grown in this experiment was "Cheyenne," a normal-height variety averaging about three feet straw length. The observed height difference was at least 10% of plant height.

The plot diagram revealed the taller plants were those receiving only nitrogen and phosphorus. All plots fertilized with K, regardless of rate, were no taller than unfertilized plots.

To follow up on this, we collected a random sample of stems from each of the four replications. **Figure 1** shows the diameter of eight stems (two from each replication) and the very obvious differences that occurred.

We then measured the force required to break each stem. The apparatus designed for this purpose measured the relative difference in force required to break a uniform length of stem.

ADDING POTASSIUM with nitrogen and phosphorus increased stem strength even more than stem thickness—18% increase in strength and 10% increase in thickness, at maximum, shown in **Table 2.**

Since potassium decreased straw length, the resistance to lodging was even greater than these stem measurements indicate.

IN SUMMARY, potassium fertilizers in a balanced soil fertility program may increase not only yields, but also stem thickness and strength.

Less breakage under adverse weather conditions could sharply increase the amount of harvested grain.

These benefits occur on soils that test very high in soil-test extractable K. **The End.**

QUALITY INCLUDES MANY THINGS . . . SEEN AND UNSEEN . . . LONGER PRODUCT LIFE . . . HIGHER GRADE VALUE . . . FULLER NUTRITION . . . GREATER CONSUMER APPEAL . . . SO VITAL IN TODAY'S MARKET-CONSCIOUS WORLD.

Order brochure, FERTILIZING for QUALITY GAINS DOLLARS, back cover.

NEWS & VIEWS

Digested by Potash/Phosphate Institute Staff . . . From Around The Globe

A Teamwork Math

WHEN DOES 1 + 1 = 3? This happens when two practices working **TOGETHER** add more bushels (or pounds) to the yield than the total bushels from each practice working alone.

Here plant population **ALONE** added 9 bushels. Nitrogen **ALONE** added 48 bushels. The total: 57 bushels. But when nitrogen was **teamed** with greater population, the **TEAM** added 76 bushels:

	Corn Yield—Bu/A	
Plant Population	No N	160 lb N/A
15,682	108	156
23,522	117	184
Increase from population		9 bu
Increase from N		48 bu
Increase from population and N		76 bu

This multiplying effect of good practices applies strongly to individual nutrients in a fertilizer program.

Each nutrient alone can increase yield, but TOGETHER they often make 1 + 1 = 3. **What a lesson to teach!**

Don't Short-Change

IT PAYS TO SUPPORT long-term research. Short-term trials often short-change needs that don't show up in a year or two.

Look at Coastal bermudagrass in Texas. Potash increased yields 5,500 lbs/A in the 7th year of the study.

If the trial had run only a year or two, potash could have been considered needless because it did not increase yields at first. YET, when disease started reducing the no-potash stand, the K-fertilized plots maintained stand and yield potential.

A Cost Cutter

HOW MANY GROWERS realize fertilizer can account for 30 to 40% of crop yield?

How many have calculated why high profits demand high yields?

The Illinois calculations below tell why. We increase yields to decrease the cost per bushel of corn and soybeans. The same results can be calculated for any agronomic crop.

CORN		SOYBEANS	
Yield	**$**	**Yield**	**$**
Bu/A	Cost/Bu	Bu/A	Cost/Bu
100	2.50	35	5.91
120	2.21	40	5.30
140	2.01	45	4.77
160	1.86	50	4.36

Just A Small Bite

IT TAKES BARELY 0.7% of U.S. energy to get the fertilizer needed to produce our crops.

This 0.7% energy is used 3 ways: (1) 88% to produce the fertilizer. (2) 1% to transport the raw materials. (3) 11% to transport, store, and apply finished product.

Such a minute bite out of our national energy supply makes the Federal Energy Administration and others look foolish talking about LESS fertilizer use. Certain facts of life will keep fertilizer at the top of many priority lists:

1. People must eat. Our little planet absorbs more people every year.

2. **Higher yields from adequate fertility** use energy more efficiently. For example, more bushels per gallon of fuel used in plowing.

3. **Fertilizer consumes only 25%** of agriculture's total energy needs.

4. **Each ton of fertilizer takes relatively little energy:** 42 million BTU per ton N, 10 million BTU per ton P_2O_5, 4 million BTU per ton K_2O.

5. **Fertilizer usage will increase.** Some say 5 to 7% yearly to help increase average yields for more food supply.

6. **The fertilizer industry works** constantly to produce more and better product with less energy.

With Precision

UP TO 8 TONS HAY per acre yearly, plus a potential crude protein yield of 3,000 lbs—that's what Dr. W. M. Oliver and other researchers at the North Louisiana Hill Farm Experiment Station at Homer are doing with Coastal Bermudagrass.

Their digestion trials show two cuttings of hay contain the same total digestible nutrients and 2.5 times the digestible protein in 100 bushels of corn.

Dr. Oliver began his grazing studies in 1971. Since then he has increased per-acre weight gains from 200 to 750 lbs for both calves and yearlings.

He believes more precise management will achieve 1,000 lbs animal gain per acre. How? By such steps as these:

1. **Begin grazing early**—when spring growth is no more than 2-3 inches tall.
2. **Stock pastures heavily**—to keep forage young and nutritious.
3. **Remove surplus forage as hay** if growth approaches 6-8 inches.
4. **Soil test annually.** Apply phosphate and potash early. Inadequate potash and phosphate makes Coastal more susceptible to disease and reduces the amount of forage. Continued PK deficiency can kill the plants.
5. **Keep nitrogen available.** Coastal hay can remove 60-70% of applied nitrogen in 28 days.

Store It Carefully

URGE CAREFUL harvesting and storing of home-grown forages — to save valuable protein.

In the Northeast, 69% of the protein grown on a field was recovered, on average, ranging from 52 to 83%. This 69% means 630 lb. protein per acre was **LOST.**

Protein is worth 20¢ per pound. So, harvest and storage method COST the farmer $135 per acre in LOST protein.

Growing Problem

NEMATODES ARE A growing problem in many soils. And fertilizer helps overcome some of this problem, as this Florida work on corn shows:

Fertilizer Rate	Not Fumigated	Fumigated
	Bu/A	
Low	88	128
Medium	166	188
High	198	223

Missouri found some soybean varieties responding better to potash than to fumigation, an accepted practice.

Costly Savings

HOW MANY GROWERS stop to remember savings that cut yields can become costs that cut profits. Let's take a time when it cost $250 or more per acre to produce corn:

One study cut the nitrogen (N) rate 50 lb per acre (from 200 to 150 lb N/A). This saved about $10.00 in fertilizer but lost 14 bushels in yield—**or about $25 net loss from each acre.**

They cut the potash (K_2O) rate 30 lbs per acre (from 120 to 90 lbs K_2O/A). This saved about $3.00 in fertilizer but lost 8 bushels in yield—**or about $16 net loss from each acre.**

Such "savings" are costly—and growers should be reminded.

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UPDATE

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MEDO-O-BLOOM FARMS POINT THE WAY

M. B. TESAR
MICHIGAN STATE UNIVERSITY

MED-O-BLOOM FARMS, a partnership near Caledonia in southern Michigan, is operated by Jerry Good and Elton Smith.

Elton is a graduate of Michigan State University's Agricultural Technology curriculum. Jerry, the younger partner, graduated from MSU in Dairy Science in 1963.

They farm 800 acres and have 200 Holstein and Guernsey cows. Holsteins average 18,000 lb milk and 660 lb butterfat. Guernseys average 12,100 lb milk and 590 lb butterfat annually.

Holsteins get about 8-10 lb dry hay fed outside, 16 lb dry grain as high moisture corn, 10 lb DM in 30 lb corn silage, and 30 lb haylage (10 lb DM) for a total of about 45 lb DM per Holstein daily.

Five hundred acres of corn yield 90 to 95 bu or 13-14 tons corn silage annually.

Alfalfa is grown on 150 acres each year and yields 4 to 5 tons hay per acre. Best yields recorded have been in the 7-ton range.

SEEDINGS ARE MADE in early August after liming and plowing under wheat stubble. The soil is tested every rotation for pH, P and K. Two to three tons of lime are added before each seeding on the loam soil to bring the pH to near 7.0.

Fourteen to 16 pounds of Saranac, Thor, or other high yielding alfalfa (Vernal on 6-10 year stands) are band seeded with about **400 lb 9-23-30 fertilizer per acre and cultipacked after seeding.** (The nitrogen isn't needed but comes in a blended mixture.) **One to 2 lb boron is added.**

Two pounds each of brome and timothy are seeded with alfalfa and one-third bushel winter barley per acre.

The barley provides winter protection and increases first-cut yields the next spring. The grass fills in dead spots in wetter areas and makes haying easier.

ALFALFA IS CUT in late bud or very early flower for high quality forage. Four cuttings of alfalfa are made each year—late May, last of June-early July, early August, and the middle of October.

The first cutting is taken as silage. The second and third cuttings are put up as large bales or regular bales. The last cutting in mid-October is used for silage.

HIGH ALFALFA YIELDS are maintained by growing the alfalfa on the sweet soil and topdressing in the fall with **400 lb 0-0-60 (240 pounds potash) after the first and third harvest years and with 400 lb 5-14-42 after the second year. Boron is added to the fertilizer.**

Most stands are kept four years but some Vernal alfalfa is left for 6 or more years on hilly land and fertilized annually to maintain good stands. **The End**

Higher Goals Mean Higher FERTILITY

M. L. VITOSH
MICHIGAN STATE UNIVERSITY

SOILS VARY in their ability to grow crops. Climate and management also affect the ability of the soil to produce.

But under an existing climate and specific management program, a given soil has its own unique yield potential. For our discussion, **yield potential may be defined as the maximum yield obtainable under existing climate and management where fertilizer is not limiting.**

The **yield goal,** which is closely related to yield potential, is a yield someone believes is possible to achieve economically.

The yield goal should be higher than the grower's long-time average yield. In some cases it may be as high or higher than the best yield ever obtained, especially if management can be improved by fertilizer practices.

Since yield goal is often used in making fertilizer recommendations, growers should select a realistic yield goal.

The farmer who tills his soil and harvests the crops is the person most familiar with his field and is in good position to select an appropriate yield goal.

SOIL TESTING is one of the best ways to use fertilizer efficiently and improving profitability for the farmer.

Table 1.

Nitrogen Recommendations For Corn.[1]

Yield goal	Nitrogen rate
bu/A	lb N/A
100	120
140	170
180	220

Michigan—[1]rates are based on a 10:1 corn to nitrogen price ratio

Table 2.

Phosphorus Recommendations For Corn

Yield goal	Soil test P (lb/A) 20	40
bu/A	..... lb P_2O_5/A	
100	60	35
140	90	65
180	125	100

Michigan

Table 3.

Potassium Recommendations For Corn on Loam, Clay Loam And Clay Soils.

Yield goal	Soil test K (lb/A) 100	175
bu/A	..... lb K_2O/A	
100	90	40
140	145	75
180	195	110

Michigan

By soil testing and following sound fertilizer recommendations, a farmer can virtually eliminate soil fertility as a limiting factor to high yields.

A test for phosphorous (P) and potassium (K) will help the grower decide

Table 4.

Nitrogen Recommendations For Wheat.

Yield goal	Soil organic matter		
	Less than 2%	2-4%	4-6%
bu/A	.....lb N/A.....		
40	60	40	25
60	90	60	35
80	—	80	45

Michigan

Table 5.

Phosphorus Recommendations For Wheat.

Yield goal	Soil test P (lb P/A)	
	20	40
bu/A	.....lb P_2O_5/A.....	
40	45	20
60	70	45
80	95	70

Michigan

Table 6.

Potassium Recommendations For Wheat on Loam, Clay Loam Or Clay Soils.

Yield goal	Soil test K (lb K/A)	
	100	175
bu/A	.....lb K_2O/A.....	
40	75	25
60	115	55
80	150	80

Michigan

which fields need how much of these elements.

Most soil test laboratories will give fertilizer recommendations based on a specific yield goal. And, of course, more fertilizer will be recommended for high yield goals than for low goals.

If a yield goal is not specified on the soil test box or information sheet, some laboratories will specify an average yield goal which may be lower than the yield you hope to achieve.

Many growers who soil test have better than average management. This is why proper selection of yield goal is so important.

Many a grower or dealer has at one time or another been disappointed by what they call meager or inadequate fertilizer recommendations. They say **much larger amounts of fertilizer are needed.**

The question is this: **"Does the yield goal for which the fertilizer recommendations are given challenge the grower?"**

If it does not, the yield goal is too low and he has an incorrect fertilizer recommendation. Every yield goal should challenge the grower.

Higher yields for most farmers means lower costs per unit of production and greater profits per acre.

SOME EXAMPLES of how yield goal influences the fertilizer recommendations are given in the tables.

Nitrogen rates on corn vary from 120 to 220 lb of nitrogen per acre for yield goals of 100 to 180 bu per acre, **Table 1.**

Phosphorus and potassium recommendations at the low soil test levels are doubled, as yield goal is increased from 100 to 180 bu per acre, **Tables 2, 3, 5** and **6.**

That's because at the low soil test level, most of the needed plant nutrients must come from the fertilizer. In addition, this recommendation includes a soil building recommendation to raise the soil test level **to increase the probability of getting the higher yield.**

Recommendations at the higher soil test levels nearly triple when corn yield goal increases from 100 to 180 bu per acre. At the higher soil test level, the soil will supply most of the phosphorus and potassium to the plant **unless yield goals are high.**

Therefore, fertilizer recommendations at a low yield goal level is primarily a maintenance one. But when yield goals are high, the recommendation includes extra fertilizer for soil building and meeting the greater plant needs.

In **Table 4,** nitrogen recommendations for wheat vary as yield goal and soil organic matter levels change.

Soils with higher organic matter levels release more nitrogen than soils with small amounts. Differences in release of nitrogen from organic matter influence the amount of nitrogen to be supplied by the fertilizer.

The same rationale could be used for corn but the amount of nitrogen released from organic matter is a much smaller percentage of the total required for corn than it is for wheat. Thus, wheat is more dependent upon soil nitrogen than is corn.

For corn, some of the differences due to soil organic matter are taken into account when the yield goal is selected because soils naturally high in organic matter generally have a higher corn yield potential.

The nitrogen recommendation in **Table 1** shows a close relationship between nitrogen recommended and the yield goal.

IN SUMMARY, selecting the appropriate yield goal for each soil or field is very important. Errors made in selecting the yield goal can cause fertilizer recommendation errors. **Remember the yield goal should challenge each grower and also be realistic.**

The response to fertilizer additions follows the law of diminishing returns: **The additional yield produced by each additional increment of fertilizer decreases until the added yield will no longer pay for the added fertilizer.**

Because of this characteristic of the response curve, the consequence of **over-fertilizing is less costly than under-fertilizing due to yield loss.**

Likewise, it is better to over-estimate the yield goal than under-estimate it. **The End.**

NEWCOMERS to this Institute's staff will recognize they are part of a remarkable heritage.

Remarkable for its stability and loyalty to the highest ideals of agronomic research and education to promote sound fertilization.

No industry leader symbolizes that loyalty better than Dean R. Gidney. When Mr. Gidney recently completed his term as Institute Board Chairman, he marked 26 years service on the Board and 40 years in the potash industry, when we include leave for World War II Navy duty.

In announcing the new Potash/Phosphate Institute with President Wagner, Chairman Gidney typically turned all credits away from his chair to a forward looking Board and to former chairman S. T. Keel for spearheading the plan.

As Mr. Gidney returns to his regular seat on the Board, my mind returns to Dr. Harvey "Skin" Mann late one afternoon in 1957.

Dr. Mann was then Institute president, a very bright, colorful leader. He was leaning back in his chair, his feet anchoring papers on his desk.

"Dr. Skin," I asked, "if you didn't have but one word to say what the Potash Institute is, what would it be?"

He lowered the letter he was studying, looked at me over the toes of his shoes, and asked, "One word? Just one word! What kind of question is that, Martin?"

"I was just wondering, Doc."

He stared at me and I stared at him. He got up and walked over to the long table beside the floor-deep windows and looked down at the intersection 3 blocks north of the White House.

"One word? That's a fool question, Martin."

"I was just wondering, Doc."

He sat down at the long table where he had chaired many board meetings. Then he said, "INTEGRITY—I hope."

Dr. Mann didn't like big words or big shots. So, when the word, **integrity,** rolled out of him, I was surprised—not at the meaning, but at the vehicle he chose. Truth, a single-syllable tool, would have sounded more like him, in the Truman mold.

But he was a wise man. There's a certain quality about the word, integrity—a certain strength of character in the face of fickle fads and seasonal swings up and down.

Many calls have said to me over the years, "Why don't you come into human interest work? The Institute needs to get a big name editor, anyway, to build an editorial prestige equal to its agronomic prestige."

Each time I think about getting out of the way for such a name, the sun hits me. A 1957 sun reflecting from the windows behind some Institute scientists sitting at that long table in Dr. Mann's office.

They are discussing how the President of the American Society of Agronomy had just advised enough soil nutrients for "slight luxury consumption at all times."

They are applying mental magnifying glasses to the idea—pros and cons—in a day before super yielders. Dr. Mann chuckles.

I was young, smart alecky, and amazed—at scientists **employed to promote fertilizer** examining such a great endorsement so carefully. But I didn't know then what I know now.

Scientific integrity doesn't shout. Doesn't con. Doesn't spotlight self, but truth—and even that with care.

No one symbolizes this integrity more than the "office boy" who brought a Phi Beta Kappa mind in an All American athlete's body to potash in 1937—and stuck through feast and famine.

DEAN R. GIDNEY

1915: Born Washington, D.C. Sept. 15. Educated in the schools of Ridgewood, N.J.

1936: Graduated from Dartmouth with BA in Economics. Member Phi Beta Kappa and All American soccer team.

1937: Joined U.S. Potash Company as "office boy and bookkeeper" after year as "messenger and tax clerk" U.S. Trust Company, Wall Street.

1939: Attended his first meeting of the American Potash Institute.

1940: Awarded MBA from New York University after 4 years night school study.

1941: Took leave from U.S. Potash to U.S. Navy in March . . . married Olive Milbrandt in New York City in July.

1946: Discharged Lt. Commander from Navy to rejoin U.S. Potash Company.

1951: Sales Vice President, U.S. Potash Company, and first elected to American Potash Institute Board.

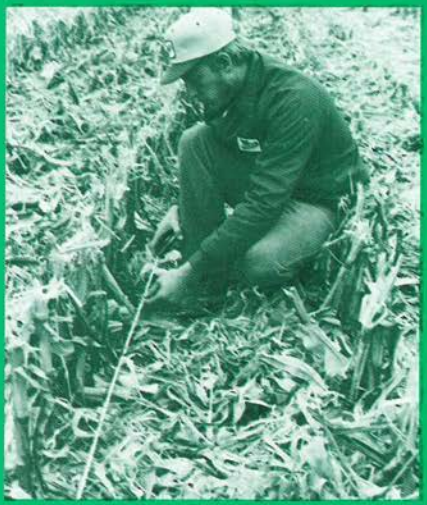
1956: Vice President and General Manager, U.S. Potash Company Division of U.S. Borax & Chemical Corporation.

1960: Vice President of Sales, Potash Company of America.

1973: Executive Vice President, Potash Company of America Division Ideal Basic Industries.

1975: President and Director, Potash Company of America Division Ideal Basic Industries. Chairman, Potash Institute Board.

Roy says he memorized every stalk in the place.



He planted 36,700 seeds an acre and averaged about 30,000 plants per acre at harvest.

A HARD WORKER BUILDS AMAZING

"I'm not going to say that's as high as I can ever get. If you don't think 400 and push 400, you're never going to reach 400."

ROY LYNN, JR., of Schoolcraft, Michigan, harvested by machine a record yield for one acre of 352.64 bushels, calculated on the basis of Number 2 corn at 15.5 per cent moisture. He set this new world's record on September 30, 1977.

The previous known record yield is 338 bushels an acre, produced in central Illinois in 1975. The average yield per acre for corn in the United States is about 90 bushels. The Lynn yield has been confirmed by the DeKalb Yieldmasters Club, which keeps such data.

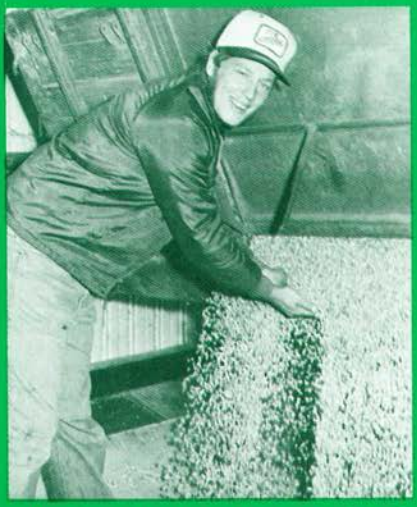
Lynn is no flash in the pan. In 1976, the Lynn farm recorded a yield on one acre of 238 bushels. This year, 10 acres were given added tender loving care and more fertilizer.

Roy estimates that the yield on all averaged more than 300 bushels per acre. For all his irrigated land, he estimates a yield of about 200 bushels an acre.

Non-irrigated crops this year suffered from a drought during the early season and pulled Roy's estimated average yield from the entire 600 acres he has in corn down to about 125 bushels per acre, he estimates.

The new record-holder is a 28-year-old bachelor whose home is near Schoolcraft, a town in southern Kalamazoo County, Michigan. The land on which the record yield was grown is actually in St. Joseph County, south of Kalamazoo County.

Lynn, who farms 1,000 acres with his father, Roy, Sr., made the yield



Roy reaches for the goal of gold —352.64 bushels of corn per acre.

CORN YIELD . . .

From DEKALB AgResearch NEWS

check on an area 1,187 feet long and 40 feet wide (1.089 acres).

The hybrid seed used for the corn was DeKalb XL-54, produced by DeKalb AgResearch, Inc., DeKalb, Illinois.

"XL-54 has been one of our best hybrids over the years—with good grain quality," comments Basil Tsotsis, DeKalb vice president in charge of corn research.

He notes that the high yield came because of an unusual coincidence of weather and other factors. "The hybrid had the potential to do it and it did it."

INFORMATION SUPPLIED to the DeKalb Yieldmasters Club re**ported these steps:**

1. 16 rows of corn were harvested

Official Witness Testimonials

(Regarding Roy Lynn Jr.'s yield of 352.64 bushels per acre corn.)

"I didn't expect 300 bushels per acre. Knew it was a good piece of corn—went way over. A good, young farmer worked it. After high school, Roy has done a great job studying and incorporating corn production practices."

Leon E. Phelps

Leon Phelps, Chairman
Three Rivers Federal Land Bank

"Roy put together a solid program under irrigation with a strong DeKalb hybrid, fertilizer, insect control and grass control using Lasso—and it paid off. Roy's previous experience and positive approach this season made us feel sure of a super yield."

Steve C. Middlemas

Steve Middlemas
Monsanto Area Representative

"Roy had an excellent program. Insects were controlled with 13 lbs of Furadan. We knew it had to be a whale of a yield. When after going only 700 feet into the field, Roy's 6-row combine was full."

Mark A Barbera

Mark A. Barbera
FMC Sales Representative

"With a controlled seed, fertilizer, chemical and water program, Roy was able to overcome all the elements and hit the top yield. It takes top management and a lot of hours to put a program like this together."

Duane L. Dean

Duane L. Dean
Dean's Farm Fertilizer

Setting a new world corn yield record was a family affair, according to those who know the Lynns, shown here. Mrs. Lynn is a registered nurse, using her talents again now that all her children have finished high school. And Roy Lynn, Sr., a former postman, bought the farm near Schoolcraft in 1967 and began farming it with his son.

to produce the yield. The corn was planted on April 26 in rows 30 inches apart. Planting rate was 36,700 seeds an acre. At harvest, there was an average of approximately 30,000 plants per acre.

2. Lynn put on "twice as much water" as usual this year to irrigate the crop because of early drought conditions and to feed nitrogen and other chemicals onto the plants and land.

(At harvest time, the corn weighed 23,320 lbs from the selected area which converts to 352.64 bushels an acre at 15.5 per cent moisture.)

The corn was irrigated 11 times and received a total of 32 inches of water (irrigation, plus natural rainfall) from planting to harvest. Nitrogen was put on during the first, third, fifth and seventh applications of water.

3. Lynn's fertilizer program included application of 380 lbs of nitrogen, 100 lbs of phosphorous and 192 lbs of potash. More than 250 lbs of the nitrogen was applied as 28 per cent nitrogen form through the irrigation water.

Micro-nutrients were added with the fourth watering—one quart zinc and one pint magnesium.

4. Weed control was provided by Lasso and AAtrex 4L. Furadan and Dyfonate were used for insect control.

Witnesses to the yield all had familiarity with the field.

5. An International Harvester combine picked the yield.

Lynn's yield also tops the previous DeKalb Yieldmasters Club record of 289.31 bushels on a selected one acre in 1976 at the Peter Cook Estates in Rio Vista, California.

IT TAKES A LOT of work to grow and groom corn so that it will produce 352.6 bushels an acre.

Roy Lynn, Jr., along with his father, has been pushing these past three years to boost corn yields on the land

he owns and rents near Schoolcraft, Michigan.

A bachelor, blond-haired Roy Lynn, Jr., stands six-feet-one-inch and weighs 195. He needed a hearty constitution to stand up to long and irregular hours of labor.

"You can have all the fertilizer and water in the world," he comments, "and it won't help if you don't manage it properly." He sometimes had to start or change the traveling water irrigation system at 1 a.m., 3 a.m. or 5 a.m.

"I memorized every stalk in the place," Roy says.

Lynn owns 292 acres and rents about another 700 acres. In 1977, he had 600 acres in corn, 175 in wheat and 100 in soybeans. He has about 35 hogs, but plans to expand.

ASKED ABOUT what he thought of the recent relatively low price of corn, Lynn remarked, **"I can't think of a better time to have more bushels."**

Roy, Jr., said he got into farming after graduating from high school in nearby Portage, Michigan. He did some reading on agriculture, but mainly used the "trial and error" method in learning about farming. **"You can read all the books in the world on plowing and still not know much about it," he says.**

Roy, Sr., bought the farm near Schoolcraft in 1967 and began farming it with his son. The Lynns have been working at raising the average yield per acre on all of their land, which experts generally agree makes more economic sense than trying for a spectacular yield on just a few acres.

Nevertheless, Roy and his father—possibly like fishermen seeking to catch a record size fish—worked on developing record yields through special treatment.

A 10-acre area, including the 1.089 acre that produced the record yield, got very special handling this year. Roy put about 380 pounds of nitrogen per acre on this area—compared to only about 200 on the rest of his land.

It took a hearty constitution to stand up to the long and irregular hours of labor.

He used about twice as much water as usual for irrigation and for adding part of the fertilizer to the field.

THE RECORD YIELDING land was bought by Roy three years ago and is in St. Joseph County, south of Kalamazoo County, where Schoolcraft and the 145-year-old Lynn farmhouse is located.

In 1976, Roy and his father received DeKalb Yieldmasters Club honors for producing 238 bushels an acre, considered a very high yield. In 1975, their highest yield was 141. The Yieldmasters Club, sponsored by DeKalb AgResearch, Inc., annually conducts a survey of good yields.

In both 1976 and 1977, DeKalb XL-54 was the Lynn's highest yielding hybrid seed corn.

The high-yielding field has sandy soil and once was swampy. Nearby is wooded area and swamp, where Roy and friends have often hunted deer. The woods may soon be cleared for more corn. But Roy is careful about conservation practices. **The End.**

Highest RETURN Input...

Dr. John Marten

Chief Economist TOP FARMERS of AMERICA

(This timely report is available in a two-color folder

THE CHIEF ECONOMIST of Top Farmers of America, Dr. John Marten, is encouraging farmers to maintain a strong fertilizer program, despite lower grain price prospects for 1978.

The clear-speaking economist says, "A strong fertilizer program is the highest return input we use in today's agriculture."

He explained why in a candid discussion with the senior vice president of the Potash/Phosphate Institute, Dr. Werner Nelson, former president of the American Society of Agronomy.

The exchange between the widely respected agronomist and economist helps answer some questions now developing in some minds.

1. What can farmers do about today's lower grain prices?

We can't, by our individual decisions, change the market price of grain or forage. A sharp manager accepts this and then plans his best strategy, Dr. Marten explains.

2. But what can we do when our production costs exceed market price?

Not much. Our efforts to maximize profits may become a job of keeping losses to a minimum in periods of depressed prices.

3. Will high fertilizer rates pay in 1978?

Yes. Maintaining optimum fertilizer rates and thus lowest costs of production per bushel can pay big dividends today. Fertilizer investment often returns 100% or more to the grower.

4. What do you advise farmers who may be thinking about reducing their fertilizer rates this year?

Simply put, don't cut off your nose to spite your face, Dr. Marten warns. Remember a ⅓ cut in grain prices may translate into only a 5% cut in the most profitable fertilizer rate for your farm. And this assumes you were applying enough in the first place.

Fertilizer investment usually returns 100% or more to the grower.

About 80% of all production costs are the same for top, average, and below farmers.

A 150-bushel corn crop grosses 50% more than 100-bushel corn.

A period of lower prices is the sorting out time and average or below farmers are biggest losers.

To get greatest return from other investments, add enough fertilizer to get close to maximum economic yield.

Production cost per bushel is decreased and profit per bushel increased by higher yields from fertilizer.

One of the best ways to ride out $2 corn, $2.25 wheat, and $5 soybeans is through adequate fertilizers.

for winter distribution . . . order on the back cover.)

If cash to buy fertilizer is short, most lenders will provide it. They know the value of fertilizer in today's farm economic picture.

The best way to test the idea of reducing fertilizer rates when grain prices fall is to look at fertility trials across the nation. They put the idea to the acid test—profit.

5. Do average or below farmers have the same production costs as top farmers?

Almost 90% of all production costs for top farmers and average or below farmers are the same. But the top farmers net more because their higher gross returns are in direct proportion to their yield. For example, 150-bushel corn grosses 50% more than 100-bushel corn.

Almost any farmer can make money with $3 corn and $9 soybeans, even with sloppy farming. But with $2 corn and $5 soybeans the farmer must do everything just about right to make money.

A period of lower prices is the sorting out time and average or below farmers are always the biggest losers. The first thought that often comes with lower crop prices is "lower fertilizer rates." It should take just as much backup information to reduce fertilizer rates as it does to increase rates.

6. How much fertilizer is adequate economically?

Once we decide to grow a crop like corn, for example, the main variable cost is fertilizer. Other costs remain about the same—seed, chemicals and harvesting, certainly taxes, tillage, interest, labor, buildings, land.

So, to realize the greatest return from other costs or investments, we should add enough fertilizer to produce close to the maximum economic yield.

There's another way to put it—profits are the most or losses the least at the point where added costs equal added returns.

7. How does price of crop affect optimum fertilizer rate?

Price of corn has little effect on optimum rate of N and K as Iowa trials show in this table.

Corn Price	Optimum N Rate		Optimum K_2O Rate
	15¢ N	25¢ N	9¢ K_2O-LM Soil Test
$/bu	lb/A		lb/A
$1.50	166	146	100
2.00	173	159	125
2.50	178	166	135
3.00	180	171	145

Dropping corn price from $3 to $2 per bushel reduced the best or optimum rate of 15¢ N only 7 lb—and how many farmers are applying 180 lb N/A? Another point to remember is that a higher N price has only a minor effect on the most profitable application.

The optimum rate of K_2O decreased only 20 lbs—from 145 to 125 lbs per acre—when corn price dropped from $3.00 to $2.00. How many farmers are applying 145 lbs K_2O?

8. How much does yield level affect return?

Very much so. If it costs $250 to grow an acre of corn and corn price is $2.50 per bushel, it takes 100 bushels per acre before profits begin. When price drops to $2, it takes a 125-bushel yield before profits start.

Let's look at an Ohio example. With $2.00 corn, 60 lb N/A gave a net loss of $18.30/A. With 120 lb N the profit was $35.22. On this soil, successive increments of N to 240 lb N increased net return to $73.10/A. Increasing N from 180 to 240 increased net return $8/A, or 57¢ return per dollar invested for the last investment—a 57% return.

N	Yield	Gross Return	Production Cost	Net Return
lb/A	bu/A	$/A	$/A	$/A
0	65	$130	$200.00	—$70.00
60	100	200	218.30	— 18.30
120	136	272	236.78	35.22
180	159	318	252.92	65.08
240	170	345	266.90	73.10
300	172	344	279.26	64.74

9. Exactly how does fertilizer's influence on yield level help maximize returns per acre or minimize losses?

Production cost per bushel is decreased and profit per bushel is increased with higher yields.

In this example with $2 corn, the 240 lb N rate produced 170 bu/A corn for the lowest production cost per bushel and highest profit per bushel—or the smallest loss. With $1.50 corn, losses are minimized at the 240 lb rate.

N	Yield	Production Cost	Profit With $2.00 Corn	Loss With $1.50 Corn
lb/A	bu/A	$/bu	$/bu	$/bu
0	65	$3.07	—$1.07	—$1.57
60	100	2.18	— .18	— .68
120	136	1.74	.26	— .24
180	159	1.59	.41	— .09
240	170	1.57	.43	— .07
300	172	1.62	.38	— .12

Fertilization results with soybeans in Ohio show this point below. Higher potash rates increased net return and decreased production cost per bushel. The fixed costs are spread over more bushels.

K_2O	Yield	Gross Return	Prod. Cost	Net Return	Cost/Bu
lb/A	bu/A	$/A	$/A	$/A	$/bu
0	49	$245	$200.00	$45.00	$4.08
40	52	260	204.32	55.68	3.92
80	54	270	208.40	61.60	3.85
120	57	285	212.72	72.28	3.73

Soybeans $5/bu, K_2O 9¢/lb, 24¢ per bu for extra yield harvested, Med. K Soil.

An even higher rate of K_2O might have returned even more profit.

Improved yield is not the only help fertility gives toward more profit. Adequate fertility also improves quality which can mean more profit on today's quality-conscious markets.

In Illinois, added phosphate (P_2O_5) not only increased yield, but also produced drier grain at harvest on this low P soil:

P_2O_5	Yield	Moisture	Discount
lb/A	bu/A	%	$/bu
0	96	33.5	$.72
40	123	29.5	.56
80	132	28.5	.52

The discount for moisture in corn grain is 1% of price for each 0.5% H_2O over 15.5%. The farmer either takes this discount or spends money for drying.

Dr. Nelson points out most corn and wheat fields are short in N. Many corn and soybean fields are short in P and K. Practically all alfalfa fields are short in P and K.

A few fields might get by on reduced rates of phosphate and/or potash for a year or two. But most fields will need even more phosphate and/or potash for maximum economic yields in the years ahead. There are essentially no corn or wheat fields where reduced N rates can be used even for one year, unless rates are already very high.

The key, Dr. Marten reminds growers, is to fertilize for maximum profits, not maximum yield. But as the figures show, **one of the best ways to ride out $2 corn, $2.25 wheat, and $5 soybeans is through adequate fertilizer, Dr. Marten concludes.**

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