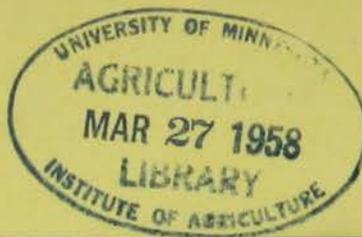


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# Top Agricultural Stories - 1957

- Research
- Recommended Farm Practices
- Farmer Experiences

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COMPILED FROM NEWS RELEASES ISSUED BY THE INFORMATION SERVICE

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The Institute of Agriculture issues many printed reports and bulletins reporting the results of its research and providing information on new farming and homemaking developments. These appear as Extension Service bulletins, folders, or fact sheets; as Experiment Station bulletins; as articles in Minnesota Farm and Home Science, Minnesota Feed Service, and Farm Business Notes; and in several other forms.

In addition, the Institute also sends news releases to newspapers, radio stations, trade and farm papers, and other outlets. These releases contain valuable information, often not published in any other form, that could be used in the educational programs carried on by county extension agents, high school teachers, and others.

This publication has brought together some of the more important of these releases. Through this publication the Institute hopes to improve its informational service and to extend the reporting of the results of its research.

# Agricultural Economics ...

## EXTRA COSTS AFFECT FARM PRICE SPREAD

Why is there such a difference between prices housewives pay in the supermarket?

It isn't because of a great profit increase to store owners. There are two important reasons for the spread.

First, all services and materials used in marketing cost more now. And second, there are more "built-in" services sold with food--including packaging, processing, labor, transportation, and other costs.

Luther Pickrel, extension agricultural economist at the University of Minnesota, points out that farmers get about 39 cents of the food dollar, compared to 53 in 1945. The U. S. Department of Agriculture investigated this change and made these findings:

\* Labor is one of the biggest food cost items. Food marketing workers have tripled hourly earnings since 1939. But productive efficiency has increased and labor cost per unit of food marketed has gone up only 2 1/2 times.

\* Food is now hauled longer distances and transportation rates are up 75 percent, meaning greatly increased transportation costs.

\* Total corporate profits in food have grown because of increased volume sold. But compute profit as percentage of sales and the story is different. Profits made up 5 percent of the marketing bill in 1940, increased to 11 percent in 1946 and have decreased since. They were 6 percent in 1955 and slightly higher in 1956.

\* Marketing margins for livestock--including costs and profits--shot up sharply after World War II, and made slight but steady increases recently. Last year, they were about 25 cents per pound.

\* Eggs are the only major farm product in which margins have dropped -- from 19.1 cents per dozen in 1949 to 17.8 cents per dozen in 1956.

## GOOD RECORD SYSTEM ADDS TO FARM PROFIT

The narrow profit margin in farming these days makes it more important than ever to keep careful records.

According to Hal Routhe and Ermond Hartmans, extension farm management specialists at the University of Minnesota, 60-70 cents of every dollar of farm income goes back into the business --for feed, machinery costs and other expenses. This is about 10 cents more than fifteen years ago.

That isn't all. Of your net income after farm expenses, about 61 percent will be used for living expenses. That means you only have 39 percent of your net income left to put back into the business.

So to make a profit, you need to watch your business more closely than ever, say Routhe and Hartmans.

Good records also help you to:

\* Watch your financial progress and "net worth".

\* Find enterprises that are most profitable, and where to make improvements.

\* Manage your income tax and social security matters to better advantage.

\* Plan your credit needs.

\* Check on household and personal expenses.

By keeping track of every expense item--no matter how small--you can save money on income tax, Routhe and Hartmans point out. A lot of expenses around the farm and home are small items, but every dollar of expense may mean 20 cents less tax.

Record systems needn't be complicated.

Routhe and Hartmans recommend a 4-part system --a check book and a deposit book, a "safety" spindle, a record book, and an "accordion-type" file envelope to keep the year's cancelled checks and receipts after they've been posted in the record book. All four items will cost about four dollars. That's a cheap investment, considering the money it can save you, Routhe and Hartmans add.

## GOOD PASTURE REDUCES COSTS

Really good pasture--compared to a poor grazing area--can save a dairy farmer up to \$34 per cow in summer feed.

Ermond Hartmans and Hal Routhe, extension farm management specialists at the University of Minnesota, point out that top quality pastures--if they are managed correctly--cost the farmer only 74 cents in production costs for every 100 pounds of total digestible nutrients (T. D. N.) in the forage.

That's far cheaper than any other feed that a farmer can raise or buy, Hartmans and Routhe say. Alfalfa-brome hay and silage each cost \$1.45 per hundred pounds of T. D. N. and oats cost \$3.69 per hundred pounds of T. D. N.

Let's compare top quality pasture with poorly-managed pasture that is 40 percent lower in feed value. Poor quality pasture would cost the farmer just as much to maintain.

But if the farmer made up the difference in feed value between the good and poor pasture by feeding hay or silage, it would cost him an extra \$10.20 per cow extra for the summer. With other feeds, it would be even more expensive. Feeding enough corn to make up for the 40 percent T. D. N. loss in poor pasture would add \$21.60 to each cow's production cost, and feeding a medium-high protein concentrate would mean an additional \$34.60 feeding cost per cow.

Hartmans and Routhe say past research has shown that with excellent pasture and ration-a-day grazing, a dairy herd with a butterfat average of 350 pounds per cow can give the farmer a \$76 labor return per acre, if he sells grade A fluid milk. But with poor pasture, the same herd producing milk for the grade A market would return the farmer only \$11 labor return per acre. Labor return is income after production costs and interest.

## RENTAL INCOME MAY COUNT FOR SOCIAL SECURITY

Rental income from a farm can count toward social security, if the landlord is "materially participating" in running the farm.

Hal Routhe and Ermond Hartmans, extension farm management specialists at the University of Minnesota, say a landlord is materially participating if his agreement with the tenant provides for it and if he follows one of these four requirements:

1. Pays for at least half the direct costs of crop production, furnishes at least half the tools, equipment and livestock used in crop production, advises and consults with the tenant periodically and inspects production activities periodically.
2. Regularly and often, takes an important part in making management decisions that contribute to, or affect, the success of the business.
3. Works 100 hours or more in work connected with crop production over a period of five weeks or more.
4. Does things which show he is significantly involved in farm production.

Most of the common crop-share or livestock-crop-share rental arrangements in Minnesota will qualify landlords income for earning social security benefits, say Routhe and Hartmans.

Landlords with cash rent arrangements should check to see if they meet the requirements.

In any case which is doubtful, the landlord can inquire at the nearest district office of the Social Security Administration or the District Director of Internal Revenue.

## FAMILY FARM IS GETTING LARGER

The family farm isn't disappearing; it's really just getting larger.

O. B. Jesness, retired head of the University's agricultural economics department, says that farms today are more entitled to the designation "family farms" than those of yesterday.

That, Jesness says, is because there is a modern trend toward fewer hired farm workers than ever. If corporate farming were taking over, there would be more--not fewer--hired workers on farms, he points out.

The trend to larger farms is apt to continue, Jesness says, because many units today are too small for efficient use of modern machinery and technology. Many farms need to grow larger to replace wear and tear on human beings with labor saving machinery.

Those who would restrict the size of farms by some arbitrary limit overlook the fact that farmers are not standardized. The best guide to desirable farm size is that the farm should fit the capacity and ability of its operator.

Jesness says there was a definite advantage in the recent farm-to-city migration. Had the trend been halted in 1910 there would be 50 to 60 million people on farms to claim a share of smaller total income than that now divided among 22 million. Without this migration, we couldn't have developed industries so highly, and automobiles would have been a rarity rather than a necessity he points out.

In most cases, communities gain rather than lose from this migration, he says. The smaller farm population will larger per capita incomes will provide expanded demand for many goods and services.

We need to develop more agricultural adjustment programs so that we don't have to rely on "warehouse-filling price supports," Jesness says. "There has been entirely too much emphasis on trying to influence prices by price supports," he declared. "We need to shift our efforts to bring agriculture into better adjustment with available markets."

## SHIFT IN SIZE, NUMBER OF CREAMERIES NOTED

Minnesota butter-making plants are getting larger and fewer, according to a study by agricultural economists at the University of Minnesota.

Economists E. Fred Koller and Arvid C. Knudtson point out that the number of creameries declined from 874 in 1938 to 550 in 1955--a reduction of 37 percent.

During the same period, the average annual butterfat receipts of these plants increased 78 percent from 307, 000 pounds in 1938 to 545, 000 last year.

While smaller creameries have been going out of business, the number of larger plants is on the increase. From 1938-55, the number of plants with annual receipts of a million pounds of butterfat or more increased from 28 to 58. Plants with annual receipts of less than 100, 000 declined 64 percent.

Koller and Knudtson say there are several reasons for this shift.

Better roads and trucks have brought increased competition from larger and more efficient plants, leaving smaller creameries with a volume too small for profitable operation. Other small plants lost out when farmers shifted from selling separated cream to whole milk.

In other areas, farmers shifted from dairying to cash crops and other livestock during and shortly after World War II. That left some creameries with receipts too small to continue operating. In some cases, small plants closed down because they couldn't afford modern equipment necessary to meet sanitary requirements. Other small creameries have consolidated.

The trend toward larger creameries has been encouraged by the fact that as volume goes up, cost per pound of butter produced goes down. In a recent University study, it cost 7.33 cents to produce a pound of butter in 6 butter plants with an annual average butter output of 165, 000 pounds. On the other hand, plants producing 2 to 3 million pounds of butter every year had average production costs of 2.7 to 3 cents per pound.

## DAIRY PLANTS, DAIRY FARMS BOOST VOLUME IN MINNESOTA

Dairy farms and dairy plants in Minnesota are switching to large volume business.

E. Fred Koller, agricultural economist at the University of Minnesota, points out that there are about 30 percent less Minnesota farms selling

## BEEF BREEDING HERDS AREN'T PROFITABLE IN MINNESOTA

milk or cream now than in 1939. During the same period, individual herds have been getting bigger and fewer, and total milk production has increased slightly.

Dairy plant trends tell a similar story. In 1935, there were 875 buttermaking plants in Minnesota, compared to 561 a year ago--a 30 percent reduction.

This change to larger volume, both on the farm and in the dairy plant, is the result of normal economic adjustments, Koller explains. It takes more capital than ever to pay for the cost of operating efficient, sanitary dairy farms and dairy plants, and the obvious way to make a profit on both is by increasing the size of the business.

There are 20 percent less dairy cows in Minnesota now than in 1944, but average milk output per cow has increased about 100 pounds every year. In 1955, the average Minnesota cow produced 6,380 pounds. Average milk output per farm has increased 35 percent. This increase is due to bigger herds, better breeding and better feeding and management.

At the same time, farmers are stepping up their equipment investments. Farmers who use bulk milk tanks instead of 10-gallon milk cans now produce 17 percent of the total volume of milk marketed in Minnesota. Milking parlors and pipeline milkers are finding their way to more farms. In order to reduce the cost per unit of these investments, farmers have found it necessary to increase their milk volume.

Milk is going to the plant in a different form than 20 years ago, too. From 1935-39, 85 percent of Minnesota's milk was sold as farm-separated cream. Today, only 30 percent is sold as cream and the rest is whole milk.

Koller says the proportion of whole milk sold in Minnesota may be even higher in a few years.

Better roads and improved trucks have helped speed the change to larger dairy plants. With more competition from larger plants, many small local operators were left without enough business to keep going. Some small creameries lost out when farmers shifted from selling separated cream to whole milk. Others couldn't afford to switch to handling whole milk, and some plants were forced to close because they couldn't afford to modernize and meet increased sanitary requirements.

As creameries became fewer, their average volume of business became greater. From 1935-55, average annual butterfat received per plant increased 50 percent.

In recent years, many creameries have changed from a butter-only business to producing dry milk, concentrated milk, cheese or fluid milk, in combination with butter-making. As more plants enlarge their volume of milk receipts, we can expect to see more large flexible dairy plants, Koller says.

Dry milk is becoming a big business by itself. Before 1939, Minnesota plants produced about 12 million pounds of nonfat dry-milk solids annually, compared to 270 million pounds now produced by about 70 plants.

Like other dairy businesses, fluid milk plants are getting bigger. There are about 270 fluid milk distributors in Minnesota now--less than half as many as 20 years ago. This is another trend that can be expected to continue.

A beef breeding herd is usually a poor money making proposition in Minnesota.

Ermond Hartmans and Hal Routhe, extension farm management specialists at the University of Minnesota, report that in a recent study, cows in beef breeding herds on southern Minnesota farms brought their owners an \$11.57 net loss per cow for the year.

In a beef breeding herd, the farmer usually has 25-30 cows and raises their calves to market weight, along with whatever other feeder calves he may buy.

Reasons for the poor showing by breeding herds are their high feed costs during winter. Hartmans and Routhe state that when a breeding herd does make money, feeder cattle would generally be even more profitable.

The 1955 calf crop in 15 southern Minnesota herds amounted to approximately 88 per 100 cows. The calves averaged 423 pounds, but the 88 percent crop meant that each cow averaged 374 pounds of calf for the year. If you figure 18 cents per pound, that's \$67.38 worth of calf per cow. But feed, building and equipment depreciation and miscellaneous items cost \$79.26 per cow for the year, meaning each cow lost \$11.57 for the year, or 30 cents loss for every hour spent on the herd by the farmer.

Hartmans and Routhe figure that, given the same amount of feed, feeder cattle would have produced a return above feed cost of \$1.20 per hour to the farmer.

They figured summer pasture costs at \$5 per acre in these comparisons. But even if the pasture cost nothing, there would still have been an annual loss of \$2.07 per cow. That shows that beef breeding herds don't pay even with permanent pasture.

These studies apply only to grade herds, Hartmans and Routhe add. With registered breeding herds, sales of animals for breeding stock could change the profit situation.

## BIGGER DAIRY HERDS REQUIRE LESS LABOR PER COW, SURVEY SHOWS

In some cases, Minnesota dairy farmers can make better use of their working time by keeping more milk cows, even without getting different dairy equipment.

That's one of the preliminary findings from a recent survey of farms in Minnesota Farm Management associations, according to H. J. Aune and L. M. Day, agricultural economists at the University of Minnesota.

Aune and Day found that farmers who had 10-cow herds and used two single units spent 5.03 hours per cow per month for milking. With the same number of milker units but in 20-cow herds, the average time was 4.3 hours per cow monthly.

For 20-cow and 40-cow herds, the time per month for milking was 4.09 and 3.96 hours respectively. Milking time was studied during the summer.

These labor savings due to larger herd size aren't always possible, Aune and Day add. If the herd is large to begin with, increasing the size might not mean much of a labor saving.

The study also shows that certain changes in dairy equipment can mean a labor saving. For example, farmers who had 30-cow herds and used mechanical gutter cleaners spent 3.97 per week cleaning the gutters. That was 2.65 hours per week less than for farmers who had the same size herd but used litter carriers. This information was collected in April when dairy cows were kept in the barn.

There is much more involved in increasing herd size and changing equipment than saving labor, the economists say. For example, additional equipment needed for grade A milk production can't be justified in many small herds. Also, saving labor may be of little help unless there's some other way to put the labor to use.

On the other hand, labor available during planting and harvesting time often limits the size of the farm business. Any possible saving in labor during these seasons may result in a good increase in earnings because of a greater possible volume of business.

#### FARM SIZE BIG FACTOR IN FARM EARNINGS

Farm size is the biggest single reason why some Minnesota farms make more money than others.

S. A. Engene and P. H. Hoepner, agricultural economists at the University of Minnesota, base that statement on a 1945-54 study of earnings on 149 farms in southern Minnesota.

Average figures for these farms show that during the 10-year period, every extra acre of cropland gave an \$18 annual increase in labor earnings.

Earnings varied greatly from one farm to another, the economists report. In 9 of the 10 years studied, eight or more farmers earned at least \$6,000 more than the average of the group for the particular year, while in 8 of the 10 years, earnings of at least five farmers fell \$6,000 or more below the average.

The study showed that the differences in income between farms were fairly consistent. Year after year, eight of the farmers had better than average incomes and another five were better than average in nine years.

On the other hand, 14 farmers didn't earn as much as the average in any year and another 12 were below average in only one year.

In addition to farm size, other factors causing differences in earnings were differences in kinds of crops grown, crop yields, kinds of livestock, livestock efficiency, labor efficiency and control of expenses.

Prices for different farm products can vary greatly, too. If hog prices go up and dairy prices go down, for example, average earnings may change very little, although hog farmers will gain and dairy farmers lose.

While some of the differences in farm earning are beyond the farmer's control, much of the variation is due to things which depend on the farmer's managing ability, the economists add.

#### INCREASED PRESSURE NOTED FOR DAIRY MARKETING EFFICIENCY

Minnesota's dairy plants are under greater pressure than ever to step up their volume for more efficiency.

E. Fred Koller, University of Minnesota agricultural economist, says increased costs of processing, handling and marketing milk are bringing about these major developments:

1. Increased volume per plant. Many plants are buying from smaller creameries in the same area. This makes the small plant a receiving station and often increases profits for both the large and the small plants. There have also been many dairy plant mergers--about 200 per year in the nation since 1940, and the pace of mergers has quickened since 1948.

2. Increased concern for market development and promotion for new products, such as low-fat milk products, cottage cheese, ice milk and others. A dairy organization in Chicago, for example, is carrying on intense experimentation with fresh concentrated milk.

3. A general "tightening-up" of business operations to increase efficiency and reduce plant costs. Many plants are putting in larger equipment to reduce per-unit costs. They are also getting more labor-saving devices, such as "cleaned-in-place" equipment that can be thoroughly cleaned without being dismantled. Automation in general is becoming more common.

Koller says these developments are a result of an outlook for continued surpluses and narrow profit margins in the dairy industry. Increased efficiency by dairy farmers is resulting in increased total milk production that is outstripping population gains. Milk production in 1957 is estimated to run about 5 billion pounds ahead of consumption for the U. S. There is a 4 percent total milk surplus in the nation, similar to recent years.

Fluid milk consumption per person has remained stable in recent years. Increased bottle milk consumption, Koller says, has been offset by a drop in consumption of evaporated milk and cream of all kinds.

#### BULK HANDLING HAS IMPORTANT EFFECT ON MILK PLANTS

Bulk milk handling will make a heavy impact on the whole milk marketing system in Minnesota, says E. Fred Koller, agricultural economist at the University of Minnesota.

For one thing, bulk handling may cause many local milk receiving stations and small creameries to close. That is because plants with bulk equipment can increase plant volume, widen their supply area, and with good roads, haul milk over long distances with less bother and expense than they would have by operating through receiving stations. Small plants would be by-passed the same way.

There are now at least 5,500 Minnesota dairy farmers selling milk in bulk--twice as many as a year ago. Most of the increase so far has been in

## ECONOMISTS DISCUSS FARM SIZE

the Twin Cities area, and most of the fluid milk areas where grade A milk is bottled are rapidly approaching 100 percent conversion.

In the long run, bulk milk handling brings only a small extra return to the dairy farmer as far as higher price is concerned. In some fluid milk areas, plants have been paying small premiums due to bulk handling. But where farmers sell milk in bulk for manufacturing, the improvement in the final product isn't enough to bring an added return over can handling.

For the larger dairy farm, there may be a net saving in production costs due to bulk handling, Koller points out. But for a herd of 15 cows or less, the farm cost per hundred-weight for cooling and holding milk in bulk is generally a little higher than with cans.

Hauling costs will be lower in areas where there is complete conversion to bulk handling, and if the plants pick up milk every other day. Again, this saving is greater for the larger producer. While an area is converting to bulk milk handling, though, all hauling costs may be higher, due to overlapping of can and bulk routes.

Dairy plants can reduce their receiving costs if they make complete conversion to bulk handling, if there are enough producers selling to each plant.

### CHORE PLANNING SAVES TIME, LABOR FOR FARMER

IVANHOE, MINN. -- One hour daily is all the time needed to care for a 50-steer beef herd on a farm here in Lincoln county.

Don Sandager keeps his chore time to a minimum through careful planning and with the help of a few simple work-saving devices.

The central feature of his beef-feeding system is an overhead track that he uses to move feed and silage out to the feeding bunker in the dry lot.

"The feed cart" Sandager explains, "is a manure carrier track and a suspended feed and silage cart. This setup makes it possible to feed the steers in only a third as much time as it used to take to carry the feed and silage out to the bunkers in baskets."

The carrier track extends from the silo room out into the feeding lot and over the full length of the feeding bunker.

The carrier track and feeding bunker cost a total of only \$250.

Sandager simplified the bedding problem for the beef steers this way: "First, I used chopped flax straw bedding. It seems to be more absorbent than oat straw, meaning you don't have to add bedding as often."

"Second, I store it in the loft directly over the steers' loafing area, and have several openings in different places in the hayloft floor." That way, Sandager is able to drop a little bedding through each opening and there isn't as much work required to spread the bedding around.

Getting hay out to the lot is short work, too. Sandager simply keeps a covered chopper wagon full of bales parked next to the lot. Then every day he throws a few bales into the bunkers and that job is done.

By allowing the bedding to build up, Sandager needs to clean out the feed lot and loafing area only once a year. That's made easier by a paved area around the feeding bunkers.

How big should a farm be in Minnesota?

There's no one size that's best, say S. A. Engene and T. R. Nodland, agricultural economists at the University of Minnesota.

But as a general rule, the economists add, the farm should be big enough so that the farmer takes in about three times as much in total sales as the family needs for personal and living expenses.

Engene and Nodland base this conclusion on a summary of thousands of records kept by Minnesota farmers in recent years.

A survey made by the Farmers Union Grain Terminal association, the economists report, showed that in 1950-54, about two-thirds of each farmer's income was used for farm expenses.

Average figures for returns per acre for 1954 show that, in general, it's hard to get a gross income of \$6,000--or a net income of \$2,000--annually on less than 100 acres of cropland. This is apt to hold true in the near future, too, say the economists.

Most Minnesota farms averaging between 50 and 99 acres of cropland had less than \$5,000 total income in 1954. As number of crop acres went up, so did gross income.

In a study of members of a farm management association from 1945-54, the economists found that farmers produced as much gross income on 100 acres as other farmers did on 145 acres, but it took an extra 25 percent of labor to do it on the small farms. That means income per man was higher on large farms.

Engene and Nodland say that according to these trends, it is likely that farmers with 100 acres or less of cropland will continue to move away. Some, though, may find other employment nearby so they can continue to use their farm on a part-time basis or merely as a place to live.

### COMMISSION FIRMS AID FARMER, ECONOMISTS SAY

Ways that livestock commission firms drum up business are a big help to Minnesota farmers, according to K. E. Egertson and D. F. Fienup, agricultural economists at the University of Minnesota.

They say that by "soliciting"--contacting the farmer before he sells his livestock--firms often give the farmer a good appraisal of the grade and finish of his livestock and give him important information on current market trends. This helps the farmer decide where and when to market his livestock for best returns.

Egertson and Fienup base their conclusions on an August, 1956 survey of patterns of solicitation used by Minnesota terminal livestock firms.

All 27 commission firms in South St. Paul used some on-the-farm solicitation in 1956. Other forms of soliciting included letters, telephoning, newsletters, farm meetings, soliciting through truckers and meeting farmers at markets.

Sixty-three percent of the firms contacted up to 10 percent of their patrons through personal solicitation, and the rest contacted 11-40 percent of their patrons by this means. Also, 63 percent used newsletters and all firms used personal letters and phone calls to some extent.

Seven commission firms had full-time solicitors and salesmen in the country 2-3 days during the week surveyed. Saturday was the most important day for soliciting business; 75 percent of the firms had solicitors out on that day.

Soliciting varies according to type of livestock. Another 1956 survey by the University agricultural economists showed that of farmers who sold cattle, 15 percent had been visited by commission workers.

On the other hand, only 5 percent of the farmers who sold hogs stated that commission men had visited them. An interesting additional fact was that 26 percent of the farmers who had not been contacted said they would like to be visited by terminal market men, when they have livestock to sell.

#### MORE INCENTIVES NEEDED TO PROMOTE MEAT-TYPE HOGS

The hog business may be undergoing a "slimming down" process, but it won't be complete unless farmers have more incentives to produce meat-type hogs.

D. F. Fienup and K. E. Egertson, agricultural economists at the University of Minnesota, point out that at present only 25 percent of the hogs produced in the U. S. are meat-type, even though consumers are steadily demanding leaner pork.

So far, there has been little incentive for the farmer to change his practices to meet the new demand. Most hogs are still bought at markets on a so-called "straight run" basis--one price per pound for the entire lot.

Two improved hog-buying methods, now used to some extent, would help farmers and consumers alike if they were more widely adopted, the economists say.

One way is the live weight and grade system, which means putting actual weight grades on live hogs. Under this system, hogs would be sorted into grades, such as No. 1 premium hogs; No. 2 average hogs, but still desirable; No. 3 over-finished and generally undesirable and medium or underfinished hogs.

Under live weight and grade, then the farmer would be paid according to grade of each hog and not on weight alone. It would give him more incentive to produce meat-type hogs, would better let him know what the market wants and would reward the good producer and penalize the poor one.

A second method that has some definite advantages is the carcass grade and yield system. It calls for pricing hogs according to carcass grade and yield. The farmer gets his check after the hogs have been slaughtered.

The price finally paid the farmer, with this method, is stated in terms of the live weight of the hogs he sold. That way, he can compare the price he received through the carcass grade and yield system with what he would have been paid by selling on a straight-run system or on a live grade basis.

One major Minnesota packing company is now buying on the carcass grade and yield system and several firms are buying on live weight and grade.

#### LAND CONTRACT GAINS POPULARITY

The "land contract" method of buying farm land is gaining popularity in Minnesota, according to H. W. Baumgartner and Philip M. Raup, agricultural economists at the University of Minnesota.

They point out that 37 percent of the sales reported by Minnesota farm real estate brokers during the first six months of 1957 were financed by land contracts, also called "contracts for deed."

Twelve years ago, only 20 percent of all farm sales were financed by land contracts.

With a land contract, unlike a mortgage, the title to the land remains with the seller until final contract payments have been made. The buyer purchases the land on the "installment" plan; he makes a down payment, usually with the balance plus interest to be paid in stated installments over a set period of years.

In a 1956 study of 205 persons buying land on contract for deed, the respondents reported that down payment requirements under this plan were low--about 20 percent. Annual payments on the principal averaged 4 percent.

The buyers most frequently mentioned these ways to safeguard a contract purchase: Make as large a down payment as possible, preferably a third or more; have small annual payments over a long period of time (20 to 35 years), and set up prepayment privileges that permit the buyer to make payments in advance of the repayment schedule in a good year.

Baumgartner and Raup add that it's also advisable from the buyer's standpoint to have a sliding scale of repayment that allows him to pay more in good years and reduce the payment in poor years. Also, there could well be a provision permitting the buyer to convert the contract into a mortgage after he has raised his equity to approximately half the purchase price.

A land contract lets a buyer get started with a relatively small initial outlay and, if drawn properly, can give him sufficient security to start farming as an "owner." That can aid in getting production loans and operating capital. Also, buying on contract is often better than renting, especially in a period of rising farm prices.

The land contract has advantages for the seller, too. It allows him to keep an investment in a business in which he is familiar, and the contract payments may be geared to his income needs. Also, a seller who receives a down payment of 30 percent or less may spread any capital gains from the sale over the years specified in the contract. If he has little or no other income, he may be able to claim this capital gain as tax-exempt income. In this way the sale of the farm can provide a form of retirement income for the seller.

#### CHANGE FROM DAIRY TO SPECIALIZED POULTRY IMPROVES FARMER'S BUSINESS

CANBY, MINN. --Sometimes the best way to expand the farm business is to make a total change

--even if it means selling off all the cows and keeping chickens in their place.

That's what Millard Hayek, who farms 180 acres near here, has found to be true in his case.

Last fall he sold his 10-cow dairy herd, remodeled the barn to hold a 4,000 hen laying flock, and installed all the labor-saving equipment needed to handle such a business.

This remodeling cost hardly more than half of what it would have cost to remodel for a larger dairy herd. Yet, prospects for the near future are for a gross income three times as high as the Hayeks had before making the change and still higher than would have been the case with an expanded dairy operation.

It all started two years ago when Millard and his wife were taking part in a series of Farm and Home Development meetings being conducted by David S. Johnson, Yellow Medicine county agent.

The Hayeks had room for 11 cows in the 32x 48-foot barn, but there was enough land on the farm to support more good milkers. They also fed about 100 hogs each year and kept a 200-hen poultry flock.

Millard and Mrs. Hayek took their problem up at the Farm and Home Development meetings with Johnson and Ermond Hartmans, a farm management specialist from the University of Minnesota. The Hayek's question was: "Can we remodel the barn, put in more cows, and make the change pay?"

By using "the farm possibility" technique, a method for evaluating change in a farm business, Hartmans and Johnson concluded that remodeling the dairy barn on this particular farm would cost almost twice as much as converting the barn so it would handle a 4,000 hen flock. And at best, twenty-two cows were all the barn would hold when remodeled. Yet, with good production and high egg quality, Hayek could do a much bigger business volume with the birds and expect a higher net income than would be the case with twenty-two milk cows. Also, he would not need to hire any extra labor.

"This kind of change wouldn't be advisable on every farm," Hartmans pointed out, "but fields on this farm are level and it's all right here to eliminate stand-over legumes. Farms with stand-over legumes in the rotation, though, generally would need some type of livestock to consume this forage. After all, every farm has its own particular problems and every farm family should try to arrive at the best program for its own situation and circumstances."

Hayek last fall sold the cows, removed all the stanchions from the ground floor of the barn, and put in a third floor above the old mow floor. This floor he equipped for brooder units and for storing feed. He put in chutes to carry the feed down to automatic feeders on the two lower floors.

On both lower floors, there are roost pits, automatic feeders and waterers and individual nests with "egg roll back" floors, tilted so that

eggs slowly roll out into a trough. In a room off the corner of the barn floor, Hayek put in an egg cooler that maintains a steady 55-60 degree temperature and controls the humidity. The same room has an egg cleaning machine and a "buffer" for the few eggs that get especially dirty.

Right now, there are about 2,700 layers on the Hayek farm--2,000 pullets and 700 older hens. At present, the pullets are averaging above 80 percent egg production and the hens are laying at a 60 percent rate.

By next year, Hayek plans to have up to 4,000 hens on the two floors.

#### LACK OF WILL OFTEN RESULTS IN FARM "BREAKING UP"

Fewer Minnesota farms would be broken up by estate settlements if more farm owners had legal wills.

That's one conclusion reached by Philip M. Raup and G. A. Jawando, University of Minnesota agricultural economists, after a study of 304 estates resulting from farm land owner deaths.

Because there were no wills, Raup and Jawando report, rural lands in 41 percent of the estates of active farmers were split up, compared to only 28 percent of the estates held by nonfarmers, who had wills in a larger percent of the cases studied.

However, there are also other causes of ownership subdivision. Many owners who made wills intentionally provided for a physical break-up of their farm lands. On the other hand, many farms continued intact after settlement regardless of whether a will had been made, even with divided ownership.

Average value of all these estates was \$28,000 each. Sixty-five of the estates were valued at less than \$15,000 while only 32 were worth more than \$60,000. Amount of state inheritance tax paid on these estates varied from .75 percent to 1.5 percent of the total value of the estate. In none of the 304 estates did the inheritance tax exceed 2 percent.

Of all estates of active farmers in the study, 76 percent had been held in "fee simple" ownership. That means the deceased person held exclusive title to the land. Sixty-eight percent of the retired farmers had fee simple ownership and 78 percent of the non-farmers fell in that category. Most of the estates not held in fee simple were in "joint tenancy," which means co-ownership, with the wife usually holding the right of survivorship.

Cash assets--mostly bank deposits--of the estates averaged about 13 percent of total estate value, while stocks and bonds averaged less than 10 percent. Life insurance was less than 2 percent of the average value of these estates, with only 77 of the 304 estates reporting any life insurance at all.

# Agricultural Engineering . . .

## UNIFORM PACKING IMPORTANT FOR HORIZONTAL SILO

Horizontal "bunker" silos can provide cheap storage space for silage. However, silage needs to be uniformly packed at filling time to keep well in one of these above-ground structures.

In tests at the University of Minnesota's North Central Experiment Station, Grand Rapids, research workers found in 1955 that silage spoiled along the walls when the silage wasn't well packed in that area.

In the summer of 1956 workers at the Grand Rapids station packed the silage along the walls as well as all the rest and covered with 6 inches of sawdust. By winter there was no spoilage except for about an inch under the sawdust on top.

Horizontal silos also need good drainage. In one silo at the Grand Rapids station, the concrete slab floor has a 2-inch crown in the center. Thus the liquid can drain to the sides and out. The side walls are raised 1 inch off the floor to insure side drainage.

University research workers are testing two horizontal silos at Grand Rapids. Both are 62' x 16', with 6' walls. One silo has posts set in concrete and spaced every 4 feet; the other has posts outside concrete slabs.

## INFRARED LAMPS HAVE MANY USES

Infrared heat lamps can help many newly-born farm animals get a good start in life.

Even in cold buildings, a heat lamp can make a nice, warm "comfort zone," if used correctly. And heat lamps are handy for other uses, too.

D. W. Bates and V. M. Meyers, agricultural engineers at the University of Minnesota, point out that, heat lamps come in three sizes--125, 150 and 250 watts. They are made either from standard glass or from hard pyrex glass.

For brooding pigs, Bates and Meyer recommend a 250-watt lamp, supported 36 inches above the floor. That will keep newborn pigs from chilling at temperatures as low as 30 degrees. If the temperature is lower, use two lamps.

After farrowing, it's wise to move the heat lamps to a protected corner and put up a barrier to keep out the sow.

For day-old chicks, suspend the lamp about 18 inches above the litter. Heat lamps can be used singly for small broodings or in multiple mountings for larger number of chicks. The mounts sometimes have automatic thermostats.

If the average brooder house temperature is no colder than 50 degrees, one 250-watt lamp is enough for 80 chicks. Add one chick for every degree over 50 and subtract one chick for every degree under 50. If the average house temperature is 35 degrees, one lamp will take care of 65 chicks.

## DRAINAGE RESEARCH SIMPLIFIES SYSTEM

A recent finding at the University of Minnesota should help simplify field drainage with tile systems.

P. W. Manson, University agricultural engineer, has found that it isn't necessary to connect lateral drain lines to the main drain pipe at a 45-degree angle. Instead, the lateral can be connected at a right angle (90 degrees) without interrupting the water flow.

Using the right angle junction eliminates some problems and can actually reduce the cost of installing a tile drain field.

In the past, lateral lines in drainage systems have been connected to the main pipes at 30-or 45 degree angles. This was always thought necessary to insure rapid drainage. But making a 45-degree junction meant the lateral lines had to be curved to make that angle. Tile lines are made up of short individual sections of tile, designed to be installed with a small gap between each section.

By curving the lateral line to enter the main, the tile sections have wider gaps on the outside than on the inside. The gaps on the side open widest need to be filled in some way or the tile needs to be trimmed on one side to prevent the line from filling with soil. Filling these gaps or making the trim makes installation more complicated and expensive.

In repeated tests at the University hydraulic research laboratory, Manson and U. S. Department of Agriculture research workers found it is possible to put the lateral junctions in at 90 degree angles and get just as good drainage as with the 45-degree junction.

## QUALITY TEST FOR TILE DEVELOPED

A new quality test for concrete drain tile has been developed by agricultural engineers at the University of Minnesota.

It's called a "hydrostatic pressure test," and its measures the permeability--flow of water through the sides--of concrete tile. The test was developed by P. W. Manson, agricultural engineer, and D. G. Miller, consulting engineer at the University.

To conduct the test, engineers seal the ends of a section of tile and force water into the tile at 20 p. s. i. (pounds per square inch). Top quality tile won't show any leakage after 5 minutes, but a poor tile may leak 40 quarts in that time.

This test is designed particularly for tile that will be installed either in acid soils--with a pH of 6 or less, as determined by soil test--or for alkali soils that contain 0.2 percent or more of sodium sulfate or magnesium sulfate.

In the past, there have been two main quality tests used for concrete tile--a "strength" test, and

a "five-hour absorption" test. But these methods aren't always dependable, especially where acid and alkali soils are concerned.

The new test would be conducted by the University and other official testing agencies. From the results, drain tile manufacturers would be able to produce a better product. For example, manufacturers can increase the life of concrete tile--at no extra cost to the buyer--5 times or more, simply by increasing the density of the concrete. For alkali soils the life of concrete tile can be increased by 10 or more times by using sulfate-resistant cement and increasing the density. Again, this improved quality wouldn't add any cost to the tile.

### COOPERATION CAN SOLVE DRAINAGE PROBLEMS

Neighborhood teamwork often spells the best answer to poor land drainage on Minnesota farms.

Where wet areas cross property lines, one farmer alone can't do much drainage, says Curtis Larson, University of Minnesota agricultural engineer. But by cooperating, landowners can work out a system that benefits everyone.

Half of Minnesota's farm land needs draining for good production. While farmers in the state install \$12 million worth of tile annually, there's still a lot more drainage to be done. Larson lists three cooperative ways to do it: informal agreements, mutual drainage systems, and legal ditches.

Informal agreements can be used where just two neighbors are involved. The owners make cost estimates, then divide the cost. To protect his investment in a drainage system, the man who owns the upper land should, with the aid of a lawyer, get an easement from the man who owns the lower land. Then the drainage system will always be open, regardless of who owns the lower farm later on.

Mutual drainage systems are better when there are more than two owners involved but no more than eight. Each landowner must agree to all phases of the project, including his share of the cost. The participating owners select an engineer who surveys the area, proposes a drainage system, and estimates the cost. The group then divides the cost and, with the help of an attorney, makes a final agreement for the project, in writing.

Legal ditches are provided for by the Minnesota Drainage Code. A majority of landowners of an affected area can file a petition for a legal ditch. If all the affected land is in one county, the system would be established by the County Board of Commissioners. If it's in two or more counties, the project comes under the District Court. Either way, the procedure involves appointing an engineer, making a survey, holding hearings and letting a contract. Such a process normally takes about two years. An advantage of the legal ditch is that it provides for drainage system on a larger area, even though a minority of landowners in the area may object to it.

### PICKER-SHELLER WORKS OUT WELL

A picker-sheller and a mechanical drier can reduce harvesting losses in the fall corn crop, according to John Strait, R. V. Keppel and V. M. Meyer, agricultural engineers at the University of Minnesota.

In tests conducted at the University's Rosemount Agricultural Experiment station, they found that by using both devices, it was possible to harvest the corn crop earlier, resulting in less corn loss.

Based on these tests, they say farmers using this equipment can start harvesting corn when the kernel moisture of the standing corn has reached 26 percent. Then sheller losses won't exceed 2 percent and kernel damage should be low enough for corn to grade No. 2.

For feed grain, you can start harvesting at about 28 percent moisture content.

The engineers found that the picker-sheller could be adjusted so that cracked corn and foreign material were low enough to meet grade requirements for No. 1 corn.

Most of the loss that did occur in the University tests was made up of gathering and snapping roll losses--which would have been just as great with a conventional corn picker.

In general, the higher the moisture content of the kernels at harvesting time, the lower the total harvesting loss, the engineers found. Total loss was more than 4 percent on 30 percent kernel moisture corn and about 7 percent at 26 percent moisture later on in the season.

### IRRIGATION CAN BE GOOD "CROP INSURANCE"

ELK RIVER, MINN. -- Twenty farmers here in central Minnesota have found that on light soil, sprinkler irrigation is good "dry weather" insurance for some crops.

If there's a long period in summer without rain, these farmers simply turn on the water in their fields. Many report that in recent years, irrigating has made the difference between a good corn yield and no crop at all.

Most of these area farmers who irrigate are members of the Irrigating Farmers' association of Minnesota. This group was formed in 1952 with the help of M. Lee Gustafson, then engineer with a local irrigation equipment firm, Sherburne County Agent E. E. Bjuke, and E. R. Allred, an agricultural engineer at the University of Minnesota.

The association was formed to help members get up-to-date information on irrigating methods and on water rights in Minnesota.

Results of irrigating are told by two Sherburne county farmers--Irvin Moldenhauer, Elk River, and Sherwood Anderson, Becker - active members of the association and hybrid seed corn producers.

In summer, 1955--a particularly dry season--Moldenhauer's seed corn fields averaged 75 bushels per acre where he irrigated once in late July. A field that wasn't irrigated yielded only 35 bushels per acre.

Moldenhauer bought his irrigation equipment

in 1952. His setup includes a portable power unit, rotary pump, and an overhead, low-pressure sprinkler system.

He pumps water from the Mississippi river, which borders his 90-acre farm. It normally takes about 2 hours to sprinkle 2 inches of water on a 2-acre area with his equipment.

Anderson says irrigating protects his investment in fertilizer. Without plenty of moisture, he points out, you don't get the full benefit from fertilizer. He usually applies 200 pounds of 0-0-60 fertilizer to corn ground before planting time, then puts on another 200 pounds of a complete fertilizer with the planter.

Irrigating helps legumes, too, Anderson says. "In several recent years, I've harvested good hay crops from sandy loam fields that wouldn't have been worth cutting if not watered."

"Second crop alfalfa that isn't irrigated will often 'stand still' during hot, dry weather. But if we irrigate at the right time, it grows nicely in late summer," Anderson says.

Anderson says that, "Some years, we need little or no irrigation. At other times, we need to keep the pump going a good share of the time. In 1956, there was more rainfall than the year before, but I still irrigated in the second week of July and again in Mid-August, and it paid off."

He has 120 acres of cropland on his 320-acre farm, and he considers his irrigation unit one of his most important farm investments. "With irrigation, my fields produce as well as some land that costs up to four times as much per acre," he says.

Engineers and extension farm management specialists at the University say that, in general, three things are necessary to make irrigating profitable in Minnesota:

1. A good potential yield increase due to irrigation. In general, returns from irrigation are greater in Minnesota on light, sandy soils that otherwise don't hold enough moisture.

2. Incorporation of an irrigation system into intensive farming. It takes more labor and a lot of fertilizer, applied according to soil tests, to make irrigating profitable.

3. A good, economical water supply, usually a nearby river or lake.

#### ELECTRICITY AIDS DAIRY FARMERS

RED WING -- Electrical power can be more than an "extra hand" around a farm. When put to the right uses, it also helps the farmer produce better quality milk and aids his profits from other farm enterprises.

Two Goodhue county farmers--Felix Mahoney, Red Wing and Rudy Mohr, Pine Island--will testify to the truth of that statement. Both of them have put electricity to work in a number of ways and say now they wouldn't be without a single one of their electrical "helpers."

Mahoney says that he found more electrical equipment necessary to solve the manpower problem. His brother had been working for him until he went into service a few years ago. So at that time, Mahoney installed a pipeline milking unit,

barn cleaner, bulk tank and electric cow trainers. Some of the equipment was furnished by a local equipment dealer, so that Mahoney's farm could be used as a demonstration farm for electricity.

"With that equipment, my family and I can now handle 30 cows with the time and effort that was needed before to take care of 20," Mahoney says. And when necessary, Mrs. Mahoney and the children can do all the dairy barn chores except the actual milking, thanks to the automatic barn cleaner and other electrical aids.

Cleaning the dairy utensils is no longer a prolonged task on the Mahoney farm. The "cleaned-in-place" pipeline is cleaned automatically after each milking. That is also a sanitation aid and helps make it possible for the Mahoneys to market their milk on a grade A market.

Rudy Mohr says that electrical equipment has ended the heavy "back work" in farm chores. He now has a silo unloader, pipeline milker and bulk milk tank, water heater, barn cleaner, electric hay hoist, and an automatic electric feeder in the poultry house.

This dairy equipment makes it possible to milk all of his 73 milk cows in about an hour. And unlike a few years ago when he didn't have all this equipment, Mohr says milking no longer keeps two men tied up. "Now the hired man can easily do the milking while I'm doing other chores," he says.

Mohr points to a number of ways in which electricity has reduced the back work around his farm. "With the pipeline milker, there's no can or pail lifting, no milker pails to move from cow to cow. The barn cleaner eliminates another hard task."

"The silage unloader means we no longer need to climb into the silo where the unloader is installed. That is a safety and time-saving advantage. Second, the unloader takes out frozen silage as easy as when it's not frozen."

An electric hay hoist in the barn mow helps simplify haying on the Mohr farm. Normally, with a hay fork, someone needs to be operating a tractor that pulls the hay fork up into the mow from the wagon. But Mohr has an electrically-operated winch that can be operated easily by the same person who "sets" the fork into the hay on the wagon.

Taking care of an 800-hen laying flock is no difficult task for Mohr, thanks to an electric, automatic feeder setup. In addition, this type of feeder helps prevent diseases and keep the birds in good health. Mohr explains that there is never any old feed in the bottom of the automatic feeder, as there always used to be with open, hand-filled feeding troughs.

The automatic feeder operates on the "shuttle" principle. There are two feeding troughs. When either one has all the feed cleaned up at the far end, an automatic switch engages and the feeder starts running. Feed comes from a hopper in the feed room. As the feeding troughs vibrate back and forth all the feed moves along the trough and none is allowed to gather in one place.

The birds tend to eat near the feed hopper end of the trough first and don't eat from the end where the switch engages until the rest of the trough is cleaned up, Mohr says. That way, no old feed is ever left in the trough.

Mahoney and Mohr are both long-time cooperators with Goodhue County Agent G. J. Kunau.

## HAY DRYERS REDUCE FEED COSTS FOR FARMERS

GAYLORD -- Mechanical hay dryers are trimming the feed budget and taking the guess work out of haymaking on three Sibley county dairy farms.

August Asmus, William Russell and Winifred Glaeser say that by having drying units in their hay mows, they find it unnecessary to buy protein supplement for the dairy cows. All three have been using dryers for 5 years or more.

By using a dryer, these farmers save more of the hay leaves and keep the hay at higher quality--high enough so that cows need only silage and ground corn and oats to balance out the ration. They also point out that hay dryers are good insurance against poor drying weather.

All three farmers use the same type drying unit--one recommended by University of Minnesota agricultural engineers and Duane Wilson, Sibley county agent. Wilson helped design the unit on the Glaeser farm.

Each drying unit includes a 5-horsepower electric motor, a 42-inch fan, and an A-shaped wind duct, about 6 feet high, 6 feet wide, pointed at the top and slatted along the sides so the air can blow out into the hay. The fan is at one end of the duct.

With a hay dryer, the hay can be hauled into the barn when it's still "tough," containing about 35-40 percent moisture. Then the leaves won't shatter and the valuable protein in the leaves is saved for the cows to eat. The dryer then reduces the moisture content until it's safe for storage.

How does a farmer put up hay with this system? Asmus says, "We cut the hay in the morning, rake it into windrows, then let the hay wilt until the following morning. We start chopping between 7 and 8 a. m., when the dew is still on the hay. If you wait until afternoon when the hay is dry, the leaves will shatter and you're no better off than if you had put it up without a dryer."

Asmus says with second or third-crop alfalfa, it's often possible to cut the hay in the morning and haul it in during the afternoon.

You can't fill the whole barn at once with moist hay and get it dry, though, Asmus points out. "We usually put in 5-6 acres daily for a few days, then slow down until that's dried. It takes a week or more of running the fan continually to dry one 6-foot layer of hay."

After you've finished drying the hay, it's important to check for damp spots that may heat later on, Asmus adds. He starts the fan, then walks over the top of the hay. If any of the air coming through the hay is warm, it means there's an area that is heating and it's necessary to run the fan until it's dry. He checks his hay several times this way.

Asmus sees several advantages in chopping and drying hay, compared to baling. "The chopped and dried hay is higher in quality and the cows like it better. In fact, the cows eat the dried hay so well that we hardly ever need to clean out the manure."

Asmus and the other two farmers say electricity for drying costs about 75-80 cents per ton of hay. Chopping and drying together cost no more than baling the same amount of hay, Asmus claims.

## TEST HEAT PUMP FOR GRAIN DRYING

Farmers may some day dry their crops for storage with a device that works on the same principle as a home refrigerator.

Called a "heat pump," the device is under test at the University of Minnesota, according to Arnold Flikke, agricultural engineer.

A heat pump is made up of a refrigeration compressor, an evaporator, a condenser, an expansion valve, and a motor to drive the compressor. In effect, Flikke explains, the heat pump takes heat from the grain bin and uses this same heat to warm the drying air that's blown into the bin.

Any crop can be dried quicker with heated air than with air that is unheated. But with conventional drying units, the drying air needs to be heated with a burner.

With a heat pump, no extra heat is required. The drying cycle works this way: Air moved by the fan passes through the grain bin and picks up moisture from the grain. Air then passes to the evaporator coil where it loses much of its heat and water content, then is brought around to the compressor and condenser, is warmed, and passes back into the grain bin again.

Heat pumps are most efficient where there are large amounts of grain to be dried.

## HAY CRUSHERS REDUCE DRYING TIME, SAVE HAY LEAVES

FARIBAULT -- Crushing the hay as soon as it's mowed can cut the field drying time in half and put better quality forage in the hay mow, a group of Rice county farmers have learned.

These farmers are using hay crushers--devices that are pulled by a tractor, operated by power takeoff.

The crusher cracks the stem so that moisture can evaporate quickly. That way, the stems dry as fast as the leaves--which contain much of the hay feed value--and the hay can be put up with less loss of leaves.

Rice County Agent Warren Liebenstein reports that crushers are gaining popularity in this area.

John Olson, owner of a 170-acre dairy farm here, says that crushing means he can cut his legume hay late in the morning and start baling it by noon of the next day. "That's only half the time it would take to get the hay dry without crushing it."

Like most other local farmers who have crushers, Olson has a model that has corrugated rollers. This device actually "crimps" the hay. There are also crushers with flat, smooth rollers.

It's important to crush the hay as soon as it's cut, Olson emphasizes. "We have a second tractor pulling the crusher, just one swath behind the mower. If you wait until the hay is wilted, the crusher won't work well."

Olson has had his crusher since he started haymaking this year. Every time he cuts, he leaves a small patch of hay in the middle of the field uncrushed, just to check the difference. "Every time, the bales from the center are too

wet to be put in the barn the same time as the rest," he says.

Olson has a small amount of sweetclover--a coarse, heavy-stemmed legume--on his farm and finds that the crusher is especially helpful with this crop. "Ordinarily it takes several days to get this hay dry. But by crushing it, we found it dried almost as fast as the alfalfa."

Martin Hachfeld, farmer and certified seed producer, tried using a hay crusher on six acres of hay this year and feels that, based on the results, the machine would be a good investment.

"It would probably be even better to use the crusher along with a dryer in the hay mow. That would just about make it possible to cut the hay and haul it into the barn the same day," Hachfeld believes.

Saving the leaves was a big advantage of a hay crusher for Lowell Albers, another dairy farmer near here. "Crushing the hay makes the stems dry as fast as the leaves. Without a crusher, by the time the stems are dry enough to put the hay in the barn, the leaves are so dry they shatter off when the hay is put up."

Albers chops his hay, and says it's possible that crushing the hay even makes for better distribution in the barn. "Hay that was crushed dries so evenly that all particles are about the same weight after it's chopped," he explains. "Then the hay blower distributes more evenly. Otherwise, the stems would be heavier than the leaves and the lighter particles always blow farther."

His crusher was a particularly big help this year when there was a lot of rain during the haying season, Albers adds. Like Olson and Hachfeld, he found that crushing the hay cut field-curing time in two. "With less time needed for field drying, we can make much better use of the sunshine that we do get."

Olson, Hachfeld and Albers all use crushers that are independent of the mower. Some models include both a mower and crushing unit, and other crushers are made to hitch on to the same tractor that pulls the mower.

#### METHOD DEVELOPED TO PUT FERTILIZER IN IRRIGATION WATER

A simple, inexpensive way to mix fertilizer solutions with irrigation water has been developed at the University of Minnesota.

Called the "closed tank method," this system is helpful where irrigation water comes from deep wells or where the farmer doesn't want to run fertilizer through the irrigating pump. It was developed by E. R. Allred and J. H. Pomroy, University agricultural engineers.

Past research has shown that liquid or water-soluble fertilizer--particularly nitrogen-containing solutions--can be applied to plants in the irrigation water. But getting the fertilizer into the

water is often a problem, engineers have found.

If the irrigation pump is above ground there's little difficulty. A line can be attached to the suction pipe below the pump, to draw in the fertilizer solution. But when the pump is below the ground surface, the suction pipe isn't accessible and the solution must be introduced into the high-pressure discharge line.



E. R. Allred, agricultural engineer, pours fertilizer into the tank for the system he and J. H. Pomroy developed for mixing fertilizer solutions with irrigation water.

One way to do this is with a second pump, but that involves extra cost. Another device called an "aspirator" can be used, but it results in reduced sprinkler pressure when the fertilizer is introduced.

The closed tank method makes it possible to put the solution into the high pressure line with no loss of pressure. The equipment consists of a water pressure tank connected with galvanized pipe on each end to outlet risers on the main line. There are valves between each end of the tank and the main line.

The tank is filled with fertilizer solution, and when both valves are opened, the fertilizer solution moves out into the main line, mixes with the irrigation water and sprays out on the crop. Allred and Pomroy have found that nearly 90 percent of the fertilizer in the tank moves out to the field in 20 minutes.

The system is now being used successfully at other agricultural experiment stations that have tested it.

# Agronomy and Plant Genetics ...

## ALL SEED SOLD SHOULD BE CERTIFIED

A University of Minnesota agronomist has called for certification of all farm crop seed which is bought and sold.

"One hundred percent certification is the only way in which we can be sure that seed keeps its varietal identity and purity," W. M. Myers, head of the University agronomy department, says.

At present, less than half of the small grain seed sold, for example, is certified, Myers points out.

He explains that "With most field crops, varieties are developed through public breeding programs. We in the breeding field have a responsibility to see that our product reaches the farmer in the form in which it was developed. Certification is the only method we know which will make that possible."

Complete certification would mean that farmers would plant nearly 100 percent certified grass and legume seed, since seed of these crops needs to be bought every year, Myers says. With grains like oats, however, the farmer normally keeps his own seed and couldn't be expected to buy new seed more often than every 3 to 5 years.

In Minnesota, if farmers planted new, certified oats seed every 4 years, on the average, we would need four times as much certified oats seed as we are now producing in the state.

Myers lists six things necessary to make 100 percent certification possible:

"1. There must be more education and promotion of certified seed. We have a good product to sell; all we need to do is push it. The crop improvement associations can't do all of this, but they can take part in the educational work and promote certified seed in general.

"2. As crop improvement people, we must continue to study our procedures and make sure we aren't following any rules that restrict the orderly marketing of seed. We have already made several advances in this respect. For example, the recent provisions for interstate seed certification were a big help.

"3. We must continue to be sure that we are certifying a superior product from a genetic standpoint. We can't just certify a crop. The variety itself must be certified. In some crops, there are no superior varieties yet, but such varieties need to be developed.

"4. We must continue to work toward more acceptance of certified seed by marketing agencies. The associations are not selling agencies themselves. For best results, the seed must be marketed by a specialist in seed marketing. Ideally, this would be someone in the seed industry. But if the present agencies can't rise to the need of selling certified seed, some others will take over the job. More cooperatives may take over this function in the future.

"5. Our certified seed producers must see their place in this program. One common complaint

now is that the average producer sells seed to his neighbors at the same price he receives from the marketing agency. Then when the agency comes back to the neighborhood to market the seed, it finds farmers have already bought their seed at wholesale prices.

"6. We must adjust our seed production programs for large volume. To get four to five times as much certified seed planted, we need large-scale seed production. This means we must have more specialized--and larger--seed producers. If this change is coming, we must be sure we don't inhibit it."

## SCIENTISTS NOTE GAINS IN CORN BORER RESEARCH

Agricultural scientists are making firm headway in their search for corn hybrids that are more resistant to ravage from the European corn borer.

Important progress has been made in Minnesota alone. Since 1955, several commercially-sold hybrids in the state have had in their makeup one or



Both corn plants shown in cross-section here were experimentally infected with the same dosage of corn borers during the growing season. The one at left, which had some resistance to borers was damaged very little. The plant at right, though, suffered severely from borer feeding and the borer tunnels became pathways for disease organisms to enter the plant.

more inbred lines which are highly resistant to corn borer. Some of these resistant lines have been developed by research workers at the University of Minnesota.

Present leaders in this intensive research

project are E. H. Rinke, plant geneticist and F. G. Holdaway, entomologist.

Although borers are less of a problem now than 8 years ago, there is still need for concern about them. The Minnesota Department of Agriculture estimated \$40 million state damage from borers during 1949 alone.

By 1955, borer damage dropped to \$9.8 million and to \$6.6 million last year. This is still a big loss. Holdaway says it's possible we are now in the low point of a "borer cycle," and that borers could become more serious again later on.

Developing borer-resistant corn is no simple matter. It has been going on in some parts of the country since early in World War II and a complete project on this breeding started at the University of Minnesota in 1948.

There are no corn hybrids that completely repel borers, but several hybrids have high resistance to feeding by first-generation borers.

Corn breeders need to be concerned about much more than just corn borer resistance in breeding new hybrids. To be of any value to farmers, a hybrid must have the correct maturity, must yield well, have strong stalks, resist smut and other plant diseases and have several other characteristics which must be "pieced together" in the breeding program.

A "flint" corn variety from Argentina is one of the key plants in the project. Agronomists brought this corn in because it is highly resistant to borer feeding. Even when infested with borer eggs, it suffers little.

Unfortunately, borer resistance is the only good characteristic this Argentine corn has, as far as Minnesota farmers are concerned. It's a flint, instead of a dent, corn. It doesn't yield well and is susceptible to many plant diseases common in Minnesota. So the agronomists must "take out" the one favorable characteristic and add it to suitable hybrids.

Here's one way this work is done:

An "inbred line" of the Argentine corn is crossed with a native inbred line that has other good characteristics. The resulting cross is then "back crossed" again with the original native inbred line. This process is repeated year after year. Each time, the agronomists select the individual plants that have the most favorable characteristics and eliminate the unwanted plants.

Eventually, it's possible by this process to keep only the borer-resistance of the Argentine corn and get rid of the undesired characteristics of that corn in the final hybrid.

Holdaway and his co-workers supply borers needed to test the experimental inbred lines and crosses. They raise borer moths in cages and collect the egg masses. Each corn plant being tested is then inoculated with about 125 live borers--an extremely high dose. Any plant that can live through and produce good ears is bound to have some borer resistance.

What makes some corn plants more resistant to borers than others? Nobody knows for sure, Holdaway says, but scientists are constantly learning more about the phenomenon. The main theory is that there is something in the resistant plants that made them unacceptable to the borers.

Rinke believes the worst damage from borers is from "secondary infections." Borers can carry disease organisms on their bodies and deposit

these organisms inside the corn plant. Also, holes left by borers are ideal entrance pathways for stalk rot and other organisms.

One unexplored possibility, Holdaway points out, is that some corn plants may be less attractive to borer moths than others. If this were true, it would mean that hybrids could be selected for this characteristic, too.

So far, there are no strains of borers that thrive on borer-resistant corn. But the prospect of such borers developing is something else scientists must be on guard against, Holdaway adds.

## PLASTIC COVER REDUCES SPOILAGE IN SILO

MONTEVIDEO--Spoiled silage can almost be a thing of the past for the farmer who covers his silo with a sheet of inexpensive plastic.

Ray Saienga, farmer here in Chippewa county, has evidence to prove that statement. A sheet of polyvinyl plastic covering eliminated surface spoilage in his upright silo and kept it down to a minimum in his bunker silo last winter.

The plastic cover is so effective that Saienga says "it doesn't pay to use a bunker silo without it."

Saienga's experience agrees with recent findings made by University of Minnesota agronomists. Polyvinyl and polyethylene make good covering for upright and bunker silos.

Chippewa County Agent Gene Pilgram reports several local farmers are following this practice, with good results.

Total surface spoilage often runs high in bunker silos, because there is more surface exposed to air than in an upright structure. Therefore, anything to keep air away from the surface will reduce spoilage. And plastic makes airtight covering possible.

Saienga built his 17 and 68-foot bunker silo a year ago. To make the walls airtight, he tarred them and covered them on the inside with sheets of plastic.

He put oats silage in the bottom and a 2-foot thick layer of alfalfa silage on top. Then he covered the silage with two sheets of polyvinyl plastic and threw silage on top of the edges along the silo wall to keep it tight.

He used the same practice on top of silage in his upright silo.

By reducing spoilage, Saienga says, "I saved more than enough feed to pay for the cost of the plastic; I used to figure on 18 inches of spoiled silage when I opened the upright silo. And I can use the same plastic at least another year and maybe for a third year."

## NEW SILAGE-MAKING SYSTEM DEMONSTRATED

A new idea in forage preservation--low-moisture, baled grass silage--has been unfolded at the University of Minnesota's Rosemount Agricultural Experiment Station.

The system is explained by Rodney Briggs, University agronomist. He says the method will be extensively tested in the future.

Here's how the system works: station workers

cut the hay, let it wilt until it contained about 40 to 50 percent moisture, then baled the hay without chopping it. They stack the bales on one end of a large sheet of plastic, then pulled the loose end of the sheet over the stack, down the sides, and covered it with soil. The result was an air-tight bag of baled silage.

Low-moisture silage itself is known to be successful. But in the past, it's been stored only in glass-lined, airtight upright silos--which few farmers have. Briggs uses the same principle, but bales the hay instead of chopping it and stores it in plastic bags, which have already worked out well for all kinds of silage.

Briggs says the system should simplify harvesting, eliminate most spoilage and make the silage easy to handle.

With conventional silos, grass silage is a "touchy" proposition, Briggs points out. It's normally chopped in the field and put in the silo at 70-75 percent moisture. If there's more moisture than that, it tends to sour. With too little moisture, it molds. That means the farmer must be extremely careful to get the right moisture content at harvest time, or he must put a preservative in the silage.

But if the silo can be kept airtight, the material can be put in at a lower moisture content without any spoilage, Briggs stated. No preservative is needed, either. Silage ferments without air. And plastic bags have proven to be effective, airtight silage containers.

Hay can be baled at 40 percent moisture with most modern hay balers.

#### SILAGE DOUBLES VALUE OF OATS

By putting oats in the silo, a farmer can get twice as much feed value as he can by putting it in the grain bin.

Oats or oats-and-pea silage is no replacement for legume silage, but it does compare favorably with corn silage and, if properly supplemented, can be used for all livestock, says Rodney Briggs, agronomist at the University of Minnesota.

Removing the oats early helps legumes and grasses get established and avoids lodging trouble. It costs only half as much to produce a hundred pounds of total digestible nutrients (T. D. N.) as silage as it does if oats are harvested as grain.

There may be a higher protein yield if the oat silage also contains peas. Peas in the mixture do best in northern Minnesota where it's cooler and the moisture is high.

Oats and peas can be sown together, but they must be thoroughly mixed. If they're sown separately, it's important to follow the first sowing as quickly as possible with the second to avoid injuring germinating seedlings.

The silage can be put in any type of silo, as long as it's chopped short and packed well. Oats ferment easily and usually no preservative is needed. But if the oats are cut before milk stage, use a preservative or wilt to 65-70 percent moisture to prevent souring.

#### WISE HARVESTING IMPROVES QUALITY OF GRASS SILAGE

There's much more to making grass silage than just putting chopped forage in the silo.

The farmer must harvest at the right time, watch the length of cut, and get the material packed well in the silo to save the most of the feed value, according to Rodney Briggs, agronomist, and Harold Searles, extension dairyman at the University of Minnesota.

Set the chopper to make as short a cut as possible--about 1/2 to 3/4 inch. Then the material will pack better.

Harvest first-crop alfalfa for grass silage so that you finish the field when it's in early bloom. Then use a preservative in the silo.

If you have trouble figuring the moisture content, Briggs and Searles suggest this method as a guide: Squeeze a handful of the chopped material in your fist for half a minute, then release it. If the material remains in a ball, it's too wet. If it rapidly falls apart, it's too dry. But if the forage slowly springs up, falls apart in chunks and leaves your hand moist, it's about right.

Sometimes it may be necessary to wilt the alfalfa for a few hours before chopping it, to get the right moisture content. Try to get 65 to 70 percent moisture.

In an upright silo, it isn't necessary to pack the lower two-thirds because of the weight of the silage. But as you fill the upper third, keep the silage slightly higher next to the walls and pack after each load. When the silo is filled, mound the center and continue packing daily until settling stops.

In a horizontal silo, it's best to use a wheel tractor to level the load as filled, and continue as long as there is any settling. Horizontal silos can be sealed by covering with plastic covers, sawdust or ground corn cobs or with 2 inches of limestone or soil. This will help prevent surface spoilage.

#### USE PRESERVATIVE FOR GRASS SILAGE

Always use a preservative when you make grass silage; it's good insurance.

Preservatives are needed for legume silage much more than for corn, explains Rodney Briggs, agronomist at the University of Minnesota. That's because legumes, unlike corn, are low in sugars and are high in protein.

Silage fermentation calls for plenty of sugars and other carbohydrates, so it's often necessary to add something to legumes to aid this fermentation process.

Several preservatives can be used.

Ground corn and cob meal, ground grain, beet pulp and liquid molasses are preservatives that will add carbohydrates and aid the fermentation process. They will also help absorb moisture and cut down feed value loss through juice flow from silage. Dry molasses is a good preservative but it's expensive.

Another preservative you can use is sodium

metabisulfite. This material contains no carbohydrates, but inhibits fermentation.

Rates for adding dry preservatives to legume silage are: corn and cob meal, 200-250 pounds per ton; ground grain, 150-200 pounds; beet pulp, 150 pounds per ton. Add liquid molasses at 80-100 pounds per ton and if you use sodium metabisulfite, put 8-10 pounds in each ton.

Dry preservatives can be spread over the load before unloading or they can be added at the blower. Liquid molasses need to be pumped to the top of the silo for best results, but may be added at the blower, and sodium metabisulfite must be added with a hopper or metering device on the chopper or blower. No matter how it's done, it's important to get sodium metabisulfite mixed well with the silage.

#### PLASTIC SILOS NEED "FORMING"

Plastic silos work best when used with a "form."

Recent research conducted at the University of Minnesota by Agronomist Rodney Briggs shows plastic bags work well for storing corn or grass silage.

But it's important to use them correctly, according to Briggs. The most effective system in 1956 studies for corn silage was to construct a conventional snow-fence silo and then cover it with polyvinyl plastic.

For grass silage, non-supported stacks were alright, but researchers used one length of snow fence for forming. As the stack was filled, the snow fence was pulled up and taken out entirely after the stack was completed, leaving well-formed walls on the stack. Then the bag was pulled up and tied at the top.

When plastic bag silos were used without forms, it wasn't possible to pack the silage as well within the bags. Also, unformed bags didn't hold their shapes well.

Minnesota studies with plastic bag silos have been conducted at the North Central School and Experiment Station at Grand Rapids, on the St. Paul campus, at the Rosemount Agricultural Experiment station and at the Southern School and Experiment Station, Waseca.

#### CORN YIELDS BEST FOLLOWING LEGUMES

You can get better corn yields by planting it in fields that were in alfalfa before.

Field studies conducted at the University of Minnesota's Southern School and Experiment Station, Waseca, again bear this out.

A. R. Schmid, University of Minnesota agronomist, found that second-year corn following alfalfa,

without extra nitrogen, produced yields as high as did second-year corn following grain with 80 pounds of nitrogen per acre added just before the corn was planted.

In 1955, 1956, and 1957 corn was raised on plots that had been either in grain, grass, or alfalfa in 1954. In each case, non-fertilized plots were compared with plots that received 20, 40, 60 and 80 pounds of nitrogen per acre annually, broadcast in the spring.

On second-year corn, yields where no fertilizer was applied averaged only 32 bushels per acre following oats, 29 bushels following grass and 84 bushels per acre following alfalfa--as high as when 80 pounds of nitrogen per acre were added on corn following grain.

On third year corn, yields were highest following the alfalfa at all levels of nitrogen. Also, yields following grass were higher than yields following grain.

Of all treatments and plots, the most profitable results came from adding 20 pounds of nitrogen to second-year corn following alfalfa--107 bushels per acre. That same nitrogen application brought yields up to only 39 bushels per acre in second-year corn following grain and to 41 bushels in corn following grass.

Schmid says that the yield increase on corn following legumes is due primarily to the added nitrogen in the soil but some of it could be a result of some unknown effect of sod on the physical condition of the soil.

#### WINTER-HARDY ALFALFA BEST FOR MINNESOTA

It takes proper management and winter-hardy varieties to get an alfalfa crop that will live through Minnesota's rugged winters.

Recommended varieties to use are Ranger and Vernal, both winter-hardy according to Laddie J. Elling, University of Minnesota agronomist.

Second, none of these varieties can be clipped in the fall and be expected to last through the winter every year.

Recent field trails at the University's Rosemount Agricultural Experiment Station bear out these conclusions, Elling explains. The winter of 1956-57 was one of the roughest in recent years and put all alfalfa through a severe test.

On the plots where the alfalfa was not clipped in the fall, Vernal winterkilled only 12 percent, Narragansett 16 percent and Ranger 18 percent. But DuPuits and Lahonton, both less winter-hardy varieties, winterkilled 53 and 75 percent, respectively.

Where alfalfa was clipped in September and again in November--an unrecommended practice--only 10 percent of the Ranger and 42 percent of the Vernal plants survived until this spring.

# Animal Husbandry . . .

## FEED ADDITIVES INCREASE GAINS IN BEEF CATTLE

Feed additives--particularly stilbestrol and certain antibiotics--are a boon to beef cattle raising in Minnesota.

You can get 25 percent increases in beef gains from these two materials and it won't cost you more than 1 3/4 cents per animal per day to add them to the feed.

That's one of the major findings in recent beef feeding experiments at the University of Minnesota. O. E. Kolari and A. L. Harvey University livestock scientists, summarize recent Minnesota research with feed additives this way:

Stilbestrol alone, fed at 10 milligrams per animal per day, boosts gains in steers by about 15 percent, compared to animals receiving no stilbestrol. It also reduces the amount of feed needed for each 100 pounds of gain. Implanting stilbestrol at 24-36 milligrams produces similar results as far as gain is concerned.

Heifers will also make better gains and require less feed per pound of gain with stilbestrol fed, but normally, you can expect a somewhat smaller increase than you'd get with steers.

Steers fed terramycin alone, at 80 milligrams per head daily, gain about 13 percent faster than steers getting no terramycin, and terramycin and stilbestrol in combination result in an increase of about 25 percent. The combination also results in greater feed efficiency than either additive fed alone.

Heifers gain about 5 percent faster with terramycin alone and the two additives together increase gains in heifers by about 14 percent.

The stilbestrol-terramycin studies have been conducted during only one year of feeding trials so far at Minnesota, but Kolari and Harvey say the combination appears to be a good one for Minnesota cattle feeders to use. They will continue to test the practice in feeding experiments, however.

Both materials can be mixed in the feed supplement by the feed dealer and both are available in most areas. Cost runs about 1.75 cents per animal per day for the combination.

## PEPSIN LITTLE HELP IN PIG STARTERS

It won't pay to add pepsin to starter rations for your little pigs, if the rations are complete otherwise.

R. J. Meade, swine nutritionist at the University of Minnesota, bases that conclusion on results of recent research. Pepsin is a "protein-splitting" enzyme. It has produced varying results when added to starter rations in some experiments around the country in recent years.

Minnesota experiments show that changing other ingredients in starter rations has more effect on pig growth than does adding pepsin.

In the most recent experiment with this material, Meade and his co-workers used a corn-rolled oats-soybean oil meal type of pig starter. A part of the soybean oil meal protein in this mixture was replaced by dried skim milk or fish meal or a combination of the two. All rations used in the test were nutritionally adequate.

Each starter was fed with and without pepsin, (Pep-Swin 1:3000) added at 5 pounds per ton.

Using dried skim milk resulted in improved pig performance. Six percent fish meal and combinations of fish meal and dried skim milk also increased final weights and reduced amount of feed required per pound of gain.

However, in starter rations with pepsin added, the pigs actually gained less rapidly and required more feed per pound of gain. Average daily gain for all pigs without pepsin was .67 pounds, compared to .62 pounds for those on pepsin.

These 6-week tests were conducted on pigs weaned at 2 weeks of age.

## WELL-FED SOWS HAVE STRONG PIGS

A hog's menu needs to be planned according to his age and the way he's fed.

For example, milking sows need a ration with 16-17 percent protein, while 14-15 percent protein is best for bred sows and gilts, say H. G. Zavoral, extension livestock specialist, and R. J. Meade, swine nutritionist at the University.

Growing pigs need less protein as they get older. Pigs weighing less than 75 pounds need a high-protein ration--14-16 percent. After 75 pounds, the protein content can be reduced to 12-14 percent until pigs weigh 150 pounds. From then to market, 10-12 percent protein is enough.

## PELLETING EAR CORN NO HELP FOR LAMBS

There doesn't seem to be any advantage in feeding pelleted ear corn to lambs.

In 1956 feeding trials conducted by the University, lambs fed pelleted ear corn didn't gain as well as lambs that received shelled corn. Gains for lambs on pelleted ear corn and for lambs fed ground ear corn were about the same, according to R. M. Jordan, livestock scientist.

Some sheep producers have thought that lambs might eat more total feed if the ear corn were pelleted. But these tests show that isn't necessarily so, Jordan says. Lambs on pelleted corn ate no more than other lambs.

Lambs in these comparisons were fed 91 days. The lambs that received pelleted corn averaged .255 pounds gain daily, lambs fed ground ear corn, .257 pounds, and lambs fed shelled corn .301 pounds.

## OATS SILAGE EQUALS CORN FOR LAMBS

Oats silage is just as good as corn silage in a fattening ration for lambs.

But with either kind of silage, the lambs will do better if they also get some hay.

In feeding experiments with lambs in 1956, University of Minnesota research workers compared lambs fed oats silage with lambs fed corn silage--with and without hay.

Lambs on oats silage without hay gained .22 pounds daily, compared with .21 pounds for lambs on corn silage and no hay, reports R. M. Jordan, University livestock scientist.

In both cases, though, adding half a pound of hay to the ration boosted the gains by more than 20 percent. Average daily gains for lambs on oats silage and hay were .26 pounds and .27 pounds for lambs fed corn silage and hay.

## HOG RAISERS HAVE IMPROVEMENT PLAN

Minnesota hog farmers have their own "on the farm" improvement program to help them select better animals for more profitable production.

This program is set up by the University of Minnesota Agricultural Extension Service and is available to anyone.

According to H. G. Zavoral, extension livestock specialist, there is one plan for commercial hog producers and another for purebred hog growers.

Under the plan, commercial producer:

1. Notches and weighs all litters at birth.
2. Weighs all pigs at about 56 days of age.
3. Weighs and makes a backfat probe on possible herd replacement gilts at about 200 pounds.
4. When possible, probes and gets carcass information on market hogs and gets feed requirement figures on a representative group or groups of hogs.
5. Makes the final selection of herd replacement gilts based on litter size, weight for age and backfat thickness.

With this system, the producer is able to select breeding stock that will produce the most profitable returns.

## STILBESTROL FEEDING AND IMPLANTING COMPARED

Orally feeding stilbestrol is a good way to give this synthetic hormone to beef cattle.

In tests at the University of Minnesota in 1955 and '56, implanting actually gave faster and more efficient gains, but orally fed steers sold at higher prices than did implanted steers.

The reason was that implanted steers showed more carcass shrinkage, graded lower, had less eye muscle and showed other unfavorable "side effects," according to A. L. Harvey, W. J. Aunan and Whitney Lindwall, University livestock scientists.

In this experiment, orally-fed steers received 10 milligrams stilbestrol daily, while implanted steers received 36 milligrams in one dose at the

start of the trial. Implanting means placing a stilbestrol-containing pellet under the skin at the base of the animal's ear.

Implanted steers in these tests gained 2.75 pounds daily, compared to 2.64 pounds for orally-fed steers and 2.2 pounds for steers that received no stilbestrol. Both methods of giving steers stilbestrol resulted in 12-13 percent less feed needed for 100 pounds of gain. However, due to the unfavorable side effects, the implanted steers brought more than \$8 per head less at market time than the orally-fed cattle.

It may be possible, the livestock men point out, that the side effects from implanting won't be as marked at lower levels. So this year, they are comparing steers at 10, 20 and 30 milligram levels to see if side effects can be avoided and still get as high increases in gains and feed efficiency.

The scientists are also testing stilbestrol fed in combination with terramycin and with dynafac, two different feed additives.

## FERTILIZING PASTURE AIDS BEEF CATTLE

There's some real advantage in fertilizing pastures for beef cattle.

But the advantage isn't always as apparent as you might think, according to Paul M. Burson, soils scientist, and A. L. Harvey, livestock scientist at the University of Minnesota.

In tests at the Beef-Grassland farm at the University's Rosemount Agricultural Experiment station, there hasn't always been an important gain advantage for cattle on fertilized pastures compared to unfertilized areas.

But fertilizing has other benefits. For one thing, heavy fertility tends to pep up the grasses in the pasture mixture--an important factor where bloat is concerned. Livestock men are generally agreed that it's wise to keep a pasture mixture down to no more than half legumes, to help control bloat. Fertilizer seems to help here.

Second, the cattle tend to eat more on the grasses when it's fertilized than on legumes, which is also helpful from a bloat standpoint.

Third, the scientists have noted that fertilized pastures are grazed more evenly by beef cattle. For some reason, the cattle will eat grass on dropping areas better on fertilized pastures than where no fertilizer was applied. Finally, it's possible to have more animals on each acre when the pasture is fertilized.

The Beef-Grassland project was started in 1952. Since then, fertilizing has increased gains in some tests but not in others. Two years ago, Burson and Harvey found there was \$30 more beef produced per acre where fertilizer was used, while last year there was little difference.

## SOWS NEED GOOD DIET

How many pigs you raise to market age can well depend on the feed given to the sows during the gestation period.

Tests in recent years at the University of Minnesota show that pig survival is highest when sows get a normal, adequate diet, according to

R. J. Meade, University swine nutritionist.

In 1955-56, pigs from sows fed low-protein rations (10.7 percent) were compared with pigs from sows fed normal rations (14.3 percent protein). University swine nutritionists found that when the pigs became sick, there were higher death losses among pigs from sows on low-protein diets than from sows that had received normal diets.

Ninety-two percent of the pigs farrowed by sows fed higher protein levels survived to weaning, while only 77 percent of the pigs from low-protein rations lived to that age.

The difference was due principally to higher death loss from disease among litters on the low-protein lot.

#### PROTEIN CONTENT DOESN'T AFFECT CARCASS QUALITY

Level of protein fed to your growing hogs most likely won't have any effect on the carcass quality or on feed efficiency as long as the pigs receive enough total protein.

However, feeding lower protein levels for the entire growing period did result in slightly slower gains and more days required for pigs to reach market weight, in a recent University experiment.

L. E. Hanson, head of the University of Minnesota animal husbandry department, and his co-workers fed three lots of 20 pigs each in this test. One lot received 16 percent protein at the start, and the ration was decreased to 11 percent protein when the pigs weighed 100 pounds. The second lot was started at 14 percent and decreased to 11 percent, and a third lot received 12 percent for the entire growing period.

All three lots required about the same amount of feed per hundred pounds of gain, but the pigs on the 12 percent ration required 9.2 more days to reach market weight than did pigs on the recommended 16-11 percent ration.

However, there was very little difference among pigs from all three groups, after being slaughtered, in percent of lean and fat tissue in the carcass. Also there was no difference in overall carcass quality.

These studies confirmed earlier findings at Minnesota and they show that the 16-11 percent protein feeding practice is still best, because it gets the hogs to market weight quicker. With changing hog prices, that alone is often a big advantage.

#### WINTERING CALVES NEED GOOD SILAGE

Corn silage will bring faster gains in steer calves fed over winter than any other kind of silage.

But the silage must be properly stored to keep spoilage to a minimum or the cost of silage will be higher no matter what kind you use.

That's what A. L. Harvey and O. E. Kolari, University of Minnesota livestock scientists, concluded after 1956-57 feeding trials at the Rosemount Agricultural Experiment Station.

They found that calves fed corn silage made 1.04 pounds gain per head daily and at only 17.2 cents per pound feed cost. That was more gain and less feed cost than from any other silage.

Calves on alfalfa-brome silage gained .90-.95 pounds daily, at a feed cost of 19.8 cents feed per pound of gain. Oat silage brought less favorable results.

However, these feed costs are based on feed actually consumed. There was a high degree of spoilage in the silos used in these tests -- up to 40-60 percent. Based on costs of the feed originally stored, calves on corn silage required 23.6 cents worth of feed per pound of gain and calves on alfalfa-brome silage averaged about the same. That shows that poor storing methods can greatly increase silage feeding costs.

As far as the comparison between corn and grass silage is concerned, these tests confirmed previous years' results, Harvey and Kolari say. On the average, grass silage is about 80 percent as efficient for wintering calves as is corn silage.

#### ARSANILIC ACID SAFE FOR PIGS

There apparently is no danger in feeding arsenic acid to pigs in free-choice rations.

That's one conclusion from recent research at the University of Minnesota, reported by L. E. Hanson, head of the animal husbandry department there.

Hanson and his co-workers found in recent experiments that pigs fed high levels of arsenic acid showed no signs of arsenic toxicity from the material. Maximum allowable levels of the material are .05 percent of the supplement and these tests show that recommended rates are safe enough to use, Hanson demonstrated.

Arsenic acid is an "antibacterial agent". In research conducted at Minnesota in past years, it has helped promote growth in pigs. But very few tests have been conducted on whether the material causes any toxicity when fed in free-choice rations.

Eight lots of six pigs each were fed on corn or oats and a mixed supplement or a soybean meal supplement from 9 weeks of age to slaughter weight. In these tests, there was no difference in average daily gain of pigs due to arsenic acid content in the separate supplements. Levels of .10 percent arsenic acid in the supplement produced no harmful effects on the pigs, even when they ate excessive amounts of supplement.

#### LINSEED AND SOYBEAN MEALS OKAY FOR BEEF

Linseed meal gave slightly better results than soybean oil meal when fed to beef steers and heifers in recent studies at the University of Minnesota's Rosemount Agricultural Experiment Station.

O. E. Kolari and A. L. Harvey, animal husbandmen at the University, report little difference between steers fed the two different protein feeds as far as daily gain and feed cost per hundred pounds of gain were concerned.

Thirty-two steers received linseed meal for 112 days, and another 32 steers were fed soybean oil meal during the same period. The cattle on linseed oil meal gained 2.44 pounds daily, compared with 2.33 pounds for the steers on soybean meal.

Feed cost per hundred pounds of gain was about the same for both groups.

A similar number of heifers was also fed the two different protein supplements. Heifers on linseed oil meal averaged 2.41 pounds per head daily and the average for heifers on soybean oil meal was 2.26 pounds per animal per day.

Heifers fed linseed oil meal also brought almost \$2 more margin over feed cost per animal than did heifers on soybean oil meal.

#### GOOD MANAGEMENT MEANS TOP HOG PRODUCTION

Nearly 12 pigs per litter raised to market age --that's possible for the farmer who does a first-class job of hog feeding and management.

Harold Ryan, a beef and hog farmer near Springfield in Redwood county, had 10 sows last year that averaged 13.6 pigs per litter at farrowing time, and 11.8 pigs from each litter lived to market weight. That's almost five more than state average.

And that's not all. Ryan's pigs gained 1.2 pounds per day and reached 218 pounds in 162 days--a good month earlier than most hogs in Minnesota.

These averages made Ryan one of Minnesota's top hog producers for the past year. He was one of 24 farmers named to the Minnesota Swine Honor Roll, sponsored by the University of Minnesota Agricultural Extension Service and the Minnesota Swine Producer's association.

Ryan's pigs had the highest survival and daily rate of gain of all 24 honor roll members.

He owes his success, he says, to careful management and feeding. He has discussed many of his practices in recent years with Redwood County Agent J. I. Swedberg, and has come up with this "hog-raising formula."

"First, I select prolific breeding stock," Ryan says. He used Tamworth-Montana crossbred gilts, bred to a Tamworth boar. "That cross makes a good meat-type animal and produces large litters," he says.

"Second, I self-feed my sows before farrowing time. They're flushed with a good laxative feed, and I make sure they have feed in front of them in the farrowing pen."

Third, Ryan uses farrowing stalls--an important point for saving more little pigs. H. G. Zavoral, extension livestock specialist at the University, says that farrowing stalls alone can mean saving one extra pig or more from each litter.

Fourth, says Ryan, he uses heat lamps at farrowing time, and stays around the hog house when pigs are being born. "I may lose some sleep that way, but I figure it pays off in keeping more pigs alive," he explains. "There's always the chance that an unattended sow will crush some of her newly-born pigs."

Finally, growing pigs on the Ryan farm get the best in feed and care. He starts them out on a pelleted pre-creep feed, then shifts to a high-protein creep mix. At about 8 weeks of age, he puts them on a ready-mixed ration with a little less protein, and lets them eat from a self-feeder.

He worms the pigs at about 2 weeks after weaning, with piperazine. That treatment, he says, makes internal parasites no problem at all.

In summer, he keeps the hogs on alfalfa-ladino pasture.

Ryan normally has two groups of pigs farrowed each year--one group in February and a second in August. He also markets some 85 steers annually, and finds that hogs and beef make a good combination.

Ninety percent of Ryan's hogs went to market as top grade meat-type animals last year, and brought him an extra 40-50 cents per hundred pounds in premium payments.

#### LOW-LEVEL STILBESTROL IMPLANTING BOOSTS GAINS IN SHEEP

Stilbestrol can be implanted at lower levels in sheep and produce as rapid gains as higher levels. Also, stilbestrol implanting seems to produce greater gains in wethers (male lambs) than in ewes.

R. M. Jordan, University of Minnesota livestock scientist, reports that when stilbestrol was implanted at 2, 3, 4, 5 and 6-milligram levels in feeder lambs, daily gains were up to 50 percent greater than for lambs that weren't implanted.

Stilbestrol is a synthetic, growth-promoting hormone. Implanting it means placing a stilbestrol-containing pellet under the animal's skin.

In University research, western feeder lambs were implanted at 6-8 months of age, then fed for 62 days. At all implanting levels, wethers made faster gains than did ewes. For example, wethers implanted with 2 milligrams of stilbestrol gained .53 pounds daily compared to .42 pounds for ewes. Wethers that weren't implanted gained .37 pounds daily and untreated ewes gained .36 pounds per day.

When the researchers implanted 5 milligrams of stilbestrol per animal, wethers gained .56 pounds daily and ewes gained .47 pounds per day.

Up to now, normal dose for implanting stilbestrol in lambs has been 12 milligrams per animal. That doesn't cost any more than the lower levels, but the problem, Jordan says, is that high-level implanting sometimes causes harmful changes in the animal's body.

It's likely that low-level implanting can bring good growth increases and may avoid the harmful effects, Jordan says. But more research will be necessary before that can be made certain.

#### LAMBS CAN YIELD GOOD RETURN, STUDY SHOWS

Every lamb in a well-managed flock can return its owner almost \$9 above feed costs, according to a recent study at the University of Minnesota's North Central School and Experiment Station, Grand Rapids.

In 1956, A. B. Salmela, animal husbandman at the Grand Rapids station, kept records on a flock of ewes and their lambs. Seventy-nine ewes produced a 138 percent lamb crop. From pre-breeding until the lambs were marketed, lambs and ewes ate \$12.63 worth of hay, silage and grain for every lamb marketed.

The lambs weighed 85-105 pounds each at market time, and brought an average total price of \$19 per head. In addition, wool sales from the flock brought \$2.50 for each lamb, for a total

return of \$21.50 per lamb marketed.

Subtract the feed cost, and that leaves a return of \$8.87 per head.

This return isn't all profit, though, because these figures don't include any depreciation on buildings or other equipment, Salmela points out. But such returns do indicate that sheep can be a profitable enterprise on farms that have extra forage and pasture to be utilized, provided the farmer is able to raise at least a 130 percent lamb crop, with lambs that weigh 85-90 pounds at 5 months and are finished sufficiently to grade choice.

That means that good management is still the key to successful sheep production, Salmela adds.

#### STILBESTROL IS AID TO MINNESOTA BEEF FARMERS

IVANHOE, MINN. -- Stilbestrol, a synthetic hormone, is boosting profits for at least two beef farmers here in Lincoln county.

Ed Kamrath and Don Sandager started feeding stilbestrol last year and find that it increases daily gains by a good 15 percent.

"Anything that puts beef animals on the market sooner is a big help," Kamrath says, "and stilbestrol helped us do it last year. We started feeding stilbestrol about the first week of July when we put our 79 beef heifers in the drylot, and fed it until they went to market."

"By feeding stilbestrol, the heifers gained 15 percent or more and went to market a week and a half earlier than before we started using the material," Kamrath adds.

Sandager reports similar results with his 50-head herd of steers. "Stilbestrol increases the rate of gain and shortens the feeding period," he says. "My steers gained about a third of a pound more per day when I fed stilbestrol, compared to when I didn't use the hormone."

"Also, last summer my steers were ready for market a good two weeks earlier, thanks to stilbestrol."

Both Kamrath and Sandager fed stilbestrol at 10 milligrams per day--the level recommended by County Agent Arnold Claassen and University of Minnesota livestock scientists. The farmers bought the material already mixed in the protein supplement.

This experience on the Kamrath and Sandager farms agrees with earlier research findings at the University. Livestock scientists have found in feeding trials that stilbestrol-fed steers put on 100 pounds of gain with 8-15 percent less feed and gained 15-20 percent faster when they received stilbestrol.

Stilbestrol needs to be used along with a good ration to be most effective, Kamrath and Sandager say. Kamrath starts his feeders in the fall on good alfalfa-brome hay and corn silage, starts feeding corn about Feb. 1, puts the animals on pasture in early spring and puts them on dry lot in early July.

Sandager follows a similar feeding plan, but uses oat silage and puts his steers on full feed earlier.

He has had good results from oats silage and says it benefits him in four ways:

"First, by putting oats up as silage, you get more out of the oats in feed value than you would by putting the oats in the bin."

"Second, it's a good way to establish the seedling and to combat Canada thistles. By cutting the oats before they're ripe, you also keep the thistles from going to seed that year. Then when the seedling comes in heavily the next year, it crowds the thistles out."

He harvested the oats in the early dough stage.

#### FUTURITY PROJECTS HELP YOUTHS DEVELOP VALUABLE HERDS

FOSSTON--"Futurity" livestock are literally building a future for a young pair of brothers here in East Polk county.

Edgar, 19, and Arlan Olson, 17, started with a single registered beef Shorthorn calf and one registered Hampshire ewe, both futurity project animals, in 1948 on a farm owned by their Uncles, Iver and Ed Olson.

Today, the Olson brothers have 60 registered rams and ewes and 17 Shorthorns, all topnotch breeding stock. They also have a few pigs and Edgar owns 180 acres of land and part interest in some farm machinery. Better yet, their up-and-coming operation has paid its own way.

In futurity projects, farm youths raise registered female breeding stock as a start toward a purebred flock or herd.

There have been no "gifts" given to the Olson youths. Uncles Iver and Ed have helped the boys handle things on a business-like basis so they would learn good farm and livestock managements.

The Olson brothers started showing in Futurity competition in 1951, at the Red River Valley Winter Shows, Crookston. They have also taken their stock to county, regional and state fairs and to the Junior Livestock Show at South St. Paul.

They have a heap of ribbons to show for their efforts. At both the 1956 and '57 Winter Shows, the brothers had the best sheep flock in open competition. This year, they won the reserve championship in Futurity sheep.

The Olson brothers' story actually starts in 1946, when Edgar, then 9 years old, worked for his uncles in summer in return for a heifer Shorthorn calf. That calf grew up, raised a calf of its own and Edgar sold both animals in 1948. He used the money to buy his first registered beef Shorthorn calf.

Since then, Edgar and Arlan have bought some stock, but have raised most from their own ewes and cows by careful selection. Lee Frederick, Fosston agricultural instructor and Harley Shurson, East Polk county agent, have helped the boys.

Building a registered breeding herd can pay for itself and bring a good extra profit, the Olson boys have found. At first, Edgar paid for the feed and shelter on his Uncles' farm by "working it off." Then as herd and flock increased, sales of breeding animals gave him more capital and he bought 180 acres of land--110 of permanent pasture. That land now produces most of the feed needed for the livestock.

# College of Veterinary Medicine...

## ENTEROTOXEMIA IS SERIOUS IN CATTLE

A "sudden death" disease, once thought common only in sheep, is taking an expensive toll of dairy and beef cattle in Minnesota.

The disease is enterotoxemia, often called "overeating disease" by sheepmen, according to Dale K. Sorensen, veterinary scientist at the University of Minnesota.

Sorensen says the organism that causes enterotoxemia is well known, but so far, there's no way to stop that organism. It's found in soil and in bedding, and sometimes even in the digestive systems of normal animals. The disease seems to occur when animals eat heavily on highly nutritive feed and activate the enterotoxemia organisms in their systems. When this happens, a powerful poison is formed which is absorbed into the bloodstream and often kills the animal in a few hours.

A problem mostly in calves 2-4 months old, enterotoxemia can also affect older animals. In most cases, the animals are normal at one feeding and are either extremely sick or dead at the next. The head is usually thrown back, calves may kick spasmodically, and animals may have convulsions.

Best way to prevent enterotoxemia, says Sorensen, is to avoid heavy feeding, even though animals can get the ailment when not eating excessively. While it's impossible to get rid of the organism completely, it's helpful to clean and disinfect calf pens periodically.

When the disease does occur, prompt veterinary attention may save the animal.

Research now underway at the University is aimed at finding whether vaccines will prevent enterotoxemia.

## TURKEYS DON'T PASS BLUECOMB IMMUNITY ON TO YOUNG

Turkeys that recover from bluecomb disease develop some immunity to the ailment but they don't pass this immunity on to their young.

This finding was made by Drs. J. T. Tumlin and B. S. Pomeroy, veterinary scientists at the University of Minnesota.

Turkey growers have believed for some time that birds recovering from bluecomb disease become immune to it, Tumlin and Pomeroy pointed out.

But many have also thought that poults--young turkeys--get this immunity from recovered adult birds through the egg sac. This is called "parental immunity" and is common in diseases like Newcastle and infectious bronchitis.

Tumlin and Pomeroy experimented with poults from four flocks of turkeys--three that had recovered from bluecomb and one that had no past history of the disease. The scientists inoculated all the poults with material taken from intestines of bluecomb-infested birds.

As many inoculated poults from recovered flocks dies from bluecomb as did poults from flocks that had never had the disease.

But examination of recovered turkeys showed there were enough bluecomb antibodies in the blood of these birds to give them immunity.

These findings, Tumlin and Pomeroy say, should help in further studies aimed at developing methods to prevent bluecomb. There is no way at present of making turkeys immune to this disease.

## SCIENTISTS PERFECT TEST FOR LEAD POISONING

A simple method for helping to detect lead poisoning in farm animals has been perfected by University of Minnesota veterinary scientists.

It takes an hour or less to perform and calls for simple laboratory equipment. It can be conducted either on blood samples of live animals or on liver tissue of dead animals.

Dr. Paul Hammond, a pharmacologist at the University College of Veterinary Medicine, developed the test in cooperation with M. H. Roepke, biochemist in the division of veterinary bacteriology, and H. N. Wright, pharmacologist at the University's Medical School.

Lead poisoning in animals is usually a result of their licking paint on barns and fences or on paint pails.

There are ways to treat lead poisoning, but in the past, veterinarians haven't had a good technique to determine whether animals actually had lead poisoning or some other ailment that produced similar symptoms. All they had to go on was the animal's general appearance.

Hammond's method is based on a test that has been known for many years. The old test was too complicated to be practical in most veterinary diagnostic laboratories.

## OIL SPRAYS HELP PREVENT BLOAT

Oil sprays and 50-percent grass mixtures can help prevent bloat.

A. F. Sellers, veterinary physiologist at the University of Minnesota, says New Zealand studies have shown it's possible to prevent much of the foaming in the animals' rumens, or stomachs, by spraying the pasture with crude soybean oil, cottonseed oil, peanut oil, or mineral oil, before putting the cows on the pasture.

Spraying rate is three ounces of oil per animal so that each animal takes in that much oil in a day's grazing. The oil needs to be emulsified in about a quart of water with a small amount of household detergent added to aid the emulsification. The spray can be applied with an ordinary farm sprayer.

Oils tend to reduce foaminess in the rumen and aid belching.

It's also helpful to prevent the cows from over-

eating on legumes. One way to do that is to feed the cows 10-15 pounds of hay each overnight, before turning them out on pasture.

Another way is to plant and maintain pasture mixtures that contain no more than half legumes.

Bloat is often a problem when cows eat fresh legume pasture, particularly when the forage is in the early growth stage. Bloat results from the cow's inability to get rid of gas that forms in her rumen, and probably not from excess gas formation. Cows on legume pastures tend to form no more rumen gas than other forages, but for some reason, some cows on "bloaty" pasture are unable to belch enough after eating fresh legumes.

When the belching rate slows down, the cow becomes bloated and may die within a few hours if the condition is especially severe and the cow goes unnoticed. Cause of death in bloated cows is unknown. But veterinarians have found that once an animal "goes down", there's no treatment available now that is sufficiently reliable or effective. The veterinarian can, however, often minimize the losses, since the less severely affected animals can be saved.

#### ANEMIA TREATMENT FOUND EFFECTIVE

Injections of an iron-dextran compound have been successful in treating and preventing iron-deficiency anemia in baby pigs at the University of Minnesota.

H. C. H. Kernkamp, veterinary pathologist, reports that 67 pigs in six groups were successfully treated with the compound. The material was injected in the animals thigh muscles.

It was used as a preventive treatment for anemia in two groups of four-day-old pigs and as a curative in four groups ranging from seven to twenty-eight days of age at time of treatment.

Pigs that had been anemic from iron deficiency showed a marked improvement from the treatment and the preventive treatments were effective for at least three weeks after birth or until the pigs ate food other than the mother's milk. There were no unfavorable side effects.

Iron-deficiency is still an important disease in baby pigs, even though other effective treatments and preventives have been known for several years. These treatments include tablets or pills containing iron compounds, or liquids that may be given as a drench or swabbed on the sow's udder for the baby pigs to lick off as they nurse. Pigs need the extra iron because the sow's milk is low in this element.

The reason for using an iron-dextran injection is to have a method for individually treating the pigs. This is a definite advantage over the other treatments, because with injections, there is more assurance that each pig will receive the medicine and in the correct dose.

#### SWINE ENTERITIS IS COMBINATION DISEASE

Swine enteritis, one of the most serious ailments in Minnesota hogs, is really a "combination" of diseases.

Raymond B. Solac, extension veterinarian at the University of Minnesota, points out that what farmers often call enteritis in pigs can be one or more of several intestinal ailments.

But no matter what the specific disease involved in an attack of enteritis, avoiding losses depends on having the disease diagnosed by a veterinarian as rapidly as possible.

One of the most common forms of enteritis is baby pig scours. This can result from an infectious disease, such TGE (transmissible gastro-enteritis) or from nutritional deficiencies. TGE is a virus disease that can also affect older hogs.

Another form of enteritis is swine dysentery also called bloody diarrhea or bloody or black scours. Enteritis can also result from different kinds of bacteria infection.

Symptoms of TGE are scouring and some vomiting. Older hogs seldom die from TGE but death losses may be high in pigs under a month of age. Mortality often runs as high as 90 or 100 percent in pigs less than a week old.

Dysentery also shows up as scours, which are often bloody after 2 or 3 days. Death rate from dysentery varies from less than 10 percent to 90 percent of the herd. The disease is spread by germs in bowels from infected animals.

The best way to prevent TGE, swine dysentery and other forms of enteritis is to be sure animals brought into the herd come from disease-free stock, Solac says.

It's wise to keep away from infected farms and to keep visitors away from the farrowing houses and pens.

#### GET RID OF TURKEYS IF BLUECOMB HITS

If bluecomb disease hits your turkey flock, the only way to completely eliminate the disease is to sell all the turkeys on the farm before starting a new flock.

That advice comes from J. T. Tumlin and B. S. Pomeroy, veterinary scientists at the University of Minnesota.

After getting rid of the turkeys, thoroughly cleanse and disinfect all houses and equipment. Then wait at least 2 weeks, longer if possible, before replacing the birds.

Recent research shows that the disease is apparently caused by a virus or virus-like agent. Field trials also show that some antibiotics, either alone or in combination, can reduce death losses by 40 or 50 percent. Antibiotics won't completely eliminate the disease, but they may be helpful in controlling secondary bacterial infections.

When the disease occurs in growing and range turkeys, the veterinary scientists recommend these steps:

Give the birds a flush of epsom salts, at 1 pound per 5 gallons drinking water, or 1 pint of molasses per 5 gallons of water for half a day.

Then use an antibiotic in the water or give it at 100 to 200 grams per ton of feed. Use the antibiotic 4 or 5 days or as long as the flock is sick.

Don't use the flush for bluecomb-infected poults. Instead, use high-level antibiotics at 500 grams per ton feed, or 250 parts per million in drinking water.

# Dairy...

## ANIMAL, VEGETABLE FATS SATISFACTORY IN MILK REPLACER

Dairy calves fed a milk replacer containing 10 percent vegetable and animal fat made good gains in recent University of Minnesota research.

Jesse Williams, University dairy cattle scientist, reports that calves receiving a mixture of 90 percent dried skim milk and 10 percent fat gained .905 pounds daily--a satisfactory gaining rate--over a 28-day feeding period.

In the same tests, calves fed a milk replacer with 15 percent fat gained .65 pounds daily and calves on a replacer containing 20 percent fat made .69 pounds daily gain.

Milk replacers have been manufactured and used for several years. Most of them contain 50-90 percent dry skim milk powder or other dried milk products. But since skim milk contains little fat, calves need some other source of energy. The added fat must be economical, or the replacer may cost so much that it will have no advantage over feeding calves whole milk.

The fat mixture Williams used was low-cost and contained 20 percent soybean lecithin--a vegetable fat--60 percent choice white grease from a packing plant and 20 percent soybean oil.

Calves in the experiment were put on milk replacer at 5 days of age and received from 1 to 1.4 pounds of the mixture for the next 28 days. They received no hay or grain.

As part of this research, Williams fed another group of calves two digestive enzymes, ficin and pancreatin, in a ration that contained dried skim milk, dried whey, soya flour, dried corn syrup and the same fat mixture used for the other groups. These calves gained only .32 pounds daily, indicating the enzymes were of no help in this ration.

## PLAN FORAGE FEEDING ACCORDING TO FARM

Which summer feeding system is best for the dairy herd--"green feeding," rotational pasturing, or feeding silage?

It all depends on the farmer's own situation, says J. D. Donker, University dairy husbandman. In research a few years ago, cows on daily rotational grazing produced practically the same amount of milk as did similar cows on a "green-feeding" system.

Then in 1956, dairy cattle scientists at the Rosemount Agricultural Experiment Station compared green-feeding and feeding the cows stored silage. Again, there was no difference as far as total milk production was concerned.

Green-feeding--also called "soilage" and "green-chopping"--means leaving the cows in a feed lot and hauling fresh, chopped forage to them daily.

With the silage feeding system, the cows again stayed in the feed lot, but they were fed stored silage instead of fresh chopped material.

In both cases, cows in the 1956 tests were fed all the dry hay they would eat.

Donker advises farmers to use the feeding system that would best suit their individual operations. Green-feeding, rotational pasturing and feeding silage can all bring equally good results, with good management.

Each system has its good and bad points, Donker says. "Silage feeding allows a farmer to make more efficient use of labor than green-chopping, and takes less time each day to feed the material but more machinery is required. Pasturing takes less labor and equipment than either green-feeding or silage feeding, but experiments have shown that the two latter systems make it possible to feed for high milk production on less total acreage for the summer than with most pasturing systems."

If you put all the "pasture" into the silo, you can do the harvesting when the crop is at its most nutritious stage of growth. With green-feeding and pasturing, the cows sooner or later are apt to get mature forage that's low in feed value. On the other hand, during harvesting and storage, silage will lose about 20 percent of its feed value, Donker says.

## GOOD MANAGEMENT RESULTS IN TOPNOTCH DAIRY HERD

NICOLLET--A 500-pound butterfat production average per cow is possible for any farmer who practices careful dairy cattle selection and feeds the cows right.

Fred Krohn had 4 grade cows when he moved on to his 160-acre farm near Nicollet 13 years ago. Since then, he has built up a herd of 24 registered Holsteins that average 502 pounds of butterfat per cow during the past year, and 475 pounds the year before.

The state butterfat average is less than 250 pounds per cow. University of Minnesota dairy specialists estimate that at least 350 pounds is necessary to give a good return to the farmer.

Krohn's herd is mostly "home grown." He developed the herd by keeping cows that pay their way and getting rid of the "boarders." By 1949 he had 12 cows, 16 in 1953, and 21 a year ago.

Not only does Krohn have a high butterfat average in his herd, but he also does a good business in selling calves and heifers as registered breeding stock.

He has been a full-fledged Dairy Herd Improvement association member since 1949. "DHIA records keep you cost-conscious," he says. "They tell you exactly what each cow is producing, and which ones aren't paying their keep."

As he tells it, he keeps cows "that stand up well in health and know enough to come in out of the rain." Some cows, he finds, are better doers and are able to take in more feed and produce more milk than others.

The cows get topnotch feed the year-around,

thanks to a good forage management setup. Krohn feeds high-quality alfalfa hay and silage in winter, along with a good grain mixture.

Krohn takes the guesswork out of alfalfa silage-making by putting in a preservative with the silage every year--a procedure recommended by County Agent Fred Wetherill and University of Minnesota Agricultural Extension specialists. He uses ground corn and cob meal for a preservative.

There are calves born during every month of the year except June and July on the Krohn farm. "That way, you even out the production and avoid big fluctuations," Krohn says.

Krohn recently remodeled his barn. He put in comfort stalls, increased stall size to 6 feet long and 50 inches wide, and installed electric cow trainers--all recommended features. The old stalls were only 4½ feet long and 39 inches wide.

With his high milk production--more than 15,000 pounds from the 21 cows he had last year--Krohn has put in a bulk tank as part of his grade A milk production system. The tank is paying for itself in increased returns, he says.

#### SCIENTISTS STANDARDIZE DRY MILK TEST

A standardized test for determining the heat treatment of nonfat dry milk has been developed at the University of Minnesota.

The test is based on a method known for years but never before perfected, according to S. T. Coulter, dairy scientist, Robert Jenness, agricultural biochemist and S. Kuramoto, dairy scientist formerly at the University of Minnesota.

It was developed to find out how much heat had been applied to skim milk during the processing for drying. Use of nonfat dry milk depends on how much heat was used.

For example, cottage cheese can be made only from powder that was produced under low heat and powder used for baking bread must have been made from milk subjected to high heat.

The test standardized by Coulter, Jenness and Kuramoto involves saturating a sample of reconstituted nonfat dry milk with salt. After saturation, the casein and part of the whey protein will precipitate, or settle out, from the solution, depending

on the heat treatment.

If the product has not been heated, only casein will precipitate from the solution. But the more heat used, the greater amount of whey protein that will settle out. By measuring the amount of protein that is left in the whey, laboratory workers can determine, within close limits, the amount of heat that had been used in the processing.

This test has recently been adopted as a basis for specifications by the American Dry Milk Institute, the U. S. Department of Agriculture and by the U. S. Army Quartermaster Corps.

#### ARTIFICIAL BREEDING GAINING IN STATE

Artificial breeding has made big strides in dairy herd improvement in Minnesota during the past 15 years.

Harold Searles, extension dairyman at the University of Minnesota, points out that more than a half million dairy cows--528,719--were bred artificially in the state during 1956. That's about a third of all Minnesota dairy cows, Searles explains.

This compares to 495,330 in 1955, 453,000 the year before that and less than 300,000 in 1951.

For the nation as a whole, Minnesota since 1953 has been second only to Wisconsin in number of dairy cows served by artificial breeding associations.

Artificial breeding made its start in Minnesota in 1936, when the first research on the practice was conducted by the University. By 1943, there were 43,000 cows in the state reported bred artificially. The small local bull studs have been replaced by large, more efficient organization.

Searles says that the better sires through artificial breeding have been a factor in our increased milk production per cow.

By employing artificial breeding, better herd sires are available to more dairy farmers. And for all except dairymen with exceptionally large herds, the cost is lower for artificial breeding--usually around \$5-\$7 per cow.

Keeping a herd sire would cost a farmer from \$150-\$175 annually just for feed. In addition, there is the initial expense in buying or raising the bull.

# Entomology and Economic Zoology...

## PINE SAWFLY DAMAGES WHITE PINE MORE THAN OTHER TREES

University of Minnesota entomologists have learned an important reason why the imported pine sawfly damages white pine trees more than other evergreens.

The reason seems to be that the female sawfly prefers the white pine for laying her eggs and the sawfly young have a better chance of surviving on the white pine than on most other trees, according to A. C. Hodson, University entomologist.

This research shows that, in general, foresters don't need to worry about the imported pine sawfly causing any great damage to trees other than white pine in Minnesota.

The sawfly may become one of the major insect pests on white pine plantations in the Midwest. But scientists have noted that the insect seems to be choosy about where it lives and feeds. In some cases, white pines have been completely stripped of their needles by sawfly attacks, even though other evergreen species nearby were only lightly infested by the insect.

Hodson and other Minnesota entomologists collected sawfly cocoons in early spring and kept them until adults emerged and mated. Then the adults were given a choice of branches from five different species of pine--white, red, jack, Scotch and mugho--on which to lay eggs.

In general, the sawfly females preferred white pine branches 3 to 1 over the next most attractive tree. Also, more eggs were laid on white pine and more of the larvae survived when they fed on white pine than on other trees.

## ARMYWORMS CAN BE CONTROLLED WITH INSECTICIDES

Heptachlor, aldrin, toxaphene and dieldrin are insecticides that will control armyworms, according to L. K. Cutkomp, A. G. Peterson and F. G. Holdaway, University of Minnesota entomologists.

Heptachlor can be used until 10 days before harvesting or pasturing a crop and 15 days is the rule for aldrin. Toxaphene, though, must not be used within 40 days of grazing or pasturing because of the possibility that some residue from the material may appear later in the milk or meat products.

For dieldrin, the waiting period is 30 days on forage and 7 days on small grains, if only the grain itself is to be used for human or livestock consumption.

Dosage for heptachlor is one-half pound per acre. Mix it this way: Put a quart of the "2-pound" (2 pounds of active ingredient per gallon) emulsifiable concentrate in enough water to spray 1 acre. This will usually be 5-30 gallons of water for a ground sprayer and 2 or 3 gallons for airplane spraying.

If you use toxaphene, apply it at 1-1½ pounds

of actual chemical per acre, or use dieldrin at one-fourth pound per acre.

## GRAIN INSECTS CARRY STORAGE MOLD

Common grain insects are one important cause of spoilage from storage mold in stored grain, University of Minnesota research workers have found.

Insects themselves don't cause the mold, but they do carry the mold organisms on their bodies, say N. S. Agrawal and A. C. Hodson, entomologists, and C. M. Christensen, plant pathologist at the University.

In recent studies, as insects increased in stored wheat, so did storage molds.

The scientists put known numbers of granary weevils--common grain insects--in wheat that was almost mold-free and had a moisture content of 12 percent. That was too dry to permit mold growth, but moist enough for the insects to live.

Then the researchers kept other samples with the same moisture content free of weevils and stored all samples in air with 75 percent relative humidity.

After a month, weevil-free samples had about 15 percent moisture and the seeds were only lightly invaded by storage mold. Wheat with weevils had about 16-17 percent moisture and many seed germs were moldy.

To see if the increased moisture alone caused the spoilage, the researchers in another experiment kept the moisture level the same in samples that contained weevils as in non-infested samples. After a month, samples with weevils had 20 times as much mold as non-infested wheat. That was strong evidence that the insects themselves carried the mold into the wheat.

Complete insect control wouldn't eliminate storage molds, because some molds are able to invade moist grain without any help from insects. But strict insect control would help reduce losses from molds in elevators and bins where, without insects, molds would cause small damage.

## SWEETCLOVER APHID CAUSES DAMAGE IN MINNESOTA

The sweetclover aphid--a newcomer to the Midwest in recent years--is becoming a problem on many Minnesota farms.

These pests were first seen causing serious damage in Red River Valley sweetclover fields in 1954, according to entomologists at the University of Minnesota. Since then, they have attacked fields in many other areas of the state.

While it looks somewhat like the spotted alfalfa aphid, the sweetclover aphid doesn't attack alfalfa or most other crops in Minnesota. It's a yellow insect with two rows of black spots along its back.

There's very little known about the sweet-

clover aphid at present, but Haws says damage to new seedlings of sweetclover often causes loss of stands. It feeds on older stands too, but doesn't kill the plants. Unlike some other insects, these aphids don't chew the plants. Instead, they suck their food from the undersides of the leaves. Aphids apparently discharge into the leaves a saliva that has a toxic effect on the leaves. This saliva is believed to cause the damage. The leaves turn yellow, then later turn brown and drop off. At first glance an aphid-infested field may look like it's affected by some kind of plant disease.

It takes about a week after the first attack by aphids for leaves to start dropping. In a heavy sweetclover aphid attack, there are many dried leaves on the ground two weeks after the first aphids appear. The ground may also be covered with aphid "skins," or outer body coverings which the insects shed as they grow.

In a 1956 greenhouse study, 40 sweetclover aphids on 10 plants multiplied to 277 new nymphs during the first 24 hours, and in six days there were 880 aphids on the 10 plants. At the University's Northwest Experiment Station at Crookston last year, aphids were first seen on new seedling in sweetclover June 11, and by June 14 65 percent of the seedlings were infested. The infestation continued all summer.

Dieldrin gave the best control over sweetclover aphids in limited tests last year. More research is needed before complete control recommendations can be made, but it's okay for farmers to try dieldrin if they find sweetclover aphids in their fields this summer. Spraying rate is a half pound of chemical per acre.

Research is also being conducted to see if varieties of sweetclover that are resistant to sweetclover aphid can be found. The possibility of biological control, such as with parasitic insects, is also being studied.

#### SEED GROWERS, BEEKEEPERS NEED TO WORK TOGETHER

Legume seed producers and beekeepers in northern Minnesota need to work together to make business profitable for both groups, according to F. G. Holdaway, University entomologist. Honeybees are necessary for pollinating any legume crop grown for seed. Unless the flowers are pollinated, there won't be any seed produced.

Also, beekeepers need to have a good source of nectar for profitable honey production. Legume seed fields can supply that nectar.

But it takes careful planning to work out a system that benefits both the seedsmen and the beekeepers, Holdaway cautions.

University research has shown that with alsike

clover, there needs to be two to three colonies for every acre of seed crop to get a good seed yield. Many beekeepers, however, feel that with that stocking rate, there wouldn't be enough nectar available for maximum honey production.

That means seed producers need to make special arrangements to insure having plenty of bees to do the pollinating, Holdaway says. He lists three arrangements that have been used in California:

1. Seedsmen own their own bees. The problem here, though, is that beekeeping calls for special skill and training that an inexperienced person would lack.

2. Seedsmen own the bees, and hire professional beekeepers to care for them. Either of these first two systems would make honey a "by-product" for the seed producer.

3. Seedsmen hire beekeepers to bring their bees in at specified times and at a specified number of colonies per acre.

For the third arrangement, actual payment would be calculated to make up the difference between the honey yield and the yield the bee-owner could expect with a lower stocking rate.

#### POTATO BEETLE RESISTANCE STUDIED

Potato beetles in Minnesota's Red River Valley apparently have built up strong resistance to DDT.

At least, that's the indication from recent research, according to L. K. Cutkomp, University of Minnesota entomologist.

He compared potato beetles from Minnesota's Red River Valley with beetles from near Ottawa, Canada--an area in which DDT had never been used and where potato beetles obviously wouldn't be expected to have any resistance to the insecticide.

Cutkomp injected the beetles with varying dosages of solutions containing DDT. Dosages that killed Canadian beetles had practically no harmful effect on the Minnesota beetles.

This shows the Minnesota beetles definitely have strong resistance to DDT, Cutkomp says. And indications are that this resistance has built up in recent years, when DDT has been widely used in the Red River Valley.

Recently, field applications of DDT have given poor results as far as controlling potato beetles is concerned. As a result, DDT is no longer recommended for potato beetle control in northwestern Minnesota, although it is still the best insecticide against the potato leafhopper--another serious potato insect. Entomologists now recommend either dieldrin, toxaphene or heptachlor for controlling potato beetles there.

# Horticulture ...

## STATE POTATO TRIAL RESULTS ANNOUNCED

Ten potato varieties produced average yields of more than 400 bushels per acre in 1956 fields around Minnesota.

Orrin Turnquist, extension horticulturist at the University of Minnesota, says state average for 19 varieties tested was 409 bushels per acre, compared to 375 bushels for varieties in 1955 tests. The potato performance plots were located near four towns in Minnesota--Baker, Oslo, Anoka and Hollandale. The plots at Baker and Oslo were on heavy black soil in the Red River Valley. At Anoka, the plots were on light soil in irrigated fields. Hollandale plots were on peat soil.

State averages for tested varieties were:

Saco, 514 bushels per acre; Red Pontiac, 488; Red LaSoda, 472; Redburt, 467; Kennebec, 440; Irish Cobbler, 435; Waseca, 419; Dazoc, 401; P-40, 390; Red Kote, 386; Early Gem, 382; Cherokee, 382; Russet Burbank, 327; Tawa, 317; Russet Rural, 386; and Rushmore, 315:

Three varieties were tested at only one of the four areas. These varieties and their yields were Antigo, 502; Red Beauty, 452 and Manota, 295 bushels per acre.

Turnquist describes some of the newer varieties as follows:

Saco is a newly-developed white potato from Maine. It's immune to one of the viruses that cause mosaic, is high in dry matter. Tubers are rough but have shallow eyes. It's a good eating potato and good for potato chips.

Red LaSoda had higher dry matter content and yielded as well as Red Pontiac or better. Seed supplies of Red LaSoda may be low this year, though.

Dazoc is a bright, attractive variety, with tubers that set heavily. The tubers don't vary in size as much as some other varieties.

Tawa, another white variety, is similar to Saco in mosaic immunity. It yielded lower and had more growth cracks than most other varieties. It has good cooking quality.

Russett Rural--an old variety--was one of the top varieties in dry matter content and yielded in the 1956 tests. It's one of the best varieties for potato chips.

## HYBRID ONIONS SUPERIOR IN TESTS

Hybrid onions may soon replace the old standard yellow globe types in both commercial and home gardens.

In tests conducted over a five-year period by the University of Minnesota Agricultural Extension Service, hybrid onions produced larger yields, showed more uniform maturity and reduced field and storage losses.

Orrin C. Turnquist, extension horticulturist at the University of Minnesota, reported that the

hybrid onions tested in commercial storage held up well without sprouting, maintained attractive color and retained their skins. They also proved highly resistant to storage diseases.

The hybrid Autumn Spice rated superior to standard types as an onion suitable for home gardens. Quick growth, mildness in flavor, firmness and storability were among its desirable characteristics.

Commercial varieties of hybrids most successful in Minnesota trials were Abundance, Encore, Epoch and Elite. They were tested in the two principal onion-growing areas in Minnesota--the peatland soils of southern Minnesota and the heavy soils of the Red River Valley.

Abundance was the highest yielder in the Hollandale area in southern Minnesota, with total yield per acre of 1,397 50-pound bags.

Turnquist reported these yields of other outstanding hybrids: on the Paul Horn farm near Moorhead - Elite, 547 50-pound bags per acre; Epoch, 438; Encore, 386; on the C. Muilenburg Farm near Maple Island - Elite, 1,283 50-pound bags per acre; Epoch, 1,050; Encore 911.

Seed of Autumn Spice, Abundance, Encore, Epoch and Elite will be available to growers this spring.

## THREE NEW GARDEN 'MUMS AVAILABLE

Three new garden chrysanthemums developed by the University of Minnesota horticulture department especially for northern climates were made available to the public in spring 1957 by Minnesota nurseries.

The chrysanthemums are Minnpink, Minn-bronze and Golden Fantasy.

Introduction of the three brings to 35 the number of garden chrysanthemums developed by the University of Minnesota for northern regions. The prefix Minn. is being used to designate garden 'mums of low growth habit introduced by the University.

Minnpink is a low, wide-spreading cushion-type chrysanthemum. It has double rose pink blooms averaging 1½ to 2 inches in diameter. Blossoming begins in mid-August, reaches a peak in September and continues till hard frost.

Minnbronze is a low, compact cushion-type plant with vivid bronze double blooms 1½ inches in diameter. Blossoming starts about mid-September.

Because of its low growth habit, Minnbronze should be planted only on the front edge of flower borders, according to R. A. Phillips and R. E. Widmer, University floriculturists who worked on the development of the new 'mums. Minnpink may be used as an edging plant or near the front of the flower border. Both varieties may be grown in front of shrubs in foundation plantings and used in planter or window boxes.

Golden Fantasy has 2-inch golden yellow flowers.

Blossoms are double, with tubular petals which are both flared and forked at the tips, giving a unique effect. Of medium height, Golden Fantasy should be used in the mid-section of the flower border or as a feature plant. Blossoming starts in early September.

#### GROW MONDO ON TRIAL BASIS ONLY

Mondo, the highly publicized "wonder grass," should be grown in Minnesota on a trial basis only.

That word comes from Richard J. Stadtherr, University of Minnesota horticulturist in charge of turf studies. Stadtherr reports numerous queries from householders who wonder if Mondo is the answer to all their lawn problems.

Tests conducted thus far in Minnesota are inconclusive as to hardiness of Mondo in this state. According to Stadtherr, it is too early to determine whether plants of Mondo growing in experimental plots at the University Fruit Breeding Farm will survive the winter.

Mondo is actually not a grass at all, but a member of the lily family, native to Japan, Korea, and northern China, Stadtherr says. It has dark green glossy, leathery leaves about one-eighth inch wide. The leaves recurve, giving a dense cover. In late summer, light blue to white flowers often appear on the plants, which may grow from 6 to 12 inches tall.

In University tests in which the plants are given ideal environmental conditions, Mondo has spread very slowly. It propagates by underground stolons or runners similar to quack grass.

Lawn mowing should be eliminated with Mondo --an argument in its favor, as far as most householders are concerned. It does well in sun or shade, is reputed to grow well even in poor soil and remains green throughout the growing season. However, it will not tolerate heavy traffic.

Once it becomes well established, it makes a dense turf-like growth and provides an excellent ground cover where it is hardy. It may be the answer to many problem areas if it proves to be hardy in Minnesota, Stadtherr says. Until that time he recommends planting on a trial basis only.

#### HORTICULTURE IS MAJOR BUSINESS

MORRIS, MINN. --Horticultural crops bring nearly \$150 million annually in total sales to farmers and food processors in Minnesota.

Leon C. Snyder, head of the University of Minnesota horticulture department, said that the fruit and vegetable processing industry alone does a \$60 million annual business, and about \$20 million of that total goes to farmers.

Listing other horticultural enterprises, Snyder said farmers sell about \$17 million worth of potatoes annually and vegetable and truck farmers market \$5-10 million. Nurserymen do a \$7 million annual business and florists in Minnesota sell about \$15 million worth of material every year.

The commercial fruit industry sells about \$3 million worth and home fruit and vegetable gardens are worth another \$20 million, Snyder said.

He added that University research has given added impetus to horticulture in the state. In past years, some 60 new fruit varieties--including early tomatoes and muskmelons that do well in west central Minnesota--have been developed by University researchers.

Snyder noted the importance of ornamental plants, without which many farm homes would be quite drab. Right now, he said, the University is testing some 800 varieties of woody ornamentals. He said plans are now underway to develop a landscape arboretum near the Fruit Breeding farm at Excelsior.

He also stressed the importance of fresh fruits and vegetables from the home garden in improving the diets of farm families.

#### HORTICULTURIST DESCRIBES NEW ORNAMENTALS

A new flowering crabapple and two new garden chrysanthemums especially adapted to northern climates have been developed by the University of Minnesota horticulture department, L. C. Snyder, head of the department, has announced.

Named the Radiant flowering crabapple and Princess and Minnehaha chrysanthemums, they will be available to the public in 1958 from nurseries in this area.

The Radiant flowering crabapple, a small compact tree with sturdy, wide-angled crotches, is ideally suited for landscape purposes. The new foliage in spring and early summer has a bright reddish cast. Flower buds are a deep red, opening to deep pink single flowers which make a brilliant display for about 10 days. The flowers are followed by small, bright red fruits averaging  $\frac{1}{2}$  inch in diameter. The fruits adhere to the tree all winter, serving as food for the birds.

The trees are completely hardy in all parts of the state where they have been tested and appear to be highly resistant to scab, cedar rust and fire blight.

Responsible for the development of the new flowering crabapple were Snyder and horticulturists R. A. Phillips, R. J. Stadtherr and A. G. Johnson.

Introduction of the new garden chrysanthemums brings to 37 the number developed by the University of Minnesota for northern regions. The work was begun by L. E. Longley and has been continued by Phillips and R. E. Widmer.

Princess chrysanthemum is a carnation-flowered variety. The double, 2-inch flowers are old rose with gold-tipped petals which are deeply forked, giving a delicate effect. The plant is a vigorous, high-mound type which reaches a height of 15-18 inches with a spread of 18-24 inches. The well rounded growth habit of this plant makes it useful for window boxes as well as the mid-portion of the flower border. Blossoming starts early in August and within a few weeks the plant is covered with a prolific display which continues until freezing weather.

Minnehaha chrysanthemum is a medium-tall upright bushy plant with salmon colored, rose-tinted fully double flowers  $2\frac{1}{2}$  inches in diameter. Blossoming starts about mid-September and continues until killing frost. By the end of September the plant is completely covered with blooms. The

plant, almost as wide as it is tall (20 inches), should be set in the middle or at the back of the flower border. Plant habit and stem stiffness make the flowers especially adaptable for bouquets.

Miscellaneous Report 29, "New Ornamentals for Minnesota," gives a description of the new varieties.

#### GIBBERELIC ACID FAILS TO BOOST VEGETABLE YIELDS

Gibberellic acid, a material known to make spectacular growth increases in some plants, failed to increase yields in vegetable crops in recent University of Minnesota experiments.

Horticulturist R. E. Nylund reports that, in many cases, adding gibberellic acid actually decreased yields, even though there was often more plant growth.

Gibberellic acid causes plant cells to grow longer. In some experiments around the nation recently, repeated applications of the material have resulted in unusually high growth and other changes in vegetables, ornamentals and other plants.

On tomatoes, Nylund tried spraying at three rates--5, 25 and 50 ppm (parts per million.) He tried spraying at transplanting time and when the first flowers opened. In every case sprayed tomatoes yielded less than those not sprayed.

In peas and in potatoes, Nylund used seed treatments and treatments when peas were in full bloom and on potato plants 8-10 inches tall. Again, all levels of treatment and both times of treatment resulted in lower yields.

Nylund compared different levels of treatment on celery and also compared one, two and three treatments during the growing season in greenhouse tests. These treatments didn't affect plant height, but gibberellic acid did reduce the number of leaves on the celery plants.

On tomatoes and peas, there was increased plant growth from gibberellic acid, but the treatment stunted potato plants.

These tests don't mean that gibberellic acid might not be useful, Nylund says. It causes many different changes in different plants. It affects flowering, in some cases, which might be helpful with ornamental plants.

So far, its biggest value may be as a research tool, Nylund says. It may give much information on plant cell growth.

#### READ LABEL WHEN YOU BUY LAWN SEED

Read the label carefully when you buy lawn seed--if you want good returns from your expenditure of money and labor.

That recommendation comes from R. J. Stadtherr, horticulturist in charge of turf studies at the University of Minnesota. For a successful lawn, he urges home owners to select only fine to medium-textured, high-quality lawn grasses adapted to the environment, soil and light conditions of the lawn.

Since most seed companies package a number of different lawn grass mixtures in various price

ranges, it is important to study the label carefully before purchasing seed. Stadtherr suggests these points to check on the label:

- \*Percentages of permanent adapted grasses.
- \*Germination percentages.
- \*Percentage of weed seeds.
- \*Date when seed was tested.

Select a mixture which contains at least 80 percent of the fine to medium-textured Kentucky bluegrasses, red fescues and bentgrasses. The bluegrasses and red fescues blend together well and have similar growth habits. Among recommended red fescues are creeping red, Chewings, Penn State Chewings, Pennlawn, Illahee and Rainier. Generally, bentgrasses are best planted individually, though sometimes the relatively non-creeping types such as Colonial, Highland and Astoria are included in mixtures.

Such coarse, hay-like grasses as the tall fescues, Canada bluegrass, crested wheatgrass, orchardgrass and timothy should not be included in a home lawn seed mixture. Alta and Kentucky 31, new selections of tall meadow fescue, are not recommended for the home lawn, but they do have value in the athletic field or park. They are especially tolerant of heavy traffic but are coarse textured and only moderately disease tolerant.

Temporary grasses like the ryegrasses and redtop should not make up more than 20 percent of any mixture. They are used to establish a quick cover to prevent erosion and to shade the good permanent grasses which germinate more slowly.

The more expensive grass seed mixtures contain largely the small-seeded, better quality permanent grasses and are generally more economical than cheaper mixtures, considering the number of good permanent seeds per pound.

Compare germination percentages on packages of various seed mixtures. Then select a seed mixture containing the highest germination percentage, especially of the good permanent grasses. Germination percentage is given for each of the grasses in the mixture.

A good lawn seed mixture should contain less than 5 percent of other crop seeds such as oats, corn or alfalfa. Weed seeds should not exceed .3 percent. Inert matter such as chaff, dust, empty seeds and other materials which will not grow should be very low in percentage.

Date when the seed was tested is very important, Stadtherr says. Reject any packages more than nine months old.

Though grass seed mixtures are especially suited to large lawns where there may be variable soil types and trees, for renovation of small areas of established lawns the University horticulturist recommends a single species. For the open lawn in full sunlight, Kentucky bluegrasses are best on heavy, fertile soils, but the red fescues do better in more sandy soils and shady places. The rough-stalked meadowgrass might be better adapted to shady and relatively moist areas.

#### START CONTROLLING CRABGRASS NOW

Thousands of Minnesota home owners should be girding themselves now for their annual battle

against a persistent and pesky enemy of the lawn--crabgrass.

That warning comes from R. J. Stadtherr and R. E. Nylund, University of Minnesota horticulturists.

They point out that crabgrass will begin to appear in lawns in early June and continue to germinate during hot weather until early September. Crabgrass plants grow rapidly in July and August, at which time they turn reddish purple and produce many wiry seedheads resembling miniature ribs of an umbrella. Since a single plant can produce more than 200,000 seeds, the horticulturists say that if these seeds are allowed to ripen, the summer's battle is lost and the enemy is entrenched more firmly than ever.

Though there is no easy or inexpensive way to win the war against crabgrass, Stadtherr and Nylund recommend two effective plans of attack; proper lawn management and chemical warfare. Chemicals will eradicate the enemy temporarily, but only proper lawn management will win the war permanently.

Good lawn management includes planting adapted turf grasses providing a good soil base, maintaining proper moisture and soil fertility and mowing properly.

For Minnesota conditions, the most desirable permanent grasses are Kentucky bluegrass and the red fescues. Temporary grasses such as ryegrass and redtop die off after a few years, opening areas for weed penetration.

Bluegrass and the fescues grow best in well drained fertile soils which are neutral to slightly acid. The deep root system needed to develop a dense thick sod will grow only in well aerated soils containing adequate supplies of nutrients and water.

Since moisture requirements are high during the active growth periods in spring and fall, the lawn should be watered thoroughly during those seasons in dry weather. But during the heat of mid-June to late August, lawn grasses become semi-dormant and their requirements for moisture are greatly reduced. Watering should then be held to a minimum to reduce germination of crabgrass seeds. Avoid daily light sprinklings which only encourage crabgrass.

Poor color, thin grass blades, slow growth rate and abundant clover and weeds are indicators that the grass lacks nutrients. The horticulturists recommend application of fertilizer monthly during the cool months of spring and fall to get the lush growth of turf that will crowd out crabgrass.

Mowing the lawn to a height of not less than  $1\frac{1}{2}$  to 2 inches encourages good grass development. At the same time it discourages crabgrass, since these weed seeds germinate poorly in the cool shade of a tall stand of perennial lawn grass.

Chemical warfare--the second plan of attack--should be used in conjunction with sound management practices. To kill crabgrass, two or more applications of phenyl mercuric acetate (PMA) or potassium cyanate have given good control in University tests when applied at 10-day intervals after seedlings first appear. Stadtherr and Nylund suggest making the first application after the crabgrass has emerged from the soil but before it has

reached the three-leaf stage. This would be in early June for a south-facing slope. On a level lawn, the crabgrass would probably emerge about the third week in June. Soaking the soil a day before the herbicides are applied will give best results.

#### NEW FRUITS LISTED FOR MINNESOTA

Three new fruit varieties have been added to the list of hardy fruits developed by the University of Minnesota for fruit growers and home gardeners in this region, L. C. Snyder, head of the department of horticulture, announced today.

The Welcome gooseberry, Centennial and Northland apple-crabs are the three new fruit varieties being introduced by the department of horticulture this year. Stock will be available from nurseries this spring.

The new fruits are the result of years of breeding work at the University of Minnesota Fruit Breeding Farm and some years of testing there and at other locations. A. N. Wilcox, professor, and T. S. Weir, assistant superintendent of the Fruit Breeding Farm, have been largely responsible for the development of these new fruits. J. D. Winter and Shirley Trantanella of the food processing laboratory have tested the fruits for freezing and canning quality.

The Welcome gooseberry has two characteristics especially welcomed by gooseberry growers--the spines have been reduced in size and number so that the fruit can be picked with comfort and safety and the bushes are relatively resistant to disease. Plants are vigorous and productive, the mildly tart berries are red, of good size and make a good red jam. This variety also makes good pie.

The two new apple varieties are called apple-crabs because they are larger than crabapples and resemble apples in their eating quality. The Centennial apple-crab is a high-quality eating apple, small for an apple but very large for a crab. Medium early, it ripens during late August or early September. A hybrid of Wealthy apple and Dolgo crabapple, the Centennial bears heavy crops of fruit with a red blush. The fruits retain their prime condition much longer than Whitney crabs.

Because the trees are semi-dwarf, they are well adapted to planting in the home yard. They have a roundish-spreading shape and in spring are covered with a profusion of single white blossoms. The Centennial is winter hardy.

The Northland apple-crab is being introduced as a hardy and productive variety, particularly for northern Minnesota. It has been described as the best all-round crab for that area.

The attractive fruit of the Northland resembles that of one of its parents, the Dolgo, in shape and bright red color. It is larger than Dolgo but smaller than McIntosh, its other parent. It is good for sauce, jelly and pickles and for eating fresh.

Trees are medium in size and very productive. They are not entirely free from blight or scab. Ripening season is early, beginning in mid-August.

# Plant Pathology and Botany . . .

## QUACKGRASS CAN BE HARM TO SOIL

Quackgrass seems to have a double-barrelled harmful effect on soil.

Thor Kommedahl, plant pathologist at the University of Minnesota, has found that quackgrass produces some kind of substance that's poisonous to legumes and grain. The studies also show that quackgrass rhizomes-horizontal underground stems are a harboring place of organisms that cause root-rot diseases in cereal crops.

This research helps explain why alfalfa and grain often don't grow well on soil that was infested with quackgrass the year before.

New alfalfa on soil that was free of quackgrass the year before produced two to three times as much dry matter per acre as a nearby plot that had been quackgrass-infested a year earlier in one field study, Kommedahl says.

Some of the difference might be explained by the fact that quackgrass robs fertility. But in tests where fertility was carefully controlled, Kommedahl again found detrimental effects from quack.

In a greenhouse, Kommedahl raised alfalfa on sterile soil and on soil that was "contaminated" with quackgrass in three different ways. In one test, he raised quack on the soil, then sifted the soil cut and planted it to alfalfa. For a second test, he put ground-up quackgrass roots in sterile soil, and in a third test he poured into sterile soil run-off water from pots that had quackgrass growing in them.

In every case, alfalfa seeds in quackgrass-contaminated soil didn't grow properly. Some were stunted and disease-susceptible, while others didn't grow at all.

## UNIVERSITY SCIENTIST EXPLAINS ATOM IN WEED RESEARCH

The atom and the Geiger counter are helping farmers in their age-old battle against weeds.

A. J. Linck, University of Minnesota plant physiologist, says radioactive isotopes are important "tracers" for showing scientists how chemical weed-killers move through plants. By finding out more about chemical movement, scientists can recommend more effective ways to use weed chemicals.

Linck and his co-workers are spraying radioactive amino triazole--a chemical weed-killer--on perennial weeds, such as Canada thistle, quackgrass, and field bindweed.

Perennial plants grow year after year from the same underground roots and rhizomes.

"With a Geiger counter, we will be able to tell how far the chemical moves into the root system.

We know that amino triazole will kill the above-ground parts of weeds, but we don't know how much of the chemical goes into the roots under different environmental conditions. It takes a good root kill to clean out any perennial weed," Linck says.

"Also, radioactive isotopes will help us learn the fate of the chemical molecule. Again with the Geiger counter, we can tell, after certain time periods, if fragments of amino triazole still have any effect on the plant," Linck adds.

Radioactive "tracers" will improve this research, Linck says, because they make it possible to study smaller quantities of chemical molecules. By conventional chemical analysis methods, it takes larger amounts of chemical in the plant before scientists can measure it, he said.

This research is part of the "Atoms for Agriculture" project--financed by a \$100,000 research grant to the University by the Northern States Power company, Minnkota Power Cooperative, Inc., Otter Tail Power company and the Central Power Electric Cooperative.

## STALK AND ROOT ROT ARE BECOMING MORE SEVERE IN MINNESOTA CORN

Stalk and root rot in corn are becoming more severe in Minnesota than ever.

In 1956, these diseases caused an estimated loss of 10 percent of the value of the Minnesota corn crop, says J. E. DeVay, former plant pathologist at the University of Minnesota. Some fields had up to 90 percent broken stalks. Yields were reduced, too, because ears fall from rotted shanks and ears on broken stalks are often missed by pickers.

These diseases may result from several things--poor nitrogen-potash balance in the soil, susceptible hybrids, growing continuous corn and excessively high stalk populations. Corn borers and other insects may add to the problem, too. Borers often leave an entrance for stalk-rotting fungi and may distribute the fungi in their tunnels.

Growing corn after corn in some areas has resulted in severe root and stalk rot around the base of the plant.

Excessive amounts of nitrogen fertilizer in fields that were in alfalfa during the two or three previous years has cut down on the standing ability of certain hybrids. Experiments so far show that standing ability of corn stalks on such fields can be increased by applying less nitrogen and more potash.

In 1955 and '56 field surveys, plant pathologists collected samples of diseased roots and stalks from 109 different corn fields in Minnesota. They isolated at least 16 different organisms, of which two or three caused most of the root, stalk and ear rot.

## RESEARCH AIDS PLANT DISEASE STUDY

Some of the mysteries of an important plant disease in Minnesota are being unraveled under plant scientists' microscopes.

J. J. Christensen, G. H. Bridgmon, and R. D. Wilcoxson, University plant pathologists, have found that new races of wheat stem rust can arise by a process called "vegetative fusion."

This helps scientists know more about why there is often so much variation among organisms that cause stem rust and what new races plant breeders may need to be looking for.

Scientists have known for years that new and more formidable races (strains) of rust and other plant diseases may develop in fields, due to hybridization and mutation. Hybridizing of stem rust occurs when two races "cross" on barberry bushes, the disease "host plants," and mutation occurs when a new strain arises spontaneously.

Now plant pathologists know that new races may also occur by a third method--vegetative fusion of parasitic filaments. Cells of the rust organisms have microscopic, thread-like structures called "hyphae." These hyphae from different rust organisms may "fuse" or grow together and result in an entirely new race or strain of rust. The Minnesota men have been able to produce new races of stem rust in the laboratory by this method.

Whenever a new rust organism is developed in fields, there's a chance that it may attack wheat varieties that are resistant to all races that were prevalent before.

At present, both durum wheats recommended in Minnesota--Langdon and Ramsey--have resistance to most of the races of stem rust now prevalent. In 1952, race 15B of stem rust severely attacked durum wheat then grown.

In spite of this new discovery, the origin of new races on barberry still is the most important means by which new virulent races of stem rust arise, Christensen adds.

## CHEMICAL EFFECT ON CANADA THISTLE REPORTED

University of Minnesota scientists have discovered one reason why it's so difficult to completely wipe out Canada thistles with one application of present-day chemicals.

R. A. Herrett and A. J. Linck, plant physiologists have learned that amino triazole, when sprayed on Canada thistles, doesn't affect growth in all parts of the plants.

Agronomists have found that amino triazole gives satisfactory control of Canada thistles, but there are always some plants left after treatment. The same thing is true with quackgrass, which, like Canada thistles, spreads by underground stems called "rhizomes."

Herrett and Linck found that plant sugar from unaffected parts of a Canada thistle plant seems to move into leaves that were affected by the chemical, enough so the plant can recover.

It's possible, with heavy doses of the chemical, to prevent seed production and kill individual Canada thistle plants that were sprayed. However, new

plants seems to be difficult to stop rhizome growth with field applications of amino triazole.

New leaves that appear shortly after the plant is sprayed are white instead of green like normal leaves. Herrett and Linck found that amino triazole immediately interferes with respiration--sugar breakdown necessary to plant growth--in these leaves.

The white leaves can't produce plant sugar themselves, but Herrett and Linck found that sugar tends to accumulate in them anyway, and apparently comes from unaffected parts of the plant.

Leaves already on the plant at spraying time are unaffected by amino triazole; only the ones that appear after spraying turn white. Herrett and Linck suspect that plant sugars from these old leaves help the plant to stay alive.

This research, Herrett said, gives some of the background needed in developing chemicals that will more effectively kill Canada thistles and similar weeds.

## "WORLD COLLECTION" AIDS SEARCH FOR BETTER CROP VARIETIES

Some 10,000 crop varieties from around the world are aiding University of Minnesota scientists in their battle against plant diseases.

In the "world collection" of crop varieties at the University's Rosemount Agricultural Experiment Station, 3,000 varieties each of wheat, oats and barley and 1,000 flax varieties are being tested for resistance to plant disease.

This is a "survival of the fittest" project.

J. J. Christensen, head of the University's plant pathology department, says many of the varieties being grown may be good as breeding material, even if they aren't practical for Minnesota farms in their present form.

The reason, he says, is that some of these foreign varieties have resistance to diseases common in Minnesota. Plant breeders can use such varieties as "parent material" in developing new varieties that combine disease resistance with good yielding characteristics.

One of the main reasons for having the world collection of flax, Christensen says, is to find flax varieties with resistance to Pamo. No flax varieties grown so far have much resistance to that disease. Another big disease problem in flax is aster yellows, which cause plant to fail to produce seed.

Other important plant diseases in Minnesota listed by Christensen are crown and stem rust in oats, foliage diseases, root rot and head blight in barley, and stem rust, leaf rust and root rot in wheat. The world collection of varieties is being used to develop varieties more resistant to all these diseases, he said.

All told, plant diseases cost Minnesota farmers about \$150 million per year in reduced crop yields, Christensen said.

Varieties in the world collection have been supplied by the U. S. Department of Agriculture. The research work with the collection at Minnesota is being conducted in cooperation with the department of agronomy and plant genetics.

# Poultry Husbandry ...

## SPRAYING EGGS PROTECTS QUALITY

A hand sprayer can help boost the quality of eggs you sell.

Milo Swanson, poultry scientist at the University of Minnesota, recently found that eggs sprayed with egg processing oil shortly after gathering were 95 percent grade A or better after 12 days of storage at 75-85 degrees.

Untreated eggs stored for the same length of time and at the same temperature were only 12 percent grade A or better.

It's been known for some time that completely dipping eggs in oil will keep them higher in quality. Oiling prevents natural carbon dioxide in eggs from escaping. Carbon dioxide keeps albumen and yolk more stable. If the gas isn't lost, eggs stay fresh longer.

Swanson found that simply spraying the eggs after they're put small-end down into "filler-flats" is as effective as complete dipping in oil. Spraying



Milo Swanson demonstrates the egg-spraying procedure which can be used by farmers to maintain higher quality in eggs they sell.

is much simpler and more sanitary for the egg producer. It also costs very little, Swanson adds.

Oiling won't prevent spoilage in dirty eggs, Swanson points out. Nor will it avoid spoilage resulting from poor washing practices. Spraying is most effective when done on naturally clean eggs the same day they are gathered.

## WARM, CLEAN WATER NECESSARY FOR WASHING EGGS, STUDY SHOWS

If eggs must be washed, it's important for the producer to use warm, clean water containing a "sanitizer detergent."

It's even better to keep eggs clean enough so they don't need to be washed at all, says Milo Swanson, poultry scientist at the University of Minnesota.

He stored eggs cleaned by four methods from as many farms and compared them with naturally clean eggs from the same places. All eggs were stored at 50 degrees (common short-time storage temperature) for 60-70 days.

Eggs from one farm had been cleaned by dry buffing and showed no spoilage after being stored. Eggs from two of the farms were washed in warm, clean water containing detergent. These eggs showed a 4 percent spoilage or less after storage. But eggs from a fourth farm were washed in cold and reused water--a very poor procedure--and 38 percent were inedible after being stored.

On one of the farms using recommended washing procedure, eggs were cleaned in a spray-type egg washing machine containing 160-degree water. Washed eggs from this farm showed 4 percent spoilage after being stored, compared to 3.3 percent spoilage for naturally clean eggs from the same place.

Eggs on the third farm were washed in a perforated pail dipped in lukewarm water and detergent in a larger container. These eggs showed 2 percent spoilage after storing, compared to no loss in naturally clean eggs from this farm.

On the fourth farm, eggs were washed by the same device as on the third farm, with one exception: the water used was cold and had been used for washing other eggs earlier in the day. These eggs were 38 percent spoiled after storing, while naturally clean eggs from the same farm showed no spoilage loss.

Swanson explains high spoilage in eggs from the fourth farm this way: the cold water cooled the eggs, causing the contents of each egg to contract and "draw" bacteria from the dirty water through the shell and into the egg. That isn't as likely to happen if the water is clean and is warmer than the egg itself.

In addition to using clean warm water and sanitizer detergent, Swanson says it's best to dry the eggs as rapidly as possible.

## JUNIOR GEESE ARE PROFITABLE AND TASTY, SAY POULTRY SCIENTISTS

If there's ever a market for them, 10-week-old "junior geese" can increase profits for the fellow

who raises them and make a tasty bird for the family table.

Besides, junior geese have less body fat than older geese--a factor preferred by certain consumers, says Paul Waibel, poultry scientist at the University of Minnesota.

Normally, geese are hatched in the spring and kept on the farm until the holiday market in late fall, Waibel points out. But if a strong market were developed for junior geese in late summer--or if they could be stored until the holiday season--goose producers could make a better income through lower feeding costs.

Junior geese averaged 9.65 pounds per bird at 9 weeks of age in feeding trials last summer at the University. The birds on pasture ate only 2.65 pounds of mash and corn per pound of growth. In total feed costs, that amounted to less than 9 cents per pound of goose, Waibel says. The birds could have been marketed at that age at a good profit.

Then, the same birds were allowed to "scavenger" on pasture from 9 to 18 weeks of age, with no extra feed. At the end of this period, the geese averaged 10 pounds per bird--only .35 pounds more than 9 weeks earlier.

Finally, the birds were put on a fattening system of pasture and plenty of corn and oats. At 26 weeks of age, the geese averaged 13.2 pounds, but it had required 11.75 pounds of corn and oats per pound of weight gain during the fattening period. As a result, the feed cost per pound of goose during the fattening period was 29 cents--more than three times as much as for the junior geese.

More research on junior geese production is being conducted at the University, according to Waibel.

#### STUDIES ON SPOTS IN EGGS REPORTED AT NATIONAL MEETING

Minnesota poultry scientists have made a finding which may eventually help farmers avoid losses from blood and meat spots in eggs.

N. V. Helbacka, former poultry research worker and Milo Swanson, poultry scientist at the University of Minnesota, have found that blood and meat spots are two different things.

In the past, it was commonly thought that meat spots were simply blood spots that had darkened. But Helbacka and Swanson found this wasn't true. Through careful laboratory studies, they learned that most meat spots don't contain red blood cells, which are common in blood spots.

Also, by fluorescing with ultra violet light, the scientists found that meat spots contain a material called protoporphyrin, which isn't commonly found in blood spots.

Nobody knows, so far, exactly what causes either of these spots in eggs, but this research should help in further studies, Helbacka said.

Eggs that contain such spots are eliminated before they reach retail outlets, but they cause a big profit loss to egg producers.

#### JUNIOR GEESSE FOUND PROMISING IN COOKING TESTS

"Junior geese" could well become popular on Minnesota farms and dinner tables in the future.

Recent studies at the University of Minnesota show that junior geese are less greasy, roast well and provide a high proportion of edible meat in relation to oven-ready weight.

A junior goose is one marketed when not more than 16 weeks of age, explains Milo Swanson, University poultry scientist.

In the past, geese have normally been marketed at about 26 weeks. But geese make most of their growth during their first 10 weeks, meaning there could be greater net profits for producers if the birds were sold sooner.

Swanson and the late T. H. Canfield, long-time authority on goose production in Minnesota, compared Toulouse and Embden breeds and geese from African-Embden and Embden-Toulouse crosses in studies on dressing losses and meat yields of geese of different ages. They processed males and females from each breed at 8, 9, 10, 11, 16½ and 26 weeks and recorded dressing losses.

Then they roasted the birds and removed all meat from the bones to determine edible meat yield.

Swanson concluded from the results that folks who don't like the high fat content and large amount of drippings in older geese might favor the junior birds. Geese processed when 8-11 weeks old had only half as much drip loss as did 26-week-old birds.

There was a higher percentage of bone in the younger geese, but Swanson points out this was outweighed by the advantage of less drip loss in the junior geese. And on the average, younger birds had about 5-6 percent more edible meat than did older ones.

Of all breeds and crosses in the experiment, the Embdens were most uniformly acceptable in carcass appearance at all age levels.



A "junior goose" carcass, right, is compared with that of a regular goose by Paul Waibel, left, and Milo Swanson, poultry researchers.

# Rural Sociology . . .

## FEW YOUNG MEN PLAN TO FARM

Less than 8 percent of the rural young men in northeast Minnesota who graduate from high school nowadays will expect to make a lifetime of farming, if they are like those who graduated a year ago.

That's one conclusion reached by Lowry Nelson and A. Majeed Khan, rural sociologists at the University of Minnesota, after a 1956 survey of 1775 seniors in 20 Minnesota high schools in northeastern and southwestern counties.

About 30 percent of these boys hoped to go into skilled or semi-skilled professions and about 27 percent of this group said they wanted professional careers.

Of the town boys in northeastern counties, less than 1 percent said they wanted to go into farming, but nearly half of them were looking forward to professional careers. Eighteen percent expected skilled or semi-skilled work.

In southwestern counties, though, proportionally five times more boys from open country areas expected to go into farming, compared to rural northeast Minnesota. Also, there were fewer boys in southwestern Minnesota who were undecided about their future work--less than 7 percent, compared to 21 percent in the northeast.

High school senior girls, on the other hand, differed very little between the two areas in their preferences for the future.

Among girls from open country in the northeast, 35 percent chose professional work as their future work and 42 percent said they hoped for "managerial-clerical" careers. Town girls from northeast Minnesota and rural and town girls from southwestern counties showed similar preferences. In all cases, 5 percent or less elected "housewife" as an occupation.

## YOUNG PEOPLE DIFFER LITTLE ON KNOWLEDGE OF CO-OPS

Young men and women near the Twin Cities differ little in their attitudes and knowledge concerning agricultural cooperatives.

John D. Kelley and Marvin Taves, University of Minnesota rural sociologists, made this finding in a 1955 survey of young people within a 60-mile radius around the Twin Cities.

Included in the survey were 153 farm youths, 158 young people from small towns or from rural nonfarm areas and 111 from St. Paul.

Although differences were small, farm boys possessed the most knowledge on questions about how cooperatives function. St. Paul boys were second and town boys ran a close third. Scores on questions asked ran from 49.5 percent correctly answered for town boys to 51.5 percent for farm boys.

Among the girls, those from St. Paul had the highest knowledge scores on co-ops, town girls

were second and farm girls were third. These scores ranged from 47.4 percent correct answers for farm girls to 49.9 percent for urban girls.

When they figured average attitude toward co-ops, the sociologists found that almost 63 percent of the farm boys were favorable toward cooperatives, compared to 48.7 percent for town boys and 60.7 for St. Paul boys. Girls averaged 51.4 percent favorable answers from town girls, 53.2 percent for farm girls and 55.3 percent for girls from St. Paul.

The fact that St. Paul boys ran a close second in knowledge and favorable attitude toward cooperatives might be explained by the broader experience and education available to boys in a metropolitan center, say the sociologists. The same thing might explain why urban girls scored higher than either town or farm girls.

## CAREER CHOICE AFFECTED BY MANY FACTORS

Future ambitions of senior high school boys in Minnesota are closely tied up with where the family lives, what Dad does for a living, and whether the youngster talks things over with his parents or other adults.

George Donohue and Lowry Nelson, rural sociologists at the University of Minnesota, base this conclusion on a 1956 survey of 652 high school senior boys in northern and southwestern Minnesota.

They found that less than 8 percent of the rural young men in northeast Minnesota expected to make a lifetime of farming, compared to about 40 percent of rural boys in southwest counties. And none of the boys in the survey planned to be farm laborers.

For all areas in the survey, almost a third of the farm boys hoped to become farmers, while less than 3 percent of male youths from any other occupational group wished to own farms.

Also, about a third of the sons of farmers aspired to skilled, semi-skilled or unskilled positions, but few farm boys or sons of skilled or semi-skilled workers wanted positions as managers or proprietors or clerical jobs.

Less than 14 percent of all these young men said that parents or other persons in the family had any influence on their choice of future occupations. About 17 percent listed the school as influential in their choice and almost half of the boys based their choice of future occupation on some kind of personal experience.

Of students who said teachers or other school officials were helpful in making decisions, almost two-thirds hoped to get professional jobs. But only about 40 percent of those considering parents as influential sought professional work.

About half of the students who talked their future over with both parents wanted professional careers, compared to 35 percent for students who discussed it with neither parent.

# School of Forestry . . .

## PLAN FARM FENCES BEFORE BUILDING.

A good farm fence, like a building, needs to be planned before it's built.

John R. Neetzal, forester at the University of Minnesota, lists several steps for good fence construction around the farm this spring.

First, plan where you'll set the corners, ends and gates. Use treated posts so that the fence will last longer. Tests at the University have shown that treating posts can give them a service life of 20 or more years.

For ordinary line construction, use posts 6½-7 feet long and 3 inches in diameter. Use 4-6 inch posts 8 feet long for corners and gates.

Don't stretch the wire too tight. Remove no more than one-fourth of the hump from the horizontal wire on woven wire, and don't use machinery to stretch barbed wire. Use a "wrap splice" for making connections.

If possible, set the posts with a power driver. Driven posts will set tighter in the soil and driving posts is cheaper in the long run than hand digging and setting.

Use galvanized staples, 1½ inches or longer, for treated pine posts. Slope them into the wood against the pull of the wire, and drive the staples at a slight angle from parallel with the side of the post. Don't drive staples tightly against the wire.

A safety tip for building fences: Use a heavy canvas carpenter's apron to carry staples.

## WELL-MANAGED FOREST PRODUCES HIGH YIELD

Fifty-seven years of forest studies in northern Minnesota show that an acre of well-managed forest plantation can bring the owner a \$12-per-acre annual return.

A good stand of natural forest on a Minnesota farm could bring just as good returns if it's cared for properly, says D. P. Duncan, forester at the University of Minnesota.

Three plots were planted to red pine trees at the University's North Central School and Experiment Station, Grand Rapids, in 1900. J. H. Allison, retired University forester, has been keeping records on these plots since 1915.

Annual growth varied from 1.3 to 1.6 cords or from 452 to 560 board feet per acre at 60 years of age from seed, depending on which measurement you use. This growth at age 60 was estimated on the basis of past growth, and is about three times what would be expected on unmanaged natural stands.

Based on current stumpage prices, that would mean about \$12 per acre if the annual growth were sold as lumber, Duncan says.

He points out two reasons for these results:

1. The forests were heavily stocked. One plot had 220 trees per acre at 50 years of age, a second

had 317 and a third had 517 trees per acre. Annual growth at this age was highest in the plot with the heaviest stocking and value per acre was higher, even though average diameter of the trees was smaller.

2. This was a good site for red pine.

## PLANNED FORESTRY WORK AIDS FARM INCOME

BALL CLUB, MINNESOTA--A well-managed woodland can give a big boost to a farmer's income and make good use of his spare time in winter.

Quentin Daigle in Itasca county has harvested \$1,500 worth of pulpwood and sawlogs from 80 acres since 1951. His only investment, other than his labor, was for a chain saw.

Nine years ago, Daigle was looking for ways to make better use of his wooded area. He had a mixture of jack pine, Norway pine, aspen saplings and brush that he knew could bring a regular income, if managed right.

Daigle talked his situation over with Floyd Colburn, Itasca county forestry agent. Colburn helped Daigle set up a complete woodland management plan, and gave him these tips: "Pick out the trees with fire scars, split butts, and other defects and cut them. By removing them now, they'll bring a profit and you'll leave more growing room for the younger trees."

In 1948, Daigle cut 5 cords of jack pine pulpwood and 4,000 board feet of jack pine lumber, and made a net profit of \$138--enough to pay him \$1.38 for each hour he spent in the woods. Colburn gave him some pointers on marking trees for that first cutting, and since then Daigle has managed the woods on his own.

In 1951 he harvested 10 cords of pulpwood and 10,000 feet of lumber, for a total return of \$560. In 1953, he harvested 60 cords of pulpwood that brought \$960.

## CUT PULPWOOD LOSES VALUE AS IT LOSES WEIGHT

A pile of jack pine pulpwood can go down in value rapidly, if the wood is to be sold on a weight basis.

The reason is that cut pulpwood loses weight as it dries out, report O. F. Hall and T. D. Rudolph, forestry research workers at the University of Minnesota. And the weight loss is much more rapid in summer than in winter.

The speed of moisture loss depends on where the pulpwood is in the pile. In studies at the Cloquet Experiment Forest during 1956-57, Hall and Rudolph found that wood inside the pile lost 1.41 percent of its weight in a month, between December and March. From May to September, the weight loss was 3.27 percent per month or a loss of 56 cents per cord of wood.

Exposed wood on the outside of the pile actually gained weight slightly in the winter, due to ice and snow accumulation. But during summer, the exposed wood lost 5.77 percent of its weight monthly, for a loss of 98 cents per cord per month.

If a logger or farmer were selling his pulpwood on a cord (volume) basis, this weight loss wouldn't make any difference. But in recent years, there's been a trend toward selling pulpwood on a weight basis. One reason is that, depending on size of sticks, one cord of pulpwood may contain more fiber by weight than another.

Selling according to weight eliminates that problem, but wood loses weight through drying if it is stored for a long time in the woods.

Hall and Rudolph say these results apply only to green jackpine. More research is necessary to tell whether other species are affected in the same way.

### CHARCOAL MANUFACTURING POSSIBLE IN MINNESOTA

Charcoal like you have in your back-yard barbecue pit could well become a small boon to Minnesota's forest owners and to the state economy in general.

About 3,000 tons of charcoal are used every year in the state, and right now, almost every bit of it comes from out-of-state. But with small-kiln production, much of this locally used charcoal could also be locally-produced, with a relatively small number of kilns, say Richard A. Skok and Ronald I. Beazley, forestry staff members at the University of Minnesota.

Kilns can be installed with low capital investments and operating costs aren't high. And an annual production of 3,000 tons of charcoal per year in the state would mean using an additional 6,000 cords of lower grade wood--or the equivalent of about 600 acres of now unused woodland.

Most charcoal sold in Minnesota is used domestically--for outdoor cooking, restaurant use and railroad dining cars.

One of the best small kilns for commercial operation, say Skok and Beazley, is the Connecticut "cinder-block" kiln, which can produce charcoal with from 80-90 percent carbon, which is as high or higher than from most other kilns. Such a unit could be installed singly by an individual forest owner, or a battery of them could be set up without too great an investment.

An important point in profitable charcoal production, say the forestry men, is cost of wood delivered to the kiln.

### CHEMICAL AIDS PINE GROWTH IN FOREST STUDIES

Minnesota foresters have found a way to encourage natural regrowth of white pine by chemical spraying.

Henry L. Hansen and Roy R. Johnson, forestry research workers at the University of Minnesota, report that spraying with "monuron"--a chemical herbicide--resulted in up to 16 times as many white pine seedlings as in unsprayed areas.

Effectiveness of the treatment in the sprayed plots was due to the chemicals controlling aspen

and other vegetation and leaving more growing room for the pine. The studies were conducted at Itasca State Park.

The foresters used experimental plots that contained old-growth white pine along with quaking aspen, hazelnut and other trees and brush. Three spraying rates of monuron were used--16, 32, and 48 pounds per acre, all in 160 gallons of water. The foresters sprayed the plots in August, 1954; and left other plots unsprayed.

Last fall, Hansen and Johnson found that plots sprayed at 16 pounds per acre averaged 6,290 one-year seedlings per acre, compared to only 690 in unsprayed plots.

When the treatment was 32 pounds per acre, the plots averaged 11,040 one-year seedlings and 9,550 seedlings on plots that had received 48 pounds chemical per acre.

In the 32 and 48-pound-per-acre treatments, all aspen was killed except for about 10 feet along the plot boundaries. The 48-pound treatment killed all hazel brush, but about 45 percent of the hazel brush remained on the 16-pound plots two years after treatment.

Hansen and Johnson point out it's too early to determine how many of these newly germinated seedlings will survive in coming years. But the tests do show, they say, that it's possible to get good vegetative control and a good "catch" of white pine seedlings by spraying with monuron.

### CHEMICAL DEBARKER SUCCESSFUL IN UNIVERSITY TESTS

Chemicals can make removing bark from aspen pulpwood a simple task, University of Minnesota forestry research shows.

Foresters Cherrng - Jiann Shiue and L. W. Rees have found that a chemical called 2, 4, 5-T--also used for killing brush--can be sprayed or brushed on standing aspen that are later cut for pulpwood. Bark from treated trees then peels off easily.

All bark needs to be removed from trees used for pulpwood, but debarking in the past has often been an expensive, time-consuming task. One way is to peel it in the spring with an ax, when the bark slips off most readily. There are also mechanical "drum" debarkers, and, as a last resort, bark can be shaved off by hand from cut pulpwood.

In recent years, sodium arsenite has been tried as a debarker, but it has some disadvantages. First, the tree must be girdled so the chemical is applied to the wood surface just inside the bark. Second, sodium arsenite is poisonous and dangerous to use.

Shiue and Rees found that 2, 4, 5-T doesn't have these disadvantages. It works best when applied in June in a band about 12-18 inches high, 4 feet above the ground and completely around the tree. At that time, the tree is growing rapidly and tissues under the bark are immature and most easily affected. Trees can then be cut any time in summer or fall.

The trees won't peel easily when frozen, but winter-cut treated trees are easy to peel after they've thawed out. Best results, Shiue and Rees say, are when the treated trees are allowed to stand through the winter and are cut in spring before natural peeling season.

# Soils . . .

## FERTILIZERS NEEDED FOR ALFALFA

Your alfalfa fields will do better if you give them a good dose of fertilizer this spring. But don't apply any nitrogen.

Alfalfa is a soil builder, as far as nitrogen is concerned, says J. M. MacGregor, soils scientist at the University of Minnesota. He reports that in tests in Nicollet County in recent years, applying nitrogen to alfalfa fields didn't increase alfalfa yields but phosphorus fertilizer paid off well.

Five years of alfalfa experiments at the Rosemount Agricultural Experiment Station showed similar results. Adding phosphorus and potassium made good increases in alfalfa yields, but adding nitrogen was no additional help.

An average yield of alfalfa in Minnesota takes 80 pounds of nitrogen, 29 pounds of phosphorus and 58 pounds of potassium from each acre.

Since it's a legume, alfalfa draws some or all of its nitrogen from the air, but it needs to depend on the soil for minerals and moisture. That means phosphorus and potassium are often the limiting factors in alfalfa production.

Alfalfa needs fertilizer most when it's seeded, to help the young alfalfa plants get a good start. But fertilizer later on helps, too. At the Rosemount station, dividing up the fertilizer application into five annual spring applications produced 1.8 tons more hay over a five-year period than applying the same total amount of fertilizer when the alfalfa was seeded down.

## CROP MANAGEMENT AFFECTS NITROGEN NEEDS

Last year's crop and how the manure you applied to your fields may save you some money on nitrogen fertilizer.

Manure and legume crops contain valuable nitrogen. So take stock of this nitrogen already in the soil when you figure fertilizer needs.

Curtis Overdahl, extension soils specialist at the University of Minnesota, explains that a high corn yield usually requires about 100 pounds per acre of some form of extra nitrogen. But if the corn follows a legume, you can figure that 40-75 pounds of the needed nitrogen is already in the soil, depending on the legume. This amount should be subtracted from the 100 pounds.

Sweet clover is the best green manure crop for adding nitrogen. Overdahl says as much as 150 pounds of nitrogen may be in the tops and roots in the fall of the first year, but only about 75 pounds will be available to crops the following year.

Alfalfa will produce nearly as much nitrogen, and red clover about three-fourths as much as sweet clover.

Where the legume in previous years on the field has been left for hay, the nitrogen application for corn should be about 75 pounds less per acre than where corn follows corn, Overdahl says. Two or three years of alfalfa supply little more nitrogen for the first year corn than will one year of alfalfa, but will supply more for second year corn.

If each acre has received 10 tons of manure, you can subtract 25-50 pounds from the 100 pounds of nitrogen usually needed, depending on how decomposed the manure is. That means a legume along with manure would make it unnecessary to add any nitrogen.

There are exceptions to this reasoning, Overdahl adds. Corn on heavy black soil following either a legume or a manure treatment may need no additional nitrogen.

On the other hand, if there is a heavy crop residue on the field, it may be necessary to add nitrogen simply to decompose this material. Manure with large quantities of bedding may require nitrogen for decomposition. But where corn follows corn and no manure is added, the recommended 100 pounds of nitrogen per acre should be enough to decompose the stalks and supply enough nitrogen for the corn crop.

## CORN VARIES IN PHOSPHATE UPTAKE

Corn plants seem to vary in how much phosphorus they take up from the soil.

And from preliminary research, indications are that the difference may be inherited, according to A. C. Caldwell, soils scientist, and E. H. Rinke and Duane Linden, University agronomists.

If this turns out to be true, it could mean that plant breeders may be able to select inbred lines according to their ability to use phosphate fertilizer.

In tests at the University's Rosemount Agricultural Experiment Station, the researchers raised some 50 different inbred lines of corn on soil that had fertilizer with phosphate tagged with radioactive isotopes. That way, the scientists were able to test the plants with a Geiger counter to find out how much fertilizer they had absorbed.

Some inbred lines took up nearly twice as much fertilizer phosphate as did others. Also, when two high-phosphate-using inbreds were crossed, the resulting hybrids also tended to be high-phosphate users. Crossing low users tended to result in low-phosphate-using hybrids, and high users crossed with low users resulted in hybrids that, on the average, were intermediate in the amount of phosphate taken up.

That strengthened the theory that the ability of the plant to take up phosphate may be inherited. But more research will be necessary before this can be completely proven, the scientists say.

## FIVE-TON RATE USUALLY BEST FOR MANURE

Where farmers have a large acreage that needs to be covered, 5 tons of manure per acre is usually the best spreading rate.

That recommendation comes from A. C. Caldwell, University of Minnesota soils scientist, and W. W. Nelson, agronomist at the Northeast Experiment Station, Duluth, based on 40 years of field trials conducted at Duluth.

These fields had received manure only until 1944. Since then, the land had been divided into plots. Some have continued to receive manure only, others got lime and fertilizer at different rates.

In general, the heavier manuring rates brought better yields in oats, hay and potatoes. But from a practical standpoint, the 5-ton rate was best.

For example, first-year hay that received no manure, lime or fertilizer yielded 1.02 tons per acre at first cutting. With lime and fertilizer, the yield was 1.21 tons, compared to 1.55 tons where there had been 5 tons of manure applied on stubble, along with lime and fertilizer. When 5 tons of manure was applied on sod, the hay yield at first cutting was 1.85 tons per acre.

## LIMING INCREASES ALFALFA YIELDS

Liming has long-time benefits for all crops in a rotation.

So reports A. C. Caldwell, soils scientist at the University of Minnesota, who conducted liming trials for six years at the Rosemount Agricultural Experiment Station.

Caldwell, in fall 1951, applied lime treatments of 0, 3, 6, 12 and 24 tons per acre on land that was put into a corn, oats, hay, hay rotation. All plots received the same fertilizer treatment. The only difference was in the lime.

Hay yields in 1956 were .36 tons per acre higher where 3 tons of lime per acre were applied and .42 tons higher where the land received 6 tons of lime per acre. Higher liming rates, though, didn't bring hay yield increases large enough to pay the added cost for the lime.

The 3 and 6-ton liming rates increased oat yields by 3 bushels per acre.

Corn yields were no higher, on the average, on any of the limed plots. In liming trials in Mower County, however, lime increased corn yields about 8 bushels per acre.

These findings back up the reasoning used for years by soils men, Caldwell says. Liming pays most often for legumes. It often helps all crops, though, by making phosphate and other nutrients more readily available.

## PHOSPHATE INCREASES ALFALFA YIELDS

In many areas of Minnesota--particularly in west central counties--phosphorus is the plant nutrient most needed to increase alfalfa growth.

That conclusion is based in field tests under way at the West Central Experiment Station, Morris. The tests are conducted by A. C. Caldwell,

University soils scientist, in cooperation with Roy Thompson, Morris Station agronomist.

Caldwell and Thompson are comparing nitrogen, phosphate and potash alone and in different combinations on alfalfa fields. In first cuttings in 1957, plots that received 80 pounds of phosphate per acre, but no other nutrient, averaged 1,434 pounds of forage per acre more than unfertilized plots.

That was higher than for any other fertilizer treatment used--even higher than applying 20 pounds nitrogen, 180 pounds of phosphate and 80 pounds of potash per acre on the same plot.

Adding nitrogen or potash alone in these tests actually resulted in reduced yields for the first cutting--meaning that such treatments obviously weren't profitable on this soil. Where just 20 pounds of nitrogen was applied, first cutting yield averaged 700 pounds less than unfertilized plots. Forty pounds of potash alone resulted in 666 pounds less than where no fertilizer was added.

The first hay cutting was taken on June 18. Hay weights were based on 72.3 percent moisture.

## GRASS WATERWAYS HELP SAVE SOIL

Grassed waterways aren't wasted land.

They give good hay and pasture, beside erosion protection. Waterways are needed on any small draws or channels extending up a slope, or across fields where water runs in volume.

Waterways fit into any good soil management plan, along with fertilizing, liming, crop rotation, contouring and terracing, according to Paul Burson, University soils scientist. He recommends this procedure for building waterways:

Plow in the small gullies, with a back furrow, until the waterway has a broad "saucer" bottom. That way, water will spread and not concentrate. The waterway should be at least 2 rods wide, but the wider the better.

Fertilize heavily. Use 300 - 500 pounds of a complete commercial fertilizer, such as 5-20-20 or a similar mixture. Put on at least 200 pounds of ammonium nitrate--33-0-0--or an equivalent amount of nitrogen in a different fertilizer. This is important. Areas needing waterways usually have a subsoil low in nitrogen and general fertility.

Seed a legume-grass mixture. A good one is alsike clover, red top, bromegrass and timothy. Use a companion crop such as oats. Finally, spread a light application of manure or straw and anchor this material into the soil by disking "zigzag" from one side to the other.

Make repairs next spring if the waterway is winter-damaged. Keep the waterways clipped next year so that no residue piles up. Otherwise, the water may concentrate in a small area and start a gully.

## BORON IS DEFICIENT IN SOME AREAS

In some areas of Minnesota, farmers working for top alfalfa yields may need to add boron to the soil.

Charles Simkins, extension soils specialist at

the University of Minnesota, says that in some sandy soils in eastern Minnesota, boron deficiency has shown up where heavy rates of lime and potash fertilizer have been used. More lime and fertilizer increase plant growth. And increased growth means plants use up more of the soil supply of boron.

Most of this trouble, Simkins says, is likely to occur on legumes, which require more boron than most other crops.

When alfalfa is boron-deficient, leaves near the growing point turn yellow and may have a reddish tinge. Flowers fail to form and buds show up as white or light brown dead tissue.

Lower leaves, though, keep a healthy color. Later on, the plant grows out at the sides and the yellow and reddish growing points may no longer be seen.

Symptoms of boron deficiency are more likely to show up in dry weather, according to J. M. MacGregor, University soils scientist. And fortunately, the symptoms may appear before the deficiency causes any important yield decrease.

Don't confuse boron deficiency and leafhopper damage. Boron deficiency results in shorter distances between the nodes on plant stems, which doesn't occur with leafhoppers.

Where legume fields show a lack of boron, it's wise to apply 20-30 pounds of borax per acre. This material contains 10 percent boron. Don't apply more though, or plants may be "burned."

Boron-containing fertilizers are available, too. One such mixture is 0-9-27B, with "B" meaning it contains about 2 percent boron.

#### FALL FERTILIZING OKAY FOR ALFALFA

It makes little difference whether you fertilize your alfalfa fields in fall or in the spring.

Recent experiments by J. M. MacGregor, University of Minnesota soils scientist, show that applying fertilizer at either time will bring about the same results.

At the Rosemount Experiment Station, MacGregor compared spring and fall annual applications of 200 pounds of 0-20-20 fertilizer on Ranger alfalfa, over a 6-year period.

In 1951, first crop year after the experiment started, fall-fertilized alfalfa yielded 3.6 tons per acre, compared with 3.25 tons from spring application--not an important difference.

Yields in 1956 were 4.48 tons per acre for spring fertilizing, compared with 4.38 tons for fall fertilizing.

During the last three years, MacGregor says, there was a slight trend toward increased alfalfa yields where fertilizer was spring applied, but the difference for the entire 6 years was very small - 25.3 tons from spring fertilizing and 24.9 tons for fall fertilizing.

#### ANNUAL FERTILIZING BEST ON ALFALFA

Fertilizing alfalfa every year is more profitable than applying fertilizer every second year.

J. M. MacGregor, University of Minnesota soils scientist, found that annual fertilizing brought \$7.80 more net profit per acre.

On one set of alfalfa plots, MacGregor applied 300 pounds of 0-20-20 at seeding time and then added another 200 pounds of the same fertilizer every spring. On a second set of plots, he applied the same amount at seeding time, but then put on the 200-pound treatment every second spring.

Annual fertilizing yielded 8.58 tons more hay over a six-year period (1951-56) or 1.43 tons more hay per acre annually than did unfertilized alfalfa, and biennial fertilizing brought yields of 5.34 more tons or .89 tons per acre more than where no fertilizer was applied.

Also, compared to where no fertilizer was used, annual fertilizing brought \$20.20 per acre more in net profit, while biennial fertilizing resulted in \$12.76 per acre higher net gain.

#### IMPROVED PRACTICES BOOST CORN YIELDS

Soil tests, fertilizer, and higher plant population almost doubled corn yields last summer for Marvin Anderson, farmer near Rushford in Fillmore County.

Anderson, one of the contestants in the Minnesota X-Tra Corn Yield Contest, harvested 132.8 bushels per acre from his "X-Tra Yield" plot that received a liberal fertilizing according to soil tests and had more than 17,000 plants per acre--the population recommended by University of Minnesota extension soils specialists.

A plot that received no fertilizer and only had 12,700 plants per acre yielded only 67.6 bushels per acre.

The higher yield from the X-Tra Yield plot brought Anderson \$56 more per acre above fertilizer cost than the low-yielding plot. Oliver Strand, Fillmore County soil conservation agent, helped Anderson keep records on these trials.

Anderson had 28 acres of corn on his rolling farm last year. Soil tests showed that his land was high in phosphate, but needed some potash and nitrogen. The field had received 7 tons of manure per acre in the spring.

Using the tests as a guide, he applied 100 pounds of 0-0-60 fertilizer, 200 pounds of 33-0-0--before planting time and 85 pounds of 5-20-20 with the corn planter on the X-Tra Yield plot. During the growing season, he sidedressed with anhydrous ammonia, at 60 pounds of actual nitrogen per acre.

Anderson's experience was typical for the state as a whole. In general, where farmers planted 12,000 or less plants per acre on fertilized plots, yields averaged about 103 bushels per acre. But for populations of 16-18,000 plants per acre--the recommended rate--yields averaged almost 129 bushels per acre.

Also, farmers using fertilizer received an average of \$16.95 per acre return over fertilizer cost.

#### MINIMUM TILLAGE, WHEEL-TRACK PLANTING HAVE ADVANTAGES

Farmers and University of Minnesota agricultural scientists are showing how to produce 100 bushels or more corn per acre by doing less field work.

Two new cropping practices--"minimum till-

age" and tractor-track planting--make that feat possible.

"Minimum tillage" means working the soil less or not at all before planting and cultivating only when necessary to control weeds during the growing season. Tractor-track planting means planting corn directly on undisked plowed ground, in the tractor's wheel tracks.

By eliminating disking and harrowing and by cultivating less, a farmer can save up to a full hour or more of man and machine time for every acre of corn he raises, say Soils Scientists George Blake and Charles Simkins at the University.

Under the conventional corn planting system, most farmers plow the sod in fall, then disk the land several times in the spring before planting. They usually go over the field with a spike tooth harrow once before planting and once again immediately after the corn is planted. Common practice has also been to cultivate two or three times during the growing season.

The idea has been that a thorough disking makes a better seedbed, but that isn't always true. Sometimes there's a tendency to overwork the soil, which can result in soil compaction. Crops need a soil that's firm but not over-compacted. And to prevent this compaction it's necessary to avoid overworking so as to maintain a "crumb" structure in the soil.

Minimum tillage and tractor-track planting were compared with conventional seedbed preparation on 21 farms in eastern Minnesota in 1956. County agents kept records on these trials. Most of the tractor-track planting was on spring-plowed land, but a few farmers tried it on fall-plowed soil. Rollin Dennistoun, assistant superintendent of the Rosemount Agricultural Experiment Station, conducted similar tests.

Average yields for all trials were 98.9 bushels per acre with minimum tillage, compared to 95.1 bushels for fields that received conventional seedbed preparation. On spring-plowed land, yields were higher for minimum tillage on nine trials, lower on one, and the same on four trials.

Three farmers tried minimum tillage on fall-plowed soil. One made higher yields for minimum tillage, one had higher yields with conventional tillage and one had no difference.

Blake and Simkins say minimum tillage and tractor-track planting have more advantages than just the time and labor saving. For example, by staying off the field in early spring, you don't pack the soil as much.

Second, less tillage leaves a better soil structure. When the soil is loose, it has better aeration and more of the summer rain will go into the soil and stay in storage for dry periods.

Third, there's less erosion on sloping land when the soil is worked less.

#### WOOD CHIP BEDDING INCREASES POTATO YIELDS

Minnesota's forest products may be used to increase crop yields in the future.

In 1956 field trials at the University of Minnesota's North Central School and Experiment Station, Grand Rapids, potato yields were increased by up to 118 bushels per acre when wood chips used for bedding were applied with nitrogen fertilizer.

This work was done by E. L. Schmidt, A. C. Caldwell and W. P. Martin, University soils scientists, in cooperation with C. L. Cole, former station superintendent and Nils Grimsbo, station staff member. They treated plots with 0-20-0 fertilizer, then used nitrogen treatments of 0, 60 and 120 pounds per acre on different plots. The scientists compared adding untreated wood chips, chips used as bedding, and straw bedding, with plots that received none of these organic matter treatments.

Of the nitrogen rates, 60 pounds per acre was most effective. Plots that received 60 pounds of nitrogen and chips bedding yielded 363 bushels of potatoes per acre--25 percent more than plots that received no nitrogen or organic matter. The same amount of nitrogen and straw bedding raised yields by 132 bushels, for a 31 percent increase.

Adding 60 pounds of nitrogen alone, without chips or straw, brought a 41 bushel increase, and 120 pounds of nitrogen increased potato yields by only 23 bushels.

#### TRACE ELEMENTS NO HELP TO DULUTH CROP YIELDS

Minor elements were no help to crop yields in recent field experiments at the University of Minnesota's Northeast Experiment Station.

In fall, 1955, W. W. Nelson, Duluth Station agronomist, and University soils researchers added manganese, magnesium, molybdenum, boron, copper and zinc to legume-grass mixtures. Elements were added alone and in combination with sulfur.

On the first hay cutting the following year, plots that received none of the minor element treatments averaged 2.22 tons per acre. Most of the plots where the minor elements were added averaged slightly less than that, although more of the differences either way were important.

#### PERMANENT PASTURES CAN HELP DAIRY PRODUCTION

Sixty-seven 10-gallon cans of milk from 1 acre of bluegrass pasture in less than 7 days of grazing --that's possible if the pasture gets plenty of nitrogen fertilizer and if the cows receive some extra grain and hay.

These results come from a "Feed or Frolic" pasture fertilizer demonstration at the University of Minnesota's North Central Experiment Station, Grand Rapids.

A. B. Salmela, and Nils Grimsbo, station staff members and Charles Simkins, extension soils specialist and Ermond Hartmans, extension agricultural economist at the University, report the results.

They say that in a 1-acre bluegrass pasture plot where 200 pounds of nitrogen fertilizer was applied early this year, 31 cows grazed for 6.5 days, received 3.4 pounds grain daily plus free-choice hay and produced 5,432 pounds of milk during that time.

That amount of milk figures out to more than 67 10-gallon cans, with 80 pounds of milk in each can.

These results were based on pasture use up to June 28, 1957.

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