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Agricultural Economics ...

AGRIBUSINESS SHIFTS TOWARD MORE OFF-FARM BUSINESS

Agribusiness is becoming more of an off-the-farm activity than ever.

Between 1948 and the mid-1950's, Minnesota income and employment from farming went down, while income and employment from off-farm agricultural enterprises took an upward turn.

The term "agribusiness" includes farming and all businesses related to it.

Economists D. F. Fienup and D. C. Dahl point out that total income from farming in the 1948-54 period dropped by more than 30 percent, while personal income from all nonfarm aspects of agribusiness rose by more than 40 percent.

The large decline in farm employment from 1948-54, despite increased employment in "off-the-farm" sectors, resulted in total agribusiness employment dropping from 44.8 to 39.4 percent of the total Minnesota labor force.

What's the reason for these changes? More and more jobs once performed by farmers have been transferred to farm-related businesses, the economists explain. More agricultural employment opportunities are now outside farming itself.

Fienup and Dahl divide agribusiness into four groups:

* Input group--manufacturers, wholesalers and retailers who are engaged to some degree in supplying farmers with the things they need for production like seed, feed, farm machinery.

* Farming group--crop and livestock producers themselves.

* Output group--manufacturers, wholesalers and retailers engaged in processing and distributing farm products.

* Facilitating group--transportation, government specialists serving agriculture (like county agents, SCS and ASC workers) and agricultural services (like custom combining and corn shelling).

Personal income received from the input, output and facilitating groups increased more rapidly than the average of other Minnesota industries between 1948 and 1954. Employment in the facilitating and input groups also increased, but declined slightly in the output group.

Total agribusiness income declined by 4 percent, from $1.33 to $1.27 million in this period, and by 1954, accounted for 25 percent of all personal income in the state.

The large decline in farm employment from 1948 to 1954, despite increased employment in "off-the-farm" sectors, resulted in total agribusiness employment dropping from 44.8 to 39.4 percent of the total Minnesota labor force.

In spite of the income drop, farm output increased by more than 11 percent during the same period. So the decrease in income is due to a lower wage bill for hired labor and lower prices received for farm products.

Fienup and Dahl conclude that a good share of agribusiness has become increasingly independent of the well-being of farms themselves. Instead, the prosperity of the off-the-farm agricultural businesses depends on a high volume of farm production and a high level of national income and employment.

FAMILY OPERATION STILL COMMON ON MINNESOTA FARMS

Factory-made machinery hasn't brought factory-type operation to Minnesota farms.

Despite mechanization and the drop in total number of workers, farms in the state are still mostly family-operated. About 85 percent of the labor comes from the family and only 15 percent is hired--a proportion which has changed little since 1947.

G. A. Lane and D. F. Fienup, agricultural economists at the University of Minnesota, make these points.

Total number of workers on Minnesota farms has dropped sharply--from 359,000 in 1947 to 273,000 in 1958. One reason is mechanization. Labor required to produce an acre of corn decreased from 20 hours in 1944 to 8 in 1954. Labor requirements for dairy herds dropped between 20 and 30 percent in the same period.

In many cases, Lane and Fienup point out, capital has replaced farm labor. There has been little change in total acres farmed in the state during the last 10 years, even though number of employed workers dropped 21 percent. The decrease was made up for by increased investment in machinery and equipment.

Some jobs that used to be done on the farm have been shifted to related agricultural businesses. One example was the change from horses and feed, both farm-produced, to tractors and boughten fuel. Another is the shift to ready-mixed feeds and concentrates. And a third is the increase in marketing services by outside agencies.

While proportion of hired and family workers has stayed constant, there are some big variations within these two groups. Family workers vary from unpaid persons working a few hours per week to full-time operators. Hired workers range from school children working two or three months during summer to well-trained, full-time farm managers.

If it weren't for family help, many operators would have a tough time getting enough workers to do all the things that pile up in mid-summer. Most hired workers prefer and need year-round jobs.

Hourly wage rates to hired farm workers in Minnesota increased from $.71 to $.86 between 1949 and 1957. However, farm wages now are less than half as high as those in manufacturing--an important reason why many workers have left farm employment.

Lane and Fienup feel that the future role of the family-operated farm in Minnesota will depend on the family's ability to adapt to changing conditions. The conditions include access to capital,

ability to manage and assume risks in larger investments, and ability to supply the kinds and quantities of products the markets demand. Credit will continue to be important, the economists conclude. How well credit institutions adapt to changing farming needs will have important effects on the future of the family farm.

PUBLIC SCHOOL SYSTEMS CHANGE IN MINNESOTA

The little red schoolhouse may be slowly disappearing, but the system that developed it still plays a major role in educating our young people.

How public school districts are formed, how they work and how they are changing are carefully explained in a new publication from the University of Minnesota.

It's Extension Pamphlet 200, titled "Public Schools are Your Schools." The authors are Floyd O. Flom, former political scientist, and Luther J. Pickrel, extension agricultural economist.

Flom and Pickrel point out there are now about 3,000 school districts in the state. In 1910, we had 8,000.

Under current law, Minnesota has five types of districts: common (most numerous but also rapidly disappearing), independent, special, associated and unorganized territory districts.

Minnesota's school systems are under local public control of some 12,000 school board members. They hire more than 25,000 teachers and provide education for more than 600,000 pupils per year.

With few exceptions, though, public schools in Minnesota have their own governing bodies. They are not controlled by municipal, town or county government, although they are governed by state law.

It's important for citizens to understand better the school systems and the improvements they may need, Flom and Pickrel say. Besides the obvious importance of education, schools represent an annual public cost of $180,000,000.

TRUCKING MORE IMPORTANT IN GRAIN SHIPPING

Motor trucks are becoming more important in transportation of Minnesota grain.

According to a University of Minnesota survey, 40 percent of the grain purchased by elevators and shipped between October 1, 1956 and September 30, 1957, went by truck.

By comparison, estimates show that trucks hauled only 27 percent of the total grain purchases of elevators in 1954, 35 percent in 1955.

Agricultural economists Reynold P. Dahl, Rollo L. Ehrich and Richard J. Herder made the study. They point out that part of the increased truck shipments resulted from drouth in Iowa, Nebraska, and other states. Therefore, it's difficult to tell how permanent the trend will be until figures are compiled for later years.

Nearly 70 percent of all grain trucked was corn--showing the importance of this crop to Minnesota. And more than 85 percent of the trucked corn went outside the state.

Soybeans accounted for almost a fifth of all grain trucked from country elevators. About 40 percent came from south central counties.

Northwestern and west central Minnesota accounted for most wheat and barley purchases. But rail shipment is still important for these crops; only 6.3 percent of the wheat and 13.8 percent of the barley was trucked. The economists add, however, that more of each will probably be trucked in the future.

Why has trucking become more common? For one thing, rail rates on grain have doubled since 1946. Truck rates haven't increased as much.

Other advantages of trucking include better service, less time and less trouble with adjustments for claims. Trucking has some disadvantages too--such as lack of transit privilege and discounting of trucked grain at some terminals. These points, though, aren't important when grain is trucked to river terminals for shipment down the Mississippi.

Although receipts of corn and soybeans at the Minneapolis Grain Exchange, as a percentage of farm sales, have declined since 1946, increased truck shipment of these crops is probably not the main reason. The economists point out that most corn is fed to livestock and therefore goes to livestock areas. Soybeans move directly to processors, many of which are at interior points within the state.

HOG PRODUCTION HAS HIGHER RISK IN FEED EFFICIENCY

A hog farmer has a riskier business than a dairyman--at least where feeding efficiency is concerned.

That was borne out in a recent study of 149 farms in the Southeast and Southwest Minnesota Farm Management Services.

University of Minnesota economists P. H. Hoepner and S. A. Engene found that variability in feed use averaged 18 percent in dairying and 22 percent in hogs. "Variability" means, using dairying as an example, that feed use will vary no more than 18 percent above or below the average during two-thirds of the years.

Suppose that earnings for labor and capital on a farm averages $2,000 per year for dairying. And suppose earnings average $3,000 for a hog enterprise.

At 18 percent variation in feed use, dairy earnings would range from $1,370 to $2,630 in two-thirds of the years. Hog earnings, at 22 percent variation, would vary in two-thirds of the years from a loss of $80 to a gain of $6,080.

In the remaining third of the years, earnings would vary outside these ranges.

"Earnings for labor and capital" are what farm families have left over for living and savings.

There were three main reasons for the

larger variation range in hogs than in dairying. First is the difference in percentage variability. Second, a hog enterprise big enough to keep a man busy involves more feed than dairying. Third, the margin between total return and feed cost is much lower than for dairying.

Hogs in this study required an average of 500 pounds of feed to produce 100 pounds of gain. The dairy farmers used 20 pounds of total digestible nutrients, or the equivalent of 25 pounds of corn, per pound of butterfat. These figures varied widely from farm to farm and from year to year.

These comparisons took into account only the risks in feeding efficiency. Other risks that may also be involved are now being studied by the economists.

FARMERS DON'T GET GRADE INFORMATION ON HOG SALES

If meat-type hog production is ever to be widely accepted, farmers must first get more information from markets on how their hogs grade.

This, economists say, is just as important as receiving a premium price for meat-type animals.

A University of Minnesota study shows that most farmers never get grade information from the buyers. Often farmers have no idea why their hogs brought a certain price. Yet, most markets pay more for high-grading hogs as an incentive for meat-type production.

Agricultural economists Ransom Blakely and Darrell Fienup interviewed 14 commission firm salesmen and buyers from four Minnesota packing firms.

All of the salemen and buyers said they bought or sold hogs on a live graded basis. But the grading usually amounted to little more than a quick mental evaluation for an entire lot of animals.

Not a single commission firm represented in the study wrote the live grade of the hogs on the farmer's pay slip. Three said they would tell the farmer the grade of his hogs if he accompanied them to market.

Several persons interviewed thought the farmer should know how his hogs' grade without being told. But even if a hog producer did have an idea of what the grade is, there was no attempt by the commission firms to confirm his judgment.

The survey also indicated that so-called "merit buying" may be more of a talking point to attract farmers than a standardized grading system. And there was evidence that commission firms and packer buyers aren't using the same criteria. For example, body length of the hog was mentioned 10 times by commission buyers, while packer buyers mentioned it only once.

Both commission salesmen and packer buyers believed farmers are getting a premium of 75 cents to a dollar per hundred for meat-type hogs, and are docked 50 to 75 cents per hundred for overly fat animals. But Blakely and Fienup say that even when farmers do receive these premiums or discounts, it's doubtful whether they realize it. All they are told is the average price for the lot.

The buyers and salesmen estimated that less than a fifth of the slaughter hogs they handle are meat-type--showing there's a long way to go in promoting production of high-grade hogs.

Blakely and Fienup conclude it's essential for farmers to know why their hogs brought a certain price. If the farmer doesn't go to the market himself, the grade should be on the sales slip. Otherwise, a farmer may blame a generally poor market or the commission salesman for a low price. He may not realize his hogs were too fat, overweight or underfinished.

HOG MARKETING PATTERNS MAKE HEALTHY SHIFTS

Minnesota's hog producers are making some wise changes in their farrowing and marketing patterns.

Following the national trend, they're taking some of the "peaks and valleys" out of the business. The result is less month-to-month price variation and more stable income.

Kenneth Egertson, extension livestock marketing specialist at the University of Minnesota, says the most significant changes are:

* Fewer farrowings in spring and more in summer and fall, compared to past years. In 1947, for example, only 24 percent of Minnesota's pigs were born between June and November. Ten years later, 36 percent were farrowed in that period.

* A shift within the spring farrowing period itself. Twelve years ago, Minnesota farmers farrowed over 55 percent of their sows in April and May. Now, only a third of the sows farrow in these two months. December-February farrowings, on the other hand, increased from 2.6 percent in 1947 to 9.6 percent in 1957.

* Earlier slaughter market peaks, thanks to the shift in farrowing. Peak hog marketing month 15-20 years ago was January. By 1947, it had moved back to December and now October is the heaviest marketing month.

* Fewer marketings during the peak. In 1937, 14 percent of the total hog crop was slaughtered in the peak month. By 1957, the figure had decreased to only 11 percent.

* Heavier marketing in summer. While 4 percent of the 1947 year's hog crop was marketed in August, 7 percent were slaughtered in that month 10 years later.

* Earlier and less severe seasonal price declines. Now prices start to drop in August, while 15 years ago the decline didn't start until mid-September.

"DEMAND EXPANSION" NOT COMPLETE ANSWER TO SURPLUSES

Farm surpluses can't be completely eliminated by getting American people to eat more.

On the other hand, the "demand expansion" approach could at least be a partial cure for some of our surplus headaches.

A team of agricultural economists at the

University of Minnesota made these conclusions after an extensive national study. J. M. Wetmore, M. E. Abel, E. W. Learn and W. W. Cochrane took a close look at three types of demand expansion proposals:

* Supplementing consumer income for food needs.

* Reducing food prices.

* Making everybody's diet nutritionally adequate.

The economists conclude that at realistic levels, demand expansion approaches would use up no more than a third of current surplus resources in U. S. agriculture.

They did not deal with specific programs. They based their predictions on expected outcome if certain objectives under the three different approaches were successfully achieved.

Examples of programs using the "demand expansion" approach are the Food Stamp plan of the late '30s and the current School Lunch program.

First, the economists asked what would happen if low-income families were enabled to eat more and better food. For example, if consumption of families with incomes under $500 per person was increased to the level now enjoyed by families earning between $500 and $750 per capita, total consumption would increase by only 2.8 percent. In terms of farm resources used for production of domestic food needs, this would be a 2.8 percent increase. Total surplus expressed in terms of these farm resources is about 8 percent.

By following the price reduction approach, the economists found that all retail food prices would need to be cut 20 percent to get a 5.2 percent boost in use of farm resources for domestic food needs. But if the retail price cut were only 10 percent, the result would be only a 2.4 percent increase in resource use. Again, either level would fall short of using up all surpluses.

There would be a slightly larger increase in farm resource use from reducing retail prices of livestock products alone. A pound of food in livestock products uses up more farm resources than would a pound of potatoes, flour, fruits or vegetables.

Making everybody's diet nutritionally adequate could actually lead to less overall food consumption and less farm resource use for production of domestic food supplies. The reason is that one of the major nutritional problems in the U. S. is overeating and total nutrient shortages in American diets are small.

The study was conducted in cooperation with other Land Grant universities and the USDA. It is reported in Technical Bulletin 231, "Policies for Expanding the Demand for Farm Food Products in the U. S." recently issued by the University Agricultural Experiment Station.

EFFECT OF FOUR-LANE HIGHWAY ON FARIBAULT REPORTED

A superhighway on a city's edge need not spell ruin to the downtown business district--or seriously upset the rest of the community.

At least, there was no economic disaster when trunk highway 65 opened in 1955 in western Faribault, Minnesota.

Instead, the 4-lane route merely redirected some changes already under way, University of Minnesota researchers conclude.

They found that Faribault was undergoing change before, during and after the highway opening. The new route entered a city which was already dynamic and changes that did occur were not a result of the highway alone.

Dale Gustafson, agricultural economist, and Everett G. Smith, geographer, made the study. The report was released this week by the University departments of agricultural economics and geography, in cooperation with the Minnesota Department of Highways and the U. S. Bureau of Public Roads. Some of the conclusions:

* After the new highway opened, Faribault had these changes: an upturn in business starts, increased commercial construction near the new highway strip, concentrated residential construction in the southwest portion of Faribault, and continued address changes in the mixed residential-commercial sections and new residential areas.

* Business firms, mostly because of partially-controlled access to the highway, have not clustered along the new route. Without this access control, however, many firms would certainly have shifted from downtown to locations fronting on the highway.

* Businessmen took a "wait and see" attitude as to building along the new route. It was three years before many commercial firms made moves to locate near the right-of-way.

* The highway did not attract residential growth. In fact, highway noise may have even kept home builders away and repelled western expansion of the city, now having a population of 18,000.

Gustafson and Smith found that up to 20 percent of the city's businesses changed ownership, location or function each year. An average of 17 families change addresses every week.

Previous to the opening of the route, the highway had gone right through the downtown business section. The new route cuts across the city's western edge, avoiding the central business district entirely.

In 1950, 5,900 vehicles of north-south traffic flowed through downtown Faribault each day. By 1958, total daily volume of north-south traffic was up to 7,650 vehicles. But only 2,700, or a little more than a third, went through the business section.

One effect of the new highway opening in 1955 was to relieve traffic congestion in the downtown shopping area.

There had been 143 business starts and stops in Faribault from 1950-53 and 148 from 1953-55--before the new route opened. The number of stops and starts dropped off to 95 from 1955-57 and then picked up to 124 between 1957 and this year. The slow-up in activity after 1955 shows the "wait and see" attitude of businessmen.

Along the new highway band, 10 new businesses started operations and there were only three stops from 1950-59. All these stops were before the highway opened.

Gustafson and Smith conclude there is no evidence that Faribault's development has been impaired by the new highway.

Economic effects of the highway on Faribault will be measured more thoroughly in a second report.

Agricultural Engineering ...

USDA SCIENTIST DESIGNS "AUTOMATIC PILOT" FOR STEERING TRACTOR

An "automatic pilot" that steers a tractor while cultivating corn has been developed by a USDA engineer formerly at the University of Minnesota.

It takes the hard work out of one of the toughest steering jobs farmers normally have with tractors.

With this device, the driver simply starts the tractor on the right row. Then the "pilot" takes over until the tractor reaches the far end of the field.

The driver still turns the tractor around at the end of the row and into the next one. But while actually cultivating, all he need do is ride along.

Louis A. Liljedahl designed the device for use with hydraulic power steering, already a feature on many tractors. Here's how it works: A set of "feelers," which hang from an electric switch unit on the front of the tractor, straddle the corn row. If the tractor moves slightly to the left, for example, the feelers move the opposite way.

This movement closes an electric switch in the pilot mechanism, which in turn opens hydraulic valves in the power steering unit and the tractor is guided back into the proper direction.

L. A. Liljedahl on a tractor equipped with the automatic pilot.

At 4 miles per hour (normal speed for cultivating) the tractor will go only 2 or 3 feet after moving away from the row until it is back on course.

The automatic pilot does not affect the tractor's normal steering mechanism; the operator still has full control. Purpose of the device is to make for more accurate cultivating, with less injury to the corn and less fatigue for the operator. It also could make it possible to cultivate at higher speeds.

One tractor firm recently introduced a device similar in principle to the one worked out by Liljedahl. However, Liljedahl has also developed a formula for design of such a steering unit.

Future research will be on whether the pilot will work on extremely small plants, like corn or soybeans 2-3 inches high. This is the stage at which cultivating is most difficult and when automatic steering would be most helpful.

GRANULAR HERBICIDES MAY HELP ANSWER APPLICATION PROBLEM

Granular weed killers may overcome many of the objections farmers have to these chemicals. Preliminary tests at the University of Minnesota showed that both Randox and Simazin in granules can give good weed control in corn.

Despite the way they knock out weeds, many farmers don't like Randox and Simazin in sprays. Liquid Randox burns the skin. You need rubber gloves, goggles, and snug-fitting clothing when using it.

Simazin as a spray brings up mechanical problems. It comes only in "wettable powder" form, to be mixed with water. But the powder is hard to keep in suspension and can plug up nozzles and hoses. Also, the powder carrier can ruin sprayers.

Granular herbicides are applied dry, eliminating the sprayer problem. Granular Randox is less toxic and therefore less worry to the operator. So the only question is whether granules give as good control as sprays.

L. A. Liljedahl, USDA engineer, compared spray and granular forms of the two chemicals in pre-emergence "band" applications--a band 14 inches wide over the row, just after planting. He mounted the applicator on the planter in each case, applying Randox at 4 pounds and Simazin at 2 pounds per acre.

At summer's end, there were 92 pounds of weeds per acre where the spray was used and 250 where he applied granules. Either one meant good control.

Machines for applying granular weed killers may be available soon. Liljedahl used one which is quite similar to those now used for granular insecticides.

PUMP DRAINAGE COSTS STUDIED

On the average, it would cost $25 per acre of wet land to put in a pumping station as an outlet for a tile drainage system.

According to a University of Minnesota survey, this is where there is no standing water to

remove. Where surface water must be pumped, the cost is higher since it depends on the area of watershed rather than the acreage of wet land.

Agricultural engineers Curtis Larson and Deane Manbeck made these findings in a survey of 76 drainage pumping plants in southern Minnesota. Costs varied a great deal with the size of the area from which water is collected. The larger the area, the lower the cost per acre. The cost may be as low as $10 per acre if 150 acres are drained, or over $30 per acre if 25 acres or less are involved.

Where the area of the watershed is several times the area of the wet land, the cost of pumping is quite high compared to the benefits. In some cases, the area of watershed can be reduced by dikes or diversion channels.

Pumping stations are used mostly for tile drainage systems where there is no gravity outlet within the farm boundaries. The pump lifts the water from a sump to a ditch, stream or lake which may be 4 to 10 feet higher than the tile main.

Very few farmers have had trouble with their pumps or motors, the engineers found, where new equipment of a well-known make was installed. Some farmers have had trouble with the sump caving in. Square sumps must be heavily reinforced or braced inside. Silo stave sumps have proved satisfactory but require a great deal of care during construction.

HAY CONDITIONER SPEEDS DRYING OF FORAGE

Using a hay conditioner can definitely mean higher quality forage.

University of Minnesota agricultural engineers found that hay conditioned with either a crusher or crimper usually could be put into the barn a day earlier than it would have otherwise.

It's an accepted fact that the quicker hay goes into the barn after cutting, the more likely it is to retain its nutrients.

John Strait found that conditioned alfalfa hay was dried down to 22 percent or less moisture; dry enough for baling within 29 hours after cutting. This was hay that wasn't rained on.

Non-conditioned hay, on the other hand, contained from 28 to 43 percent moisture after the same length of time. It would have taken this hay, in many cases, another 5-10 hours before it would have been dry enough to put up.

These tests were mostly on hay cut at about 10 a.m. Since conditioned hay in good weather was dry enough 29 hours later, it could have been baled on the afternoon of the day following cutting. Unconditioned hay, however, usually couldn't have been baled until the third day.

Strait compared four kinds of conditioners and found that all types gave virtually the same results as far as drying is concerned.

Purpose of a hay conditioner is to crush the hay stem so it will dry faster. Normally, legume hay leaves dry faster than the stems. By the time stems are dry, leaves are often so brittle they fall off at baling time. Leaves, however, are high in protein, meaning they are important to save.

By helping the stem dry faster, conditioning can mean higher hay quality. Also, getting hay dry and off the field quicker helps a farmer take advantage of shorter periods of good drying weather.

IRRIGATION CALLS FOR GOOD QUALITY WATER

In most of Minnesota, it matters little whether irrigation water comes from lakes, ponds, rivers or wells.

The only problem is that water from some wells in certain areas contains too much sodium and boron for use on crops. But as far as surface water in concerned, there's little to worry about anywhere.

Agricultural engineers E. R. Allred, R. A. Young and D. H. Petersen at the University of Minnesota recently studied water samples from around the state.

None of the surface water samples contained more than 1,600 p.p.m. of salts. In general, there is no problem as long as the concentration is under 2,000 p.p.m. (parts per million).

There was a salt problem in some wells, however, and the biggest share of the trouble was in deep, rather than shallow wells. The problem area is along the Red River, in extreme western counties and in the southwest. Most difficult conditions were in deep wells in Marshall and Kittson counties.

In the problem areas, the engineers say a commercial chemist should check water from any well before it's used for irrigation.

Except for the salt concentration, other differences between water sources are of little importance for irrigating. It's sometimes thought that crops grow better if irrigated with water from a pond or lake, because the water is warmer. The engineers say, however, that the temperature of the water at the source does not materially affect crops. Nor do lakes or ponds contain enough algae and other organic substances for them to be preferred over well water.

NEW BUILDING IDEA TRIED AT ROSEMOUNT

A new concept in pole-frame farm buildings is being tested at the University of Minnesota's Rosemount Agricultural Experiment station.

Farm construction engineer C. K. Otis and forestry researcher John R. Neetzel say the concept involves a wall built by nailing treated 2-inch tongue-and-grooved planks to the inside of the poles. An experimental 26 x 98-foot hog farrowing house was built this way.

Up to now, most pole-type buildings have had either metal or wood siding attached to nailing girts on the outside of the poles.

The experimental idea leaves the poles exposed--no problem as far as weather is concerned, as long as the poles are well-treated.

Otis and Neetzel say such construction has possibilities for machine sheds, loafing sheds

for dairy or beef cattle, hog farrowing houses and feeding buildings.

The method takes less construction time and work, since no purlins (special members) are needed to support the roof, and no nailing girts or other framing are needed. The planks are instead nailed directly to the upright poles, act as a frame and support the roof.

It eliminates need for "double construction" near the ground level when the building is used for livestock. With conventional pole buildings (siding outside the poles) farmers often find extra siding must be nailed to poles on the inside at least 4 or 5 feet up from the ground. Otherwise, manure and litter wedges in around the poles, is hard to clean out and animals tend to push the wall off the building. The extra siding, however, wastes lumber; the engineers figured it might be more economical to put all the siding inside the poles in the first place.

Such a building has a completely smooth interior, which would keep the building more sanitary when used for livestock.

Otis and Neetzel emphasize that the idea is still experimental and will take many years of testing to determine its effectiveness.

AG ENGINEERS STUDY SMALL HAY BALES

Twelve-inch hay cubes may replace conventional hay bales on many farms in the future.

University of Minnesota farm engineers say the small, cubic bales could have several advantages. They would be easier to handle mechanically, easier to dry artifically and could help save hay quality.

John Strait and other engineers tested small bales at the Rosemount Experiment station last summer. He says the little, 10-15 pound cubes should be easy to move by conveyor from baler to trailing wagon, and from wagon to barn mow.

Agricultural engineer John Strait holds an experimental 12-inch hay cube. Below it is a conventional hay bale.

Drying the small bale is easier for several reasons. For one, hay in small bale form has twice as much exposed area per pound as hay in conventional bales, which are about 32 inches long, 18 inches wide and a foot thick. Also, nearly nine-tenths of the hay in a small bale is within 3 inches of the surface. That's compared to about two-thirds in conventional bales.

As a result, it's easier to reach all the hay in a small bale with forced air. In fact, Strait says small bales should be mow-dried almost as easily as the same amount of hay in chopped form.

Conventional bales must be stacked according to a pattern in a tightly enclosed area, if dried artificially. Neither the arranging nor the enclosing is necessary with small bales. They can be dropped and left where they fall in the mow. An ordinary duct-type drying system is all that's needed, and the bales could be dried with either heated or unheated air.

Strait is studying small bales as part of a complete haying system, involving cutting, conditioning, raking, baling, storage and drying. Conditioning speeds the field drying process, which lessens risk of quality loss due to bad weather. Then, since the bales can be dried artificially, they can be put up when the hay has 30-35 percent moisture. At such a moisture content, the leaves are tough and won't shatter.

The University men modified a conventional baler to produce the small bales.

HERRINGBONE DESIGN WORKS WELL FOR MILKING PARLOR

Thinking of putting in a milking parlor?

Then take a close look at the new herringbone type before making your final decision. According to Russell Larson, USDA engineer at the University of Minnesota, the design has some real possibilities for larger herds.

It first became popular in New Zealand and is now gaining attention here. Several makes of the herringbone parlor are now available. As its name suggests, a herringbone parlor has stalls at an angle on either side of the working alley.

Larson says that of the different sizes of herringbone parlors, the double-four (four stalls on each side) is generally best for a one-man operation. With this arrangement, you milk four cows at once on one side while the four others are brought in, fed, and made ready for milking on the other side.

In arriving at this conclusion, Larson made a stop-watch check of every step in the milking operation with different size parlors. He found that if a worker had 3.87 minutes for each animal, he would be able to get the milkers off about 83 percent of the cows as soon as they had finished milking.

With a double-four unit, Larson also found that a worker, following proper milking practices, would be able to complete all the work involved in milking a cow in 3.06 minutes.

In other words, comparing the milking time

with the time needed to do the work, Larson concluded that a double-four was about the optimum size, with enough time left over to take care of extra work or delays that might be necessary now and then.

It's possible, with a well-trained herd, for one worker to handle a double-five herringbone parlor--with 10 milking stalls. Larson says it took 3.75 minutes to do all the work for each cow in such a parlor, which is still a few seconds less than the time needed for milking. But he adds that this is pretty close figuring.

A single delay, like fitting kick-clamps, changing filters or chasing a lagging cow, could upset the schedule. So in general, the double-four is a better bet for one man.

All of Larson's calculations were based on parlors with automatic feeding equipment and pipeline milkers.

BE CHOOSY WHEN BUYING HOUSE PAINT

An all-purpose house paint? There's no such thing.

Paint that may be ideal for your farmhouse may not be the right mixture at all for the next one down the road.

So says C. H. Christopherson, farm building engineer at the University of Minnesota. The so-called low-cost "utility paints" should be used only where a short-lived paint job is all you need.

He recommends a first-grade paint--one that will hold up well for at least four or five years. And pick the right one; preferably the same kind used before. There's a wide choice of good paints available--stain-resistant, self-cleaning, mildew-resistant, fume-resistant and blister-resistant, depending on what particular problems there may be.

Christopherson says summer and early fall are ideal for painting, when temperature is between 50 and 80 degrees. But avoid those extremely hot days. The paint may get too thin for maximum durability. If it's too cold, paint oils thicken, and this makes paint harder to spread. Paint also dries slower when it's cold.

How much paint for a house? Christopherson figures a gallon for about 600 square feet on a smooth, non-porous surface.

You can put it on with brush or sprayer, but the latter method is a little more touchy--should be left for experienced operators. Rollers are all right for large flat areas, but not for wood siding.

Number of paint coats to apply depends on condition of the old paint and your personal likes and dislikes. Three coats are best on new wood, but you can use an undercoater and finish coat for a two-coat system. More important is film thickness, which should be about .005 of an inch.

SILO UNLOADERS STUDIED IN U FARM RESEARCH

More and more farmers are unloading their silos these days by pushing a button.

But mechanical silo unloaders do have some problems, apart from their cost, research at the University of Minnesota shows. Several types of unloaders have been studied there by W. A. Junnila, USDA Engineer.

Here's what he's found so far:

* Unloading time varies widely. With a 3-horsepower unit in a 14-foot silo, engineers were able to unload all the way from 80 to 180 pounds of silage per minute.

* Unloaders work better if the silo is a perfect circle.

* Frozen silage is one of the big problems. And poorest results have been where moist air from the barn rises into the silo. The moisture condenses and refreezes in the silage, and high ridges develop on both sides of the door. The machine often can't get around such ridges. One way to prevent this moist air from rising into the silo is to put an exhaust fan in the dairy barn.

* All unloaders need occasional adjustments and oiling. As silage is removed, you need to remove the doors and lower the delivery spout.

* There needs to be a little clearance between the end cutter and the wall. This silage usually falls down and no special cleaners are needed. If a cold ring freezes to the wall in winter, it can be scraped loose with a putty knife. If it isn't removed, the unit may be crowded toward the center when the guide wheels reach it.

* The equipment needs special wiring. Most important is to have large enough wires to maintain the required voltage.

There are several kinds of silo unloaders. One type unloads from the bottom, but most unload from the top. Some are suspended from the top, while others have wide wheels and ride on the surface. The suspended types are lifted clear after each operation, which prevents silage from freezing to the unit. Those with surface riders are cleared by a blower after each operation.

LAND FORMING HOLDS PROMISE FOR MINNESOTA

Farmers may never move mountains, but they can do a lot about the shape of their land.

A pair of farm engineers foresee land forming in many areas as a way to boost crop yields and make land easier to farm.

Reshaping can be done, at reasonable cost, to make better use of water. It's for land that has a lot of shallow depressions, where you need to haul soil from high spots to fill in the low ones.

Agronomy and Plant Genetics ...

INTERSEEDING ALFALFA SUCCESSFUL IN CORN IN WESTERN MINNESOTA

Corn may have some possibilities as a "companion crop" for legumes in Minnesota.

Three farmers in Lac qui Parle county last summer seeded alfalfa and red clover between corn rows with good results.

Farmers Ivan Kleven, Roy Johnson and M.G. Heimdahl made the studies in cooperation with C. A. Van Doren, U. S. Department of Agriculture researcher, and two University of Minnesota scientists--George Blake, soil physicist, and Rodney Briggs, former agronomist.

Heimdahl and Johnson seeded alfalfa on July 11 between corn rows 80 inches apart, and Kleven did the same with red clover. By the end of the summer, Heimdahl had 11 alfalfa plants per square foot and there were 13 per square foot in corn fields on the Johnson farm. Both are good stands.

Heimdahl found that alfalfa underseeded in oats produced stands equal to or better than the stands obtained by interseeding in corn. On the Johnson farm, however, using flax as a companion crop resulted in much poorer alfalfa stands than did interseeding.

Kleven had 10 red clover plants per square foot in the interseeded plots and extremely poor stands where he seeded the legume in flax.

Widening the corn rows to 80 inches did result in some yield reduction. The three farms averaged 67 bushels corn per acre where rows were 80 inches apart, which was more than 11 bushels under the 40-inch spacing.

Alfalfa and clover are normally seeded either with a crop like oats or flax in spring, or in August on fallowed land without a companion crop. However, oats and flax are both relatively low yielders, compared to corn, and seeding legumes without a companion crop means a field doesn't raise a harvestable crop for an entire summer. Soil moisture and timely rainfall may play an important role in the success of interseeding in wide row corn. Interseeding is one attempt to solve both problems, and has been under extensive study in recent years at the University.

YOUR OWN SEED MAY BE WORST YOU CAN GET

Think twice before planting seed from your own bin this spring.

This seed may be the poorest you can get. And seed from your neighbor may be no better.

On the other hand, you stand the best chance of getting a good crop by buying certified seed from a good dealer.

Harley Otto and William Hueg, extension agronomists at the University of Minnesota, point out that poor seed is really mighty expensive. It means risking poor stands, introducing more weeds, and getting a poor yield.

In spring, 1956, the Minnesota Department of Agriculture made a survey of seed which farmers were putting in their drill boxes, right out in the field. Of samples where the farmer was using his own seed, 22 percent contained so many weed seeds that, had it been offered for sale, the seed would have violated state law.

Of seed samples from neighbors, 24 percent would have violated the weed law. But only 10 percent of the seed from dealers was in violation.

Put another way, only a little more than three-fourths of the seed was of salable, or good, quality where seed came from the same farm or from a neighbor. Nine-tenths of seed from dealers was good quality.

Yet, despite the difference, more than 76 percent of the farmers were using their own seed and nearly 13 percent got it from their neighbors. Less than 8 percent bought their seed from seed dealers.

One seed sample from a farmer's own bin had 180 Canada thistle seeds per pound. At this rate, the farmer would plant 13,000 Canada thistle plants per acre--a disastrous price to pay for his own seed.

MOW DRYING AND HAY CONDITIONER ARE QUALITY AIDS

If you can afford all of them, a field conditioner, field chopper and mow curing system together make the ideal hay harvester setup.

This combination gives you more hay quality improvement and added return above cost than any other arrangement of currently-available haying equipment.

But, if you don't have a drying unit in the mow, a conditioner will do more good when used in conjunction with a baler than it will with a chopper.

In other words, if you use a field chopper, you get good hay quality only when the chopper is used along with a mow curing system.

William Hueg and Hal Routhe, extension agronomist and farm management specialists, respectively, at the University of Minnesota, draw these conclusions from recent evaluations of hay samples.

Conditioners are machines that crimp or crush the hay stem to make it dry faster and closer to the drying rate of leaves. The leaves, which contain much of the hay's feed value, are less apt to shatter at baling time if the hay is conditioned. Conditioning is done shortly after cutting the hay.

Except for conditioners, however, mechanical field equipment does little to improve hay quality. While field choppers make the job easier, they actually result in more leaf shattering than did the old-fashioned hay loader.

Balers cause some leaf shattering, but not as much as choppers. Also, field-cured chopped hay is often coarse, woody, and the leaves and

stems tend to separate when blown into the barn. Cows often don't like to eat such forage.

Hueg and Routhe conclude that using a chopper and conditioner, but no barn dryer, will result in practically no return above the added cost of the equipment--figuring hay quality, protein content and resulting price. Hay made with that combination had 11 percent protein and will be worth about $15.50 per ton if 14 percent protein hay is worth $20 per ton.

On the other hand, unconditioned hay made with a chopper and dried with a mow curing system had 14 percent protein and was worth $20 per ton. It brought the farmer $585 above the added cost of the machinery for every 100 tons of hay produced. And with chopper, conditioner and mow drying, return above added cost for 100 tons of hay was $690.

Using a baler and field conditioner but no mow dryer brought a return above cost of the equipment of $135. Baling, field conditioning and mow drying in combination resulted in a $505 return.

Hueg and Routhe note some other points to consider on balers and field choppers. A chopper can be used for several things--hay, straw, silage or stalks for bedding. It will generally handle more hay per hour than a baler, genrally has lower cost and requires less labor per ton than baling. Chopped hay, however, is harder to handle over long hauls.

Balers are more limited in the work they will do, but are better for hay that needs to be hauled a great distance. There is also a handling problem if baled hay is mow-cured; bales averaging 30-35 percent moisture when taken to the barn will weigh between 80 and 120 pounds each.

PERMANENT GRASS OFTEN HAS VALUE FOR PASTURES

Don't overlook those grass pastures when you're planning your summer dairy feeding program.

If properly managed, "permanent" grass can produce nearly as much feed value as there is in a 90-bushel-per-acre corn crop. A group of Northeast Minnesota farmers proved it last year, according to William Hueg, extension agronomist, and Lowell Hanson, extension soils specialist at the University of Minnesota.

This, however, was where the farmers used plenty of fertilizer and managed the pasture on a "ration-a-day" basis. This meant giving the cows only as much pasture area as needed for one day's eating, and moving to fresh grazing the following day.

Even in Southeast Minnesota, another group of farmers had permanent pasture yields equalling, in feed value, 63 bushels of shelled corn per acre.

To get pasture "yields" of this kind, Hueg and Hanson recommend this pasture plan:

First, select a pasture area which has good potential for improvement. Test the soil and apply phosphorous, potassium and lime according to needs early in spring. Put on 50 pounds of actual nitrogen per acre at the same time.

Use an intensive grazing system, like ration-a-day, and feed grain according to pasture conditions, milk production and condition of the cows. Clip each strip after grazed and spread the manure with a harrow.

Apply between 30 and 50 pounds of actual nitrogen after each grazing. Legume pastures may also need 40 to 100 pounds of potassium after the first grazing.

Take the surplus forage off the field as hay or silage. Cattle aren't likely to eat grass or legumes after the crop heads out.

Finally, keep some records that will tell you just how good your procedure was. Keep a check on days of grazing, milk production, grain and extra forage fed to the cows. Then next year, you'll know more about how to improve the system.

UPRIGHT SILOS HAVE BEST RECORD FOR SILAGE QUALITY

Of all types of silos, the traditional upright structure still keeps silage quality highest.

Extension agronomist William Hueg at the University of Minnesota backs that statement up with data from nearly 800 silage samples collected in recent years.

Of the samples from upright silos, 64 percent scored "excellent" or "good"--more than for any other kind of storage. Next best were samples from trench silos, scoring about 40 percent excellent or good. Only a third of the samples from bunker and stack silos scored that high.

Trench, stack and bunker silos can still make good silage, Hueg adds. But you need to use more care with these structures for best results. In each kind, the silage needs to be packed well. It's wise to cover the material with a plastic sheet to prevent surface spoilage.

Preservatives on legume silage are important, too, the evaluations showed. Also, they must be used in recommended amounts--about 10 pounds of sodium metabisulfite or 200 pounds of carbohydrate (ground grain) per ton of chopped forage.

Of samples where ground grain was used in recommended amounts, 82 percent were excellent or good, compared to 65 percent for chemical preservatives. The trouble with the chemicals was most likely the fact that it's difficult to get such a small amount of material mixed in well. Since ground grain is used in much greater quantity, mixing isn't as much of a problem. Also grain adds to feed value of the silage.

For both kinds of preservative, Hueg found silage quality was correspondingly lower when the material was used in less than recommended amounts.

DOUGH STAGE IS RIGHT TIME TO MAKE OAT SILAGE

The best time to cut oats for silage is in the dough stage.

Agronomist Rodney Briggs at the University of Minnesota last summer found three good reasons why this is so.

First, he found, the moisture content at this stage is just right--about 67 percent--for making good silage. Oats cut earlier had too much moisture. When cut later, it was too dry.

Second, oats in dough stage had a higher sugar content that oats cut at an earlier stage. And the more the sugar, the better the material will ferment.

Third, Briggs says, yields in the dough stage were higher than at any other time.

Some authorities in recent years have felt that farmers would get better oats silage by cutting it earlier--such as in the "boot" stage in mid-June. Briggs, however, found this wasn't so. Oats at that stage had far too much moisture for good fermentation, had a low sugar content and produced poor yields.

He compared oats cut at six different stages: "boot"; heading, June 25; flower, June 30; "milk," July 7; dough, July 21 and seed, July 30. Up to dough stage, the silage was better the later it was cut.

TOPPING DOESN'T PAY ON CORN

There seems to be little point in topping corn in late summer, University of Minnesota agronomists have found.

Removing the tops didn't increase yields or reduce stalk breakage in certain hybrids, it's better to plant breakage-resistant hybrids in the first place.

Agronomists J. C. Sentz and E. H. Rinke made the studies the last two summers at the Southern Experiment station, Waseca. They topped some corn on September 9, some on September 16 and some on September 26.

At harvesting time, root lodging averaged from 2.4 to 3.6 percent in topped corn and 3.2 percent in corn not topped. The differences were not big enough to be important.

Ear moisture at harvest was about the same in all plots, regardless of when or whether the tops were removed.

Corn topped September 9 when moisture averaged 53 percent yielded about 6 bushels per acre below untopped corn. However, corn topped at later dates when moisture was 49 percent or less yielded about the same as untopped plots.

There was about a third less stalk breakage in some topped hybrids, but the reduction was much lower than that in breakage-resistant hybrids.

NEW WEED KILLER SHOWS PROMISE

Atrazine, another new chemical weed-killer, promises to be a big help in controlling weeds in Minnesota corn fields.

University of Minnesota agronomist Richard Behrens applied it at 2-4 pounds of actual chemical per acre in recent research. It gave better control of annual grass and broad-leaved weeds than Simazin---up to now one of the foremost chemicals for killing weeds in cornfields.

Unlike Simazin, however, Atrazine can be used as a post-emergence treatment, after the corn comes up. This makes it possible to delay spraying until the farmer knows whether weeds will be serious enough to warrant spraying.

Simazin and Randox, another popular chemical, both must be used as pre-emergence sprays at corn planting time or at least before the corn comes up. Neither are very effective on weeds that have already emerged.

So far, Atrazine is on the market only in wettable powder form, to be mixed with water for spraying. Granular Atrazine is not yet available.

Behrens says other weed research shows that:

* It makes little difference with most anti-weed chemicals whether they are applied as sprays or in granular form. Simazin is one exception; it takes about 4 pounds of active ingredient of this chemical in granules to control weeds as well as 2 pounds will in a spray.

* A mixture called Randox-T (Randox with a special additive) seems to control both annual grass and broad-leaved weeds in corn without injuring the crop. Randox alone controls only grasses.

* Winter carryover is a problem with both Atrazine and Simazin. Where either chemical is used, enough may stay in the soil to severely injure small grains, especially oats, if planted in the same field the following spring. So the best rule is to use these chemicals only where small grains don't follow corn.

* Amoben looks promising as a pre-emergence spray on soybeans. Although it isn't on the market yet, Amoben at 2-4 pounds per acre controlled both annual grasses and broad-leaved weeds in Rosemount trials. The only recommended chemical for pre-emergence spraying on soybeans in the past, has been Randox, and it kills only grasses.

ALFALFA-BROME TOP MIXTURE FOR PASTURES

Alfalfa and bromegrass still make about the best mixture there is for dairy pastures. But a higher alfalfa seeding rate than often used might be a good idea.

That's some of the evidence from pasture studies started in 1957 at the University of Minnesota's Rosemount Agricultural Experiment station.

The studies also show that late summer forage seeding--which might be needed in many areas this summer--can be very successful.

W. F. Wedin, U. S. Department of Agriculture agronomist, and J. D. Donker, University dairy researcher, are directing the trials.

They found that a mixture of alfalfa, brome, ladino and orchardgrass seeded in August, 1957, had 30 plants per square foot last summer. Then last winter, the orchardgrass and ladino killed out completely, but enough alfalfa and brome lived through this spring to average 13 total plants per square foot--still a fair stand.

These particular plots had been seeded at 6 pounds of alfalfa per acre and had about 4-1/2

alfalfa plants per square foot this spring. Plots seeded at 8 pounds at the same time averaged nearly one more plant than that, a difference which is resulting in more forage for grazing this year.

Wedin says orchardgrass survival is apparently favored by good snow cover. But it won't live through a dry, "open," cold winter like the one just past. This is why it often overwinters well in northern counties, but usually winterkills in the southern part of the state.

In other plots, Wedin found that red ladino, and alsike clover and meadow fescue also took a heavy beating last winter. In fact, except for alfalfa and bromegrass, timothy was the only other forage crop to overwinter well in the Rosemount pasture tests.

BALED HAY CAN BE DRIED WITH PORTABLE UNIT

Here's an idea for drying hay bales mechanically--in a pole shed, outside, or most anywhere you like.

Simply stack the bales with a tunnel down the middle, close the far end, and hook up a portable drying unit to the open end. Earlier this year, research workers at the University of Minnesota's Northeast Experiment Station, Duluth, dried 12 tons of baled hay overnight this way.

W. W. Nelson, who conducted the research, figures the system is particularly handy for the farmer who doesn't have a drying unit built into a barn mow. It should work out well for a beef man, or for a dairy farmer with a loose-housing setup.

Nelson used the same type drier commonly used for corn, grain and other crops. It has a 5-horsepower motor, a 38-inch fan and a 750,000 B.T.U. heating furnace. This type drier is popular in many areas of Minnesota and many of them are portable--meaning it might even be possible to dry baled hay on a custom basis.

Also, for the farmer already owning such a drier, using it for hay too means getting more from his investment.

Drying bales calls for some careful stacking, though. Nelson and his co-workers stacked about 600 40-pound bales on boards, three layers deep on bottom and top and three rows wide on the sides and far end. This is important, since it makes the thickness of hay between the tunnel and the outside the same everywhere in the stack. If it isn't done this way, the bales farthest from the tunnel won't dry as fast or maybe not at all. Also, the bales were loosely tied, which probably also aided drying.

Bales in the experiments averaged 40 percent moisture when put in the stack. After 12-15 hours of drying, they were all down to 20 percent--dry enough for storing.

Agronomists point out that drying can mean a big improvement in hay quality. If hay is put up when still "tough"--around 40 percent moisture--more of the quality-rich leaves will be saved.

RED LEAF, YELLOW DWARF NOT CARRIED BY SEED

Here's one note of assurance for farmers with grain fields ravaged by green bug invasions.

Seed from oats fields infected with red leaf, or wheat or barley infected with yellow dwarf is all right to sow the next year.

The virus does not spread through the seed, nor is it soil-borne. As long as the seed germinates well, it's all right.

Red leaf and yellow dwarf are caused by the same virus. It is spread by green bugs like those which attacked grain fields around southern Minnesota in early June, 1959. An unusual combination of cool weather and strong winds brought the aphids into the state from the southwest.

RED CLOVER SEEDING IN 18-INCH ROWS LOOKS PROMISING

Red clover seed producers may some day get higher quality seed by planting the crop in rows 18 or 20 inches apart.

First, though, there would need to be special equipment available for handling clover this way, a University of Minnesota agronomist says.

Laddie J. Elling found that planting in rows can produce clover seed yields practically as high as broadcasting. Besides, row-seeding requires less seed at planting time and makes it possible to cultivate the crop. This can result in higher seed quality, through keeping out weeds and unwanted crops.

Elling, over a three year period, noted little difference in yields between broadcasting 4 pounds of red clover seed per acre and seeding 2 pounds per acre in 18-inch rows. In 1959, for example, row seeding was just 9 pounds per acre under broadcasting.

However, yields went down both when he planted 4 pounds per acre in rows and when he spread the rows 36 inches apart.

The studies, conducted by Elling and entomologist A. G. Peterson in northwestern Minnesota, also showed that:

* Dollard clover yields about 20 percent more than either Midland or Wegener varieties. Midland and Wegener yield about the same.

* Two reasons for the higher Dollard yield are higher blossom numbers and greater bee activity on this variety. Even though the three varieties didn't differ according to number plants per acre, Dollard had more flowering heads per acre than either of the other two. Also, Peterson counted more bees per plot on Dollard. Bees are necessary for pollination of any legume seed crop.

* Bloom begins later on Dollard than the other varieties, even though Dollard eventually has a higher total bloom.

Seed production is a major farm enterprise in northwestern Minnesota. State farmers produce 5 to 8 million pounds red clover seed per year.

Animal Husbandry . . .

PROTEIN SUPPLEMENTS STUDIED AT MORRIS

A protein supplement containing a mixture of molasses, urea and alcohol was not profitable for feeding lambs in University of Minnesota experiments.

Lambs getting the mixture gained no faster than lambs getting soybean oil meal. In fact, lambs fed the mixture actually gained slower in one case. Besides, the mixture is more expensive than soybean oil meal and lambs tend to waste it.

R. M. Jordan and H. E. Hanke made the studies at the University's West Central Experiment Station, Morris.

Protein supplements containing urea as the major source of nitrogen are generally not used in lamb fattening rations. Combining urea with molasses--and particularly alcohol--has been advanced in some areas as a way to increase utilization of the urea by animals such as sheep and cattle.

However, most evidence shows the molasses and alcohol have no effect on how well animals can utilize the urea.

Jordan and Hanke, compared soybean oil meal and the mixture both for lambs getting bromegrass and for lambs getting alfalfa hay. For those on bromegrass, there was no significant difference in gain between the two kinds of protein supplement. For lambs getting alfalfa, those fed soybean oil meal as the supplement gained .52 pounds daily while lambs on the mixture averaged .40 pounds per day. Those fed molasses and soybean oil meal averaged .43 pounds.

Jordan said the mixture costs up to $20 more per ton than soybean oil meal, meaning it isn't profitable for lambs. Also, the molasses in the mixture often sticks to the wool of lambs, resulting in greater waste.

REPORTS STUDIES ON PELLETING LAMB RATIONS

Whether it will pay to feed a pelleted ration to lambs depends mostly on how much labor and feed handling cost pellets will save.

But according to University of Minnesota research, the gain increases are not enough to pay for the extra $4 or so per ton that pelleting costs.

According to livestock scientist R. M. Jordan, pelleting trials were conducted in spring and again in fall, 1958, on lambs at the West Central Experiment Station, Morris.

In the spring trials, Jordan and H. E. Hanke at the Morris station found that lambs gained slightly faster on pelleted rations than they did on long alfalfa hay and shelled corn. They tried three pelleted rations--one of half hay and half barley concentrate.

Because of the cost of pelleting, feed cost per hundred pounds of gain was higher in all three pelleted rations than it was for lambs on long hay and shelled corn.

In the fall trials, there was little difference between gains from pelleted rations and a loose ground mixture of hay and corn. An exception: pellets containing barley resulted in slower gains than all other rations.

Whether or not the ration was in pellet form had no important effect in either study on carcass grade, yield and shrinkage during shipment to market.

Jordan and Hanke conclude that pelleting will usually increase average daily gain and average feed consumption when you compare it with long hay and shelled corn. But the difference disappears if the non-pelleted ration is ground and mixed.

CREEP FEEDING, EARLY LAMBING UP SHEEP PROFITS

Minnesota sheepmen may find that two new practices can boost their profits.

One is creep feeding lambs on grain, so they'll gain faster. Second is a switch to earlier lambing--before Feb. 20--so the fast-growing lambs reach market weight by mid-June when prices hit their peak.

R. M. Jordan, University of Minnesota livestock scientist, recently compared four different feeding systems for lambs and ewes over a 62-day period. Most economical gains, he found, came from creep feeding lambs a mixture of 9 parts grain and one part soybean meal, with ewes fed an all-roughage diet.

These lambs gained .61 pounds per day, at a feed cost of $9.91 per 100 pounds gain--lowest of all systems compared. A group in which lambs were creep-fed and ewes received grain did gain a bit faster--.64 pounds per day--but feed cost went up to $11.24.

Daily gain averaged .46 pounds per day where ewes received grain and lambs were not creep-fed, and only .36 for a lot in which neither practice was followed. Both lots also had feed costs over $11 per 100 pounds gain.

Jordan concludes that if ewes get plenty of good quality roughage, it's questionable whether they need grain. Where he fed grain to ewes and not to lambs, increases that did occur most likely resulted from lambs eating grain intended for their mothers. Besides, grain-feeding ewes increased milk production very little. So a farmer with limited grain should reserve it for the lambs.

Since giving both ewes and lambs grain did bring the most rapid gains, this practice is best if it means a higher price. For this to work out, lambs must be born by late February, or they won't be ready for market in June.

If lambs are born in mid-March or April, there's little chance to get them finished by June or early July, regardless of how they're fed. In that case, it may be most economical to creep-feed

the lamb until pasture is ready and finish the lambs in dry lot in the fall.

ARTIFICIAL BREEDING IN FUTURE FOR HOGS

Artificial breeding may in the future be as common in hog production as it is now in dairying.

University of Minnesota scientists say technical aspects of the procedure are now being refined. It's only a matter of time until it becomes widespread.

The technique is being studied cooperatively by two University departments--dairy husbandry and animal husbandry. Principal researchers are E. F. Graham, dairy physiologist, and R. J. Meade, livestock scientist.

As a physiologist, Graham is concerned with reproduction research on several classes of farm livestock--cattle, hogs and sheep. His earlier research on artificial breeding in dairy cattle provides important background for adapting the method to swine.

A recent trip to Japan by Graham led to the latest and most encouraging development in the research. He studied swine semen collection methods there and found them effective enough for general use.

Still to be worked out are semen storage, processing and freezing methods.

Artificial breeding could have a host of advantages to the swine industry. Each boar could service up to 28 times as many females per year as is now possible. Boars could be used 12 months per year instead of 6. And topnotch sires would be more readily available to small herds.

As a result, more farmers could produce good meat-type hogs.

As in dairy breeders' associations, artificial breeding in swine would probably mean keeping a number of boars in one location. Semen would be collected and distributed to area technicians for insemination.

There would be other advantages, too. Swine testing stations would become more important. Farmers would get more information on breeding. Fewer sires would be needed and a larger percentage could be "progeny-tested"--meaning getting records on their offspring. If semen could be frozen and stored for a long time, it would be possible to test a boar and continue using the semen for several years. That isn't possible now, because of the relatively short service life of boars.

Breeding has always been one of the critical problems in hog production--Minnesota's number two source of farm income. Maintaining good boars is expensive. Small producers often feel they can't afford such animals. Renting them is a problem, too.

Naturally, then, interest in artificial breeding is high. In a recent Midwest survey, 74 percent of the farmers said they would use it in swine if service were available.

The scientists say that by using semen, and figuring 6 months service per year, a boar could sire 4,160 pigs per year--figuring 8 pigs per litter. Using frozen semen and 12 months of service, the number could be doubled. By comparison, the same boar by natural service would under average conditions sire only 320 pigs for market in a single year.

There are several technical problems in artificial swine breeding, but Graham is confident they can eventually be worked out. Semen collection was a major one, until he learned of the Japanese method. The second greatest problem is semen storage, and materials for diluting it. Procedures used with cattle semen don't necessarily work with hogs.

There are some other problems, too. It's more difficult to detect and isolate swine females in heat than is true with cattle. Then there's the matter of estrus cycles. Most hog producers would prefer to have all sows in a group farrow within a very short period of time. But that might not happen if left to chance. Now, the University is experimenting with hormone treatments that would delay heat periods for any specified length of time. Then a farmer could more accurately select the time when each gilt would farrow.

HIGHER DOSE OF IRON STOPS ANEMIA IN PIGS

A higher dose of injectable iron can prevent nutritional anemia in little pigs from shortly after birth until weaning.

University of Minnesota scientists recently found that injecting 150 or 200 milligrams of iron into pigs at 3 or 4 days of age made it unnecessary to treat the pigs later. By 35 days of age, the pigs still had higher blood hemoglobin levels than did pigs injected with 100 milligrams of iron. Up to now, dosage has normally been 100 milligrams.

Hemoglobin level is a measure of whether a pig is suffering from nutritional anemia--an old problem in little pigs.

Injectable iron has been used in recent years. The trouble, though, has been that pigs injected shortly after birth at the normally recommended level--100 milligrams--often needed a second injection at about 3 weeks of age. This, of course, means extra work and expense.

R. J. Meade, swine nutritionist, H. C. H. Kernkamp, veterinary researcher, and Harvey Windles and Myron Dammann, animal husbandry researchers, recently ran two trials on this problem.

In the first trial, pigs getting a 150 or 200-milligram dosage at 3 or 4 days had higher hemoglobin levels at 35 days of age than did pigs getting only 100 milligrams at the early age. And the pigs getting the 200 milligrams had as high hemoglobin levels at 35 days as did pigs getting two injections--one at 3 or 4 days and the second at 3 weeks.

After 35 days, pigs are usually eating enough feed so they can get their iron that way.

In the second trial, 150-milligram dosages at either 3 or 7 days resulted in higher hemoglobin levels at 35 days. The scientists also tried adding vitamin B at the same time as the

injection, but found it didn't affect hemoglobin level.

Also, the researchers found that giving iron in ferric ammonium citrate form was not as effective as giving the same amount in iron-dextran. And some pigs getting ferric ammonium citrate got sick shortly after treatment. A few even died.

MORE PROTEIN DOESN'T IMPROVE HOG CARCASS VALUE

Boosting the protein content of the ration isn't a profitable way to produce a leaner pig.

Experimental results vary, but in general they show that percent of protein in a hog's diet has little effect on carcass quality.

For example, livestock researcher A. B. Salmela at the University of Minnesota's North Central Experiment station last year compared different levels of protein and carcass quality.

Hogs getting 18 percent protein from start to 100 pounds and 15 percent from then to market did yield slightly higher in the four lean cuts of slaughter weight of the pigs, compared to 14 and 11 percent protein levels. The effect disappeared, though, when figured as percentage yield of the four lean cuts of the cold carcass. There was also a difference in loin eye area at the 10th rib; pigs on the high protein level had .39 square inches more.

No other measures of carcass quality, such as backfat thickness, were affected by difference in protein level.

St. Paul campus livestock scientists R. E. Comstock, W. E. Rempel, R. J. Meade and L. E. Hanson also took part in this research.

PELLETS MAY BECOME POPULAR IN BEEF FEEDING

What's the future of pelleting in beef production?

University of Minnesota livestock scientists figure it will depend mostly on pelleting costs.

Many farmers find pellets mighty convenient for handling and feeding. As a result, and because some research also shows other advantages, the pelleting idea is getting more and more popular.

O. E. Kolari, A. L. Harvey, J. C. Meiske and W. J. Aunan summarize recent studies this way:

* Results vary on effect of pelleting on gain. In recent Minnesota studies, pelleted hay and ground corn gained 2.09 pounds per day, compared to 1.83 for animals fed long hay and ground corn. But two other feeding combinations--corn pellets with long hay and both corn and hay pellets--didn't increase gains nearly as much.

* University studies also show pelleting has little effect on daily feed intake, efficiency of feed use, and margin over feed costs. Feed intake varied from 19.2 pounds dry matter per head daily for those getting both hay and corn pellets to 21.03 for steers on pelleted hay and ground ear corn. Feeding hay and corn pellets together reduced feed requirement per pound of gain by 9 percent.

* Most research shows that high roughage rations benefit more from pelleting than rations high in corn or other energy feeds. A pelleted ration shouldn't have more than a third grain, to get the most advantage.

* Pelleting apparently doesn't make roughage more digestible. Increased total feed intake is what probably causes some animals on pellets to gain faster; pellets move through the digestive tract faster. Finely ground hay, like in pellets, apparently has a faster rate of digestibility than baled or chopped hay.

* Pelleted hay is more compact and less dusty. Some researchers feel this is more important in stimulating feed intake than reduction in bulk.

NO EFFECT FROM TRANQUILIZERS ON "SHRINK" IN SHEEP

Tranquilizers apparently do not reduce "shrink" in lambs during shipment, University of Minnesota studies show.

Also, tranquilizers do not cause lambs to gain any faster when fed during the fattening period.

Livestock scientist R. M. Jordan and other researchers split 81 feeder lambs at Greenbush, Minnesota, into three groups. They injected 27 of these lambs with 100 milligrams each of a tranquilizer called Chloropromazine. A second group of 27 lambs received a 12-milligram injection of Perphenazine tranquilizer and the rest got no tranquilizer.

The research men weighed the lambs just before treating and shipping, and then weighed them again 22 hours later when they arrived at St. Paul. The trip was 325 miles. All lambs averaged close to six pounds shrink per lamb, and the tranquilizer treatments had no effect on this shrinkage.

Lambs which had been treated with tranquilizers also did not regain their lost weight any faster than non-treated lambs.

In another trial at the West Central Experiment station, Morris, H. E. Hanke and Jordan found that a tranquilizer called Hydroxyzine did not increase gains in fattening lambs.

Lambs that received the tranquilizer at one milligram per pound of total feed averaged .41 pounds per day. A second group fed a combination of the tranquilizer and 3/4 milligram stilbestrol per pound of feed gained .38 pounds per day and untreated lambs averaged .43 pounds daily gain.

One reason for the slower gains among lambs getting the combination was lower feed consumption--a third of a pound per day less than those untreated or not getting the stilbestrol.

In other tests, adding Chloropromazine and Trifloroperazine to the feed also did not affect gains.

FATTENING LAMBS DO WELL ON RAPE PASTURE

It's often more profitable to put fattening lambs on rape pasture than to feed them on drylot.

At the University of Minnesota's West Central Experiment station, Morris, lambs kept for 53 days of a 77-day fattening period on rape pasture returned a profit of $1.20 each. Lambs fed in drylot for all 77 days actually lost 14 cents per head.

Livestock researchers H. E. Hanke and R. M. Jordan made the study with 85 lambs. They put 26 in drylot for the whole period and put 59 on rape pasture. However, the pasture "ran out" after 53 days and these lambs went into drylot for the last 24 days.

Lambs in both groups averaged .49 pounds per head daily for the entire 77 days. There was a big difference in feed costs, though. Lambs on rape had a feed cost of $5.11 per hundred pounds of gain, compared to $10.42 for those in drylot throughout the study.

Bloat was no problem among lambs on rape in these trials.

If the rape pasture had lasted for the entire period, there would have been no advantage in taking lambs off this pasture as was actually done. During the first 53 days, lambs on rape outgained those in drylot, but gained less after taken off the pasture.

HOG BREEDING PROGRAM EXPLAINED

The University of Minnesota is developing improved breeding procedures for hog production and another new hog breed.

According to livestock geneticists Ralph Comstock and W. E. Rempel, the Waseca station is the "end point" of the hog breeding research. More than 60 litters of hogs are raised per year at the station in research aimed at comparing:

1. Two methods of selecting for improvement of cross-bred pigs. At other branch experiment stations, breeding stock of the Minnesota 1, 2 and 3 breeds, developed in past years by the University, is selected according to performance of the purebreds themselves. At the Rosemount Experiment station, the selection is being done according to how well the hogs perform as parents of crossbreds. The idea of Waseca research now is to see which approach is best.

2. Crossbred hogs with a new purebred. The crossbreds involve the three original Minnesota breeds, and the new purebred--to be called the Minnesota No. 4--is being developed from crosses of those breeds.

3. Different types of cross-breeding systems. One is a three-way cross, such as produced by mating a Minnesota 2 boar with a gilt from a cross of the 1 and 3 breeds. The second is a three-breed "rotational" cross, developed at the University several years ago, and the third is a "second-order rotational" cross. The first method means that the farmer would have to buy replacements or raise them in a special crossing program. With either rotational system, he would use gilts selected from his own general stock.

Characteristics emphasized in the selection and comparisons, the scientists said, are growth rate, backfat thickness, litter size and feed efficiency.

Comstock said the Minnesota No. 4 breed is not yet fully developed; color and other characteristics are not fixed. But he added that it will be a good market hog.

The original three Minnesota breeds have been developed since 1940, largely through research started by the late L. M. Winters. The No. 1 originated from the Landrace and Tamworth breeds, the No. 2 from Poland China and Yorkshire breeds and the No. 3 is made up of Gloucester Old Spot, a Welsh breed and some other breeding.

Hogs of the No. 1 and 2 breeds are now raised on may farms in the state. A limited number of No. 3 females was sold to commercial hog breeders for the first time in 1958. It isn't yet known when No. 4 hogs will be released, Comstock says.

The idea of the No. 4, is to get in all the genes, or the genetic potential, of the other three breeds, develop the line as a pure breed and see how it compared with a three-way cross that has the same genes available. Genes are the bodies in animal cells that carry inherited characteristics.

DROUTH-DAMAGED CORN MAKES GOOD SILAGE FOR BEEF CATTLE

Can silage made from drouth-damaged corn be fed to beef cattle?

Yes--and with good results, even if the silage contains little or no grain, according to Robert E. Jacobs, extension livestock specialist at the University of Minnesota.

He says such silage can best be used for yearling or two-year-old cattle or for wintering beef calves.

Iowa State University had good success with drouth-damaged corn in a feeding trial conducted between December 22, 1955 and May 12, 1956.

The Iowa researchers had harvested drouth-damaged corn in early August, and it yielded about 5 tons per acre. There was little corn grain in the silage. It averaged only about 3 percent grain, or an equivalent of 2 bushels of corn per acre. Yet, the cattle eating the silage did well.

Silage in the Iowa trial was fed to yearling cattle, weighing about 700 pounds at the start, for 141 days. One group consumed 46.7 pounds silage, 2 pounds alfalfa-brome hay, 1.5 pounds of a 40 percent protein supplement and .22 pounds of mineral, fed free-choice. These cattle gained 1.61 pounds daily.

Another group of steers consumed 39.7 pounds silage, 1.5 pounds of 40 percent protein supplement, 8.1 pounds ground ear corn and .19 pounds mineral per day--but got no hay. They were fed 6 pounds ground ear corn daily for the first 84 days and 12 pounds daily for the last 56 days and gained 2.19 pounds per day.

Dairy Husbandry...

COW POOLS: PASSING FANCY OR DAIRY REVOLUTION?

What's the future of the cow pool in Minnesota? Will it revolutionize the dairy business? Or is it just a talked-up idea that will soon be forgotten?

You can get "yes" answers to either question. And some will predict the outcome to be something in between. At the University of Minnesota, a group of extension specialists, economists and other research men feel that the pool probably won't become too important in this state.

Reasons for these conclusions include low prices for Minnesota milk, increased cost of forages for cow pools and management problems. Many dairy farmers might have trouble finding as good a use as they now have for their land, buildings and working time if they send their cows to a pool.

A cow pool is a place where cattle owned by several farmers or other persons are kept, fed and milked. So far, the pools already operating in the Midwest could be counted on one hand. But more than a dozen are in the planning stage around the nation.

There seem to be four general types of arrangements:

* Cooperatively-owned pool, with the farmers hiring a manager and cow pool workers and with each farmer hauling feed to the pool and hauling manure away.

* Cooperative setup similar to the above, but with farmers pooling their labor and doing the work themselves.

* Privately-owned pool where farmers bring their cows in and are charged for all feed, housing, management and veterinary costs.

* Investor-type pool, where both facilities and animals are corporation-owned, and farmers and others simply own stock in the corporation.

The University men see these possible advantages in cow pools:

1. Opportunity for better working hours. Most dairy farmers are tied to their job morning and evening for 365 days per year. Putting cows in a pool might give them an 8-hour day and more time off.

2. Specialized management for the dairy herd--including help from veterinarians and other specialists not always readily available on the home farm. These advantages might be particularly important for herds now producing at low levels.

3. A chance for some farmers now on grade B markets to get into grade A production--without the required expense in buildings and facilities on the home farm.

4. A large supply of top grade milk at one point--reducing transportation and other problems for processors. It would help distributors simplify the entire milk procuring, processing and selling system.

Then flip the coin and there are several disadvantages:

1. Lack of other ways, in many cases, to market crops and labor if the cows go to a pool. In Minnesota, the bulk of the dairy farms have a good labor supply in relation to land. Also, this land is suited especially to high-forage rotations. If a family can't market these crops and find other uses for the labor, a pool would have no advantages. Besides, while roughage, family labor and the equity in buildings and equipment are all marketed at the home farm, these things must often be paid for in cash when cows are in a pool--but depending on the arrangement.

2. Higher forage costs. If hay were the only roughage, each cow would eat about 6 tons per year. Add the hauling cost to the market price for hay, and total cost would be some $50 per cow more than it would be for the same hay raised and fed on the home farm. Transportation costs would be even higher for grass silage, corn silage or fresh green chopped material.

3. Management problems. Even with the best farm managers, a pool tends to lose the personal interest of cattle ownership. Manure can be a problem too. Then there would be problems with mastitis and other diseases. Herd replacement might be difficult. Feed flavors, too, might hit milk from the entire herd in one day and affect a large supply of milk.

4. Low prices for Minnesota milk. Most economists say a farmer would need to get at least $3.50 per hundred pounds for milk and have cows averaging 400 pounds butterfat--just to break even in most pools. That's figuring $2 per hour for labor and adding interest and cash costs. Minnesota milk prices aren't that high and average butterfat production is around 250 pounds per cow annually.

How can a farmer decide whether a pool would be a good idea?

For one thing, he must remember that when he joins a pool, he becomes an investor. Yet, most Minnesota dairy farmers are short on investment capital but long on labor. If they invest in cows and put the animals in a pool, they may have little or nothing left to invest in equipment and other livestock for the home farm. So in many cases they might be better off by actually selling the cows to the pool and, that way, getting capital to invest in working equipment.

A dozen farmers in one area, each with maybe 30 or 40 cows, might pool their cattle and forages and divide up their working time so each has a 5 or 6-day work week. Farmers doing this would have to adjust their desires to those of someone else and lose some independence. Would such a scheme work? Maybe not in many places, but it's something to mull over.

The University men conclude that if cow pools are efficient enough to compete with farmers who keep their own herds, the pools will show up. Pools would no doubt be more efficient than the below-average herds, but probably wouldn't outdo the good dairymen. And even if they did compete, they would

be no panacea for the small farmer -- unless he has a good deal of capital and can find other profitable uses for his land and labor.

FEED ADDITIVES NO HELP TO DAIRY COWS

Two of the new feed additives seem to be no help to dairy cows.

University of Minnesota dairy cattle scientists make that conclusion after studies on Dynafac and Protamone.

J. D. Donker, A. C. Linnerud, V. K. Singh and H. J. Rebhan fed Dynafac to 10 milking cows at 1.5 grams per day for 3 months. They found no difference at the end of the trial in milk production, fat content of milk, feed consumed, amount of feed consumed per unit of milk produced and weight changes of the cattle.

However, the additive might benefit cows where a "subclinical"--or unrecognized--disease is present.

In the first of two trials, Protamone had no effect either on growth rate or amount of feed the heifers ate. In the second test, the heifers getting Protamone gained weight more slowly than those not fed the additive. The additive did speed up the heart rate, but this had no beneficial effect. In fact, when the heart rate approached 10 percent increase above animals not getting Protamone, the growth rate actually decreased.

DAIRY RECORDS UP INCOME FROM DAIRY COWS

HAYWARD, MINN. --It's no accident that each cow on the Chris Skaar farm makes more than twice as much profit as the average bovine in Minnesota.

Two of the big reasons for the difference are milk testing and record keeping, which the Skaars do through one of the Freeborn county Dairy Herd Improvement associations.

Last year, the 26 milking Guernseys in this herd averaged 426 pounds butterfat and a return of $285 per cow above feed costs. State average is 245 pounds fat and a return of $130 over feed.

There are really two Chris Skaars. One is the elder Chris Skaar, retired, who's commonly known as "Grandpa." The other is his grandson, 21-year-old "Chrisy," who has operated the herd since his father, Carlyle, died in 1956.

The Skaar herd has the distinction of being one of the first to be tested in Freeborn county Dairy Herd Improvement association No. 1, which in turn is the oldest such association in the state. While there have been some interruptions--such as during World Wars I and II--Grandpa Skaar, his sons and grandson have been on some kind of a testing program most of the time since 1914.

Since 1946, the herd has been tested continuously on the DHIA "Standard" plan. DHIA supervisor Lester Perschbacher, weighs, samples and tests each cow's milk once a month. He then computes monthly and annual milk production for each cow, compares this with the feed they get as shown on Chrisy's records, and estimates the return per cow.

Says Grandpa: "No man is a good enough guesser to tell, in every case, which is a good cow and which is the poor one."

Chrisy agrees whole-heartedly. "You don't have to be a mechanic to tell when a tractor isn't working right, but you need to test to find the poor cows."

"In this herd," he continues, "a cow doesn't last long if she isn't making 400 pounds butterfat by her second milking year." The only exception to this rule, he says, is when an old cow is kept a year or two after she's passed her milking peak, simply because she will produce good calves for replacement.

Grandpa Skaar admits that dairy standards are changing. "Back in the early days, when we first tested, we thought a cow was mighty good if she produced 300 pounds of butterfat in a year. Now, a cow that doesn't do better than that is a cull," he says.

"A man would be foolish to throw as much feed into a cow producing 10-20 pounds of milk per day as one giving 50 pounds."

"CULLING GUIDE" HELPS IMPROVE DAIRY HERD

PARKERS PRAIRIE--A record system that cost him a mere 25 cents helped boost milk production by 12-15 percent per cow in one year in Leo Blashack's herd.

The system takes a half hour of Blashack's time each month. But it does a bang-up job of finding the poor producers--which a farmer can't always spot without records.

This ingenious record plan is the "Milk Record and Culling Guide" which Sherman Mandt, East Ottertail county agent, first introduced in the area in January, 1958. The plan costs a quarter per copy. Blashack put it to work the following month and has used it since.

The records show that the herd averaged 976 pounds per cow in February of 1958. A year after weeding out the poor ones, Blashack upped the average to 1,131 pounds.

The Culling Guide is the last word in simplicity. Blashack simply weighs milk for each cow for one day of every month. He checks this weight against a chart in the book and gets an estimate of the cow's production for the month. At the end of the lactation period, he has the goods on each cow. If she's producing well, she stays. If she's a loafer, out she goes.

Without records, Blashack says, you simply can't consistently tell good cows from the poor ones. He has a convincing way of proving his point. He takes visitors into his barn and challenges them to point out his 5 best cows.

What happens? "Nobody yet has picked out more than one or two of the top cows," he says. "The ones most people pick rank way down in production.

"As soon as we started keeping records, we found that some cows we thought were good

weren't so good after all."

Blashack milks around two dozen Holsteins.

He was one of the first farmers in Minnesota to adopt the Culling Guide - a plan started by University of Minnesota extension dairymen in 1958. It's part of the overall Dairy Herd Improvement program and is designed specifically for farmers who aren't already on another record plan.

The Culling Guide involves total milk weight only; it doesn't include testing. But farmers like Blashack and scores of others have found that this alone is mighty important in herd improvement.

CALVES PREFER HAY OVER GRAIN AT CERTAIN AGE

In general, pelleting hay and grain won't make dairy calves gain faster.

In several University of Minnesota tests calves getting long hay and grain in meal form actually gained a little faster than calves getting pellets.

But if you're feeding pellets because of handling convenience, it may be wiser to mix the hay and concentrate together and make one pellet. If the two parts of the ration are pelleted separately, the calves may overeat on hay and not eat enough grain, thereby reducing their intake of energy.

Dairy cattle researchers W. A. Olson and J. B. Williams recently compared two systems for dairy calves: grain pellets and hay pellets mixed together, and hay and grain mixed and compressed into one pellet. They tried each system at two hay levels--40 and 60 percent.

For the first 42 days, calves on the higher hay level did a little better, regardless of whether they got the separate hay and grain pellets or the combination pellets.

During the second 42-day period, though, calves on the lower hay level gained faster and seemed to prefer hay to grain. Where hay and grain were pelleted separately, they tended to nose the feed around and eat the hay pellets first.

Olson and Williams conclude that where pellets are fed, it's better to have the entire ration mixed before pelleting, so the animal doesn't have a choice. Otherwise, the calf may not eat enough grain.

COWS PRODUCE MILK ANTIBODIES EARLY IN LACTATION

A new development in the protective milk principle has been reported by University of Minnesota dairy scientists.

Researcher Herbert Struss says cows can produce antibodies in their udders at maximum levels during any stage of the lactation (milking) period.

Up to now, it was believed that antibody production was possible only during the first few weeks after calving. Had that been true, dairy farms would have been severely limited in the amount of antibody-containing milk they could produce.

Struss found that continuous antibody production can be maintained in cows by injecting their udders with antigens (disease-producing organisms) at weekly intervals. He made the finding in work with W. E. Petersen, dairy cattle physiologist, and Berry Campbell, former anatomist at the University of Minnesota.

Petersen and Campbell first advanced the protective milk theory in 1955. It involves vaccinating a cow's udder with antigens of diseases that affect humans or other animals. The udder, Petersen and Campbell say, then produces antibodies which remain in the milk and which can produce immunity to the diseases in persons drinking the milk.

Struss used 6 cows which had been milking for periods varying from 8 to 175 days. He injected half of the udder of each with killed Brucella abortus antigen, the organism that causes brucellosis. Using killed tissues prevents actual transmission of the disease.

Then Struss checked the milk and blood for antibody levels by use of the plate agglutination test. He found no important difference in antibody level which could be traced to stage of lactation.

In another study, Struss said he injected cows with Salmonella pullorum antigens (the germs causing pullorum disease in chickens) at 5, 10 and 15-day intervals. In all but one of the cows, the milk contained the maximum antibody level by 24 days after the first injection, indicating that subsequent injections had little or no effect.

MILK REPLACERS NEED ADDED FAT

Milk replacer for calves should contain some added fat, University of Minnesota dairy cattle research shows.

W. A. Olson found that 30 percent lard added to milk replacers doubled growth of calves for the first 28 days.

Here's why this is important: Calves which grow more rapidly in the first 4 weeks, are usually healthier and better able to fight off ailments like scours or pneumonia. Faster growth is also important, of course, if the calf is being raised for veal.

Olson compared 5, 10, 20 and 30 percent stabilized lard in milk replacer diets for dairy calves. At the end of 28 days, calves on the different replacers had averaged .39, .52, .49 and .65 pounds daily gain, respectively. Those getting no fat averaged .32 pounds gain per day--or roughly half as much as those on the highest fat level.

As calves grew older, however, the extra fat became less important. At weaning time, when the calves were 42 days old, average daily gain was .76 for those getting no fat and .93 for those on the 30 percent level. Calves on other fat levels were in between these two extremes.

Calves getting no fat had more trouble with scours, Olson said.

In addition to the lard, milk replacer used in this study was made from fortified, low heat, dry skimmilk solids. A total of 33 calves were used in the study.

Dairy Industries . . .

"STABILIZERS" HELP PREVENT ICE CRYSTALS IN ICE CREAM

There's one kind of ice that has no place in ice cream--and University of Minnesota dairy scientists are finding more ways to help keep it out.

The unwanted ice is the large crystals that often form in ice cream sold from self-service cabinets or stored in home freezers.

R. J. Anderson and E. L. Thomas have found that certain "stabilizers" slow down ice crystal growth better than others. They also have found a way manufacturers can predict--before the ice cream is made--how good a job a stabilizer will do.

Stabilizers are added to ice cream mix as a general body and texture aid--but mostly to prevent excessive ice crystal growth.

Anderson and Thomas compared 10 stabilizers at rates ordinarily used by ice cream manufacturers and checked the ice cream after 2 or 3 weeks of storage in the top layer of a self-service cabinet. Certain vegetable gums (not related to chewing gum) and milk protein stabilizers resulted in less ice crystal growth, and therefore better texture, than did other stabilizers.

Some vegetable gums which made the smoothest ice cream, however, also made it excessively gummy or stocky. So the scientists are now trying to determine other factors involved in ice cream stabilizing.

Before making the ice cream, the research men checked the "basic viscosity" of the mix--thickness after aging but before putting into the freezer. As it turned out, the higher this viscosity value, the slower the ice crystal growth after storage and the better the texture. Thomas and Anderson say manufacturers could use this finding to predict stabilizer effectiveness.

Ice crystal formation actually results from temperature fluctuations which often occur in self-service cabinets and home freezers. Several stabilizers have been used to help prevent this. Before World War II the most common was gelatin, but now several others, including milk protein products and a variety of vegetable gums, are widely used.

University dairy industry men have made several findings in recent years regarding ice cream quality. For example, Thomas and V. S. Packard, in 1955, were among the first to show that aluminum wrappers can help protect quality of ice cream stored in self-service cabinets. They also found that most of the trouble that does occur is in the top layers.

SOFT CHEDDAR CHEESE MELTS BEST

Homemakers who have had trouble with cheese curdling or failing to melt properly can take a cue from research conducted by the University of Minnesota's dairy industries department.

Researchers found that the relative hardness or softness of Cheddar cheese is the best indication of ease of melting. The harder the cheese, the longer it will take to melt.

The University tests showed wide variation among samples of natural Cheddar cheese in rate of melting. Some cheese samples melted very rapidly; others would not melt at all. In cases where little heat treatment was necessary to make the cheese melt, the melted cheese was soft and easily stirred. But when samples required a long time to melt, the melted cheese was difficult to stir and generally quite stringy.

Amount of moisture and fat in the cheese was found to have little effect on the rate of melting. Acidity had a greater effect than moisture or fat, but hardness or softness of the cheese turned out to be the most important factor in melting ease.

The dairy department's interest in how natural Cheddar cheese melts was stimulated by inquiries from both housewives and men in the cheese industry. Since natural Cheddar cheese generally is more flavorful than process cheese, many homemakers prefer the natural cheese in cooked dishes. However, because natural cheese often will not melt at all or is often stringy when melted, its present use is limited.

School of Forestry ...

SUBURBAN SURVEY SHOWS MARKET FOR OAK PANELING

Popularity of the rumpus room in modern homes can mean good business for the farmer who has oak lumber to sell.

A recent survey of 48 homes in Roseville, just north of St. Paul, showed that hardwood paneling is popular for living rooms, recreation rooms and dens.

Equally important to woodlot owners, the survey showed that "character marked" paneling is actually more popular than "clear" paneling for recreation rooms. For dens, there was no difference, but the Roseville people did prefer the clear paneling in living rooms.

Foresters Roger Long and Walter Wallin at the University of Minnesota made the study.

The survey also showed that people as a whole like wide paneling with simple patterns. They liked widely-spaced grooves, compared to grooves spaced close together. Natural and bleached type finishes were more popular than darker stains and Philippine mahogany and oak were much preferred over cedar and pine paneling.

Long and Wallin found that most people aren't interested in paneling for dining rooms, kitchens and bedrooms.

Minnesota has about 1.2 million acres of oak forest, much of which isn't suitable for clear lumber uses. It does make good "character marked" paneling--which is similar in grade to "knotty pine"--and the survey shows a possible market for this material.

Character marked paneling is cheaper than the clear paneling--not because of any difference in the quality of paneling--but because the clear oak lumber is also usable for such things as furniture and the other isn't.

MILLIONS OF TREES REPLACE SCARS OF PINE COUNTY FIRE

HINCKLEY--It has taken a half century, but scars from the great fire here are now rapidly healing.

One September day in 1894, a raging forest fire burned 7 townships in this area, killed 418 people and completely destroyed the city of Hinckley. Forests of majestic pines became black, barren wasteland.

Now, millions of new evergreens are growing again in Pine county--thanks to the biggest boom in tree planting the area has ever seen.

In spring of 1959, 112 land owners planted 750,000 trees on a thousand acres of Pine county soil. They have planted two and a fourth million trees since 1953 and regard their conifers as a vital "crop of the future."

Pine county is only one example of the tree boom. Some 12-14 million trees were planted on private land around the state in 1959, totaling nearly 70 million in the past seven years.

Farmers and rural residents doing the planting mean business. Earl Meidlinger, near Finlayson, has planted 40,000 Scotch and Norway pines and other trees in the last three years, including more than 10,000 this year. Why? Meidlinger, a bank cashier in town, says trees are the best use for his one-time farm.

"Christmas trees which I cut in the next 6 or 7 years should pay the initial investment for the planting," he says. After that, he figures on making some post cuttings and later harvesting some trees as pulpwood.

Meidlinger, Roland Theis and another neighbor "pool" their tree planting efforts. They use a tractor-drawn tree planter which was made from an old plow beam and scrap iron. Cost: about $80.

Axel Hansen, Jr., Pine county extension forestry agent, sees several benefits from trees, in addition to the Christmas market. "They're cover for the land," he points out. "And they make possible future harvests of a variety of timber products. Also, they increase property value, an important consideration." Hansen points to a major public benefit. Tree planting here resulted in large areas of land--once tax-delinquent--being returned to the tax rolls.

Up at Sturgeon Lake, John Cunningham and R. L. Dunaski have planted 200,000 trees for the Christmas market since 1951. They planted in six different locations--meaning less chance of getting burned out by a forest fire, should one occur.

They marketed a few trees in 1957 and sold about 1,500 to Twin City Christmas lots the next winter. They, too, like Scotch pines, but also have plenty of Norway pines and Balsam firs. Their ultimate goal: a 60,000 tree "turnover" every year. They will plant that many trees and harvest what was planted 7 years earlier--all in the same 12 months' period.

"Not that we can harvest as many as we plant," John explains, "because you have to figure on losing some trees over the years. Then, some just don't develop into good Christmas trees, despite the pruning and care you give them. But trees that survive and don't have good shapes can usually be sold for boughs and trimming."

With more people raising trees, will the Christmas market remain? "There will always be a good market for quality trees," Cunningham answers. "But we need standard Christmas tree grades. That way, you could sell trees in large quantities over the telephone, and the wholesale buyer would know exactly what he's getting."

There's more behind the tree planting boom than just the business prospects. Parker Anderson and Marvin Smith, University of Minnesota extension foresters, call it a "deeply-rooted philosophy of stewardship of the land--a satisfaction people get from reviving forest land."

Probably more than ever since 1894, Pine county definitely deserves its name.

LARGE TREES MAKE GOOD WILDLIFE COVER

A good way to make evergreen cover for deer, grouse and other wildlife is to transplant trees 6 to 8 feet tall.

Five such wildlife cover areas planted in 1934 in northeastern Minnesota have been thoroughly successful, according to L. W. Krefting, a U. S. Fish and Wildlife Service biologist at the University of Minnesota.

Three of the plantings consisted of 302 balsam fir trees 6-8 feet tall when planted 25 years ago. A fourth was black spruce and the fifth was both black and white spruce, about 8 feet tall at planting time. All of the trees came from natural stands near the transplanting area.

Survival ranged from 42-85 percent in the balsam fir. The black spruce planting was in an aspen stand and 84 percent survived. However, hares damaged the mixed black and white spruce plantings and only 36 percent lived until 1958.

The balsam fir trees now average from 10 to 33 feet tall and from 1.4 to 4.8 inches in diameter.

Krefting says the study shows that deer, ruffed grouse, hares, red squirrels and moose have used the plantings as protective covering in winter. Apparently, he says, the areas are attractive to animals because of wind protection and reduced snow depth.

Best spacing for all the plantings, he says, was about 4 x 4 feet. The area should be at least a tenth of an acre in size.

FORESTERS FIND CLUE TO PREVENTING WAVINESS IN DRIED ASPEN LUMBER

A new finding that could make aspen trees more valuable for commercial lumber has been made at the University of Minnesota.

Forest products researchers have some clues to why the surface of some aspen lumber takes on a wavy washboard effect during kiln drying. The trouble seems to be that certain wood cells collapse in the process. The findings could lead to drying methods which will avoid the waviness.

Like any lumber, green aspen must be kiln-dried before it can be used in paneling, furniture or other high-quality products. If wavy areas develop, they must be planed out, and half the lumber may be wasted.

This characteristic is one reason why wood products men often object to aspen--the most common tree species in Minnesota. But if it could be eliminated, aspen would be valuable lumber for manufacturing. It has good color, even grain, holds nails and screws well and is easy to paint.

The problem was studied by A. E. Kemp, formerly at the University, and R. L. Hossfeld and L. W. Rees, forestry researchers.

The waviness occurs because certain sections of the lumber collapse, or sink in. But finding out just when and how the collapse takes place was a puzzle. Temperature in a drying kiln goes up to 180 degrees and the humidity may reach 90 percent. Naturally, no person could stay in the kiln under such conditions and watch the wood dry.

Kemp designed a machine that would scan small changes in profile of lumber as it dried, and register the changes on a meter outside the kiln.

Collapse occurred early in the drying process--usually between 44 and 150 minutes after drying started. Kiln humidity made a difference, too.

Most of the collapse was in the "wet wood"--appropriately named for its higher moisture content.

Through repeated tests, Kemp determined conditions under which aspen could be dried without--theoretically, at least--resulting in any collapse. Whether this can be put to use commercially is a matter for further testing.

LATH MILL BOOSTS FOREST INDUSTRY

GRAND RAPIDS--Strips of wood 4 feet long, an inch and a half wide and a mere half inch thick have built the framework for a $160,000 annual business here.

The strips are lath--made mostly from popple, that tree you see everywhere in northern Minnesota and which some people call worthless. And the lath is giving a boost to the Rural Development program here.

Just a year and a half ago, Clair Cole and his son, Ray, employed two extra men, and were in the not-too-profitable box lumber business.

Now, the Coles turn out more than 50,000 lath every day and are turning away other orders they can't fill. In 1959, they produced some 8 million--laid end to end, enough lath to reach across the U. S. twice.

Firms buying the lath use it for slatted floors in poultry houses, for snow fencing and for fences around temporary silos.

The business brings outside money into northern Minnesota, provides added employment for local people and furnishes a good use for surplus popple--or aspen, as foresters call it.

How did it happen? "I had been in the lumber business 25 years," Iowa-born Clair Cole relates. "I first produced railroad ties and went into box lumber in 1940. This was good business during the war, but it fell off in recent years.

"We were looking hard for a better market. Then one day, Floyd Colburn (Itasca county extension forestry agent) showed me a letter from Parker Anderson, a University of Minnesota extension forester. The letter told of someone in Illinois who wanted to buy lath.

"We never did sell lath to that particular company. But knowing that lath was in demand encouraged us. So we checked around the country and decided to go into lath production on a big scale."

The change was no snap to make. "It takes a big volume to make lath business pay," Clair continues. "Each lath sells for just 2 cents. A person shouldn't go into this business unless he can produce at least 30 to 40 thousand lath every day."

The Coles almost completely re-tooled their operation, housed in a 100-foot round roof building on the banks of the Mississippi river. Key

piece of added equipment is a $40,000 "gang saw" that turns 8-foot aspen logs into planks in less than 5 seconds. With the entire setup, it takes less than 5 minutes from the time a log goes into the mill until it is wrapped up into a bundle of lath.

When they started making lath early in 1958, the Coles hired 8 or 10 workers, and were up to 16 men on a full-time basis--in addition to themselves--by spring, 1959.

Clair Cole, a member of the Itasca County Rural Development committee, see lath production as business for more areas of northern Minnesota. He says, "More competition wouldn't hurt me--unless it were competition for logs. But the lath market is good enough for a lot more production than Minnesota will have for several years."

Plant Pathology and Botany . . .

SOIL FUMIGANTS REDUCE NEMATODES UP PEA YIELDS

Soil "fumigants" that kill nematodes can definitely increase yields of canning peas.

But whether the treatment will be economically feasible is still a question, according to University of Minnesota plant pathologists.

Nematodes are tiny, worm-like parasites which live in the soil.

W. A. Haglund and T. H. King treated fields of canning peas with soil fumigants during the last two summers in four areas of Minnesota. On the average, treatment increased yields by 400 pounds per acre.

Treatments they used were Dorlone at 16 and 24 gallons per acre and Telone at 16 and 32 gallons.

The main trouble so far is the cost. At current prices, these treatments would run from $25 to $30 per acre. And at 5 cents per pound, a 400-pound pea yield increase would raise income by only $20 per acre--clearly not enough to cover the added cost of the fumigant.

However, Haglund and King say it may be possible to get the same results with lower treatment rates, a point they will study in the future.

Nematodes have recently been recognized as a problem in most of Minnesota--although they've actually been around for hundreds of years. A survey by D. P. Taylor, University nematologist, recently showed every major crop in the state is suffering nematode damage.

Nematodes leave tiny holes in plant roots. This damage alone may injure crops and the holes may also be pathways for disease organisms.

SALT DAMAGES ELM TREES

Applying salt to streets in winter is having one unfortunate effect in several Minnesota communities.

The salt has injured many trees--especially American elms.

Even worse, the damage might affect elms not in cities, a University of Minnesota forest pathologist says. The reason: the elm bark beetle that spreads the dreaded Dutch Elm disease breeds in injured or dying elms--like those damaged by salt.

Dutch Elm disease has not yet been seen in Minnesota. But it could show up most any time and French says it would therefore be best to start a "sanitation" program of eliminating dead tree parts now. Elm bark beetles spread the disease only if there are dead or dying elms around for them to live in.

The reason Dutch Elm disease developed rapidly in Ohio and some other states was because another elm disease preceded it. The first disease resulted in a few dead and dying elms in which the beetles breed.

French found in July, 1954, that many boulevard trees in St. Paul had leaves turning yellow to brown. Some trees were almost completely defoliated. In August, 1956, nearly one tree in ten on principal thoroughfares was affected. Of 1,914 trees examined, 31 had few leaves and 5 were dead.

The salt-injured trees seemed normal in spring of that year, except for the type of dieback which had also been seen other years. The damage symptoms started showing up in mid-June of the 1956 season. Margins of the leaves turned yellow, then brown, and the discoloration moved toward the center of the leaf. As this continued, leaves curled and dropped from the trees.

Most trees affected were at intersections or on streets where salt was applied often during winter months. French found more damage on the side of the tree toward the street. Also, trees on sloping streets were more severely injured than those on level streets. This was probably due to heavier salt application and because a tree might be subject to more salt moving over the area where its roots were located.

Careful checks were made at monthly intervals of defoliation and dieback on 56 trees. One American elm was completely defoliated in September, 1954. Only a few living branches remained by June, 1955, and by September 28 of the same year, the tree was dead. Trees of other species were damaged, too.

In greenhouse tests, French found that slight injury symptoms occurred on elm seedlings to which salt was applied once. This was at a rate equivalent to 2,500 pounds of sodium chloride plus 625 pounds calcium chloride per mile. A second application of the same amount of salt to the same trees resulted in symptoms similar to those noted earlier on boulevard trees.

When there was a single application of salt in concentrations two and four times greater than the above amount, some seedlings lost their leaves. Leaves on others turned yellow at the margins.

Scientists also found that sodium content was above normal both for an injured elm and for an injured Norway maple. This, according to French, suggests sodium was translocated, resulting in damage.

CROP SEQUENCE HAS EFFECT ON CROP DISEASES

Severity of root rot or stalk breakage in a corn field depends to some extent on what crop the field raised the year before.

Which hybrid the farmer plants may be just as important. Some resist plant disease organisms better than others.

A pair of University of Minnesota plant pathologists found this true at the Rosemount Experiment station.

Thor Kommedahl and Roy Wilcoxson found almost four times as much root rot in corn following corn and wheat than in corn following oats, flax or soybeans. Also, there were more root rot fungi in fields of corn-after-corn.

However, there was a big difference in corn varieties--an important point for the farmer considering raising continuous corn. For example, there was less trouble with root rot in Minhybrid 608--a rather resistant variety--when it followed itself than occurred with less resistant hybrids.

Stalk breakage varied. Sometimes it was greater in corn following corn, wheat and soybeans and sometimes not. Corn smut was no more severe where corn followed corn than where it followed another crop.

In wheat, root rot was between two and three times more severe in fields that raised wheat the year before, compared to wheat following soybeans. Also, the disease was worse in wheat after oats and flax than after soybeans. But as with corn, there was less root rot trouble in both wheat and oats where resistant varieties were concerned, regardless of the crop sequence.

MORE EFFECTS OF GIBBERELLIC ACID NOTED

Two more effects of gibberellic acid on plants have been noted by scientists at the University of Minnesota.

This so-called "wonder" chemical, is known to stimulate growth. Now scientists find it also causes a plant both to take up more phosphorus and to lose water more rapidly.

Botanists A. J. Linck and T. W. Sudia put bean plant roots in gibberellic acid solutions, added radioactive phosphorus (P-32) and checked plants 28, 52 and 76 hours later with a Geiger counter.

In all cases, plants treated with the chemical had absorbed more phosphorus than non-treated ones. Gibberellic acid also affected the phosphorus distribution. After 76 hours, upper stems of treated plants had four times as much phosphorus as non-treated ones. In new leaves, though, gibberellic acid only doubled the amount of phosphorus.

Another experiment showed that plants treated with the material lost more water than untreated ones.

NEMATODE, FUNGUS TEAM UP TO DESTROY SOYBEANS

If root knot nematodes and root rot fungi both attack, a soybean crop can be virtually wiped out before the young plants even break ground.

University of Minnesota scientists recently planted soybeans in soil infested with both the nematodes and the fungus. Germination three weeks later was only two percent.

Nematologist Donald P. Taylor and plant pathologist T. D. Wyllie did the work.

The nematode they studied--a small, almost-invisible, worm-like parasite--is native to Minnesota and could be a serious problem in some areas.

Taylor and Wyllie found that three weeks after planting, soybeans in the soil infested with the northern root knot nematode alone averaged 83 percent germination. Where the fungus was present without nematodes, germination was cut in half.

If you added these two reductions together, the result would be about 33 percent germination. Yet, where both nematodes and fungus were present, only two percent of the soybean plants were actually alive three weeks after planting.

The scientists say the best approach to the problem is development of improved soybean varieties that resist either the disease, the nematodes, or both. Such research is now under way at the University.

NEW VIRUS DISEASE NOTED IN FLAX

Minnesota flax growers have another virus plant disease to contend with--flax "crinkle."

The new disease was identified by a pair of University of Minnesota plant pathologists.

Crinkle, so-called because of the effect it has on flax leaves, was first noted at the University's St. Paul campus in 1956. The next year, research men found it in several fields in Minnesota, North and South Dakota. A fifth of the plants were infected in some fields, and it hit nearly two-thirds of the plants in certain plots in 1957.

R. A. Fredriksen and R. W. Goth say all commercial varieties of flax so far tested are susceptible to the virus. Farmers can check for it by examining the leaves on the main stem or tillers of the flax plant. The disease causes irregular intervals, or "crinkles," along the lateral veins of the leaves. It also lowers seed yields.

Crinkle virus is spread by the six-spotted leafhopper, the same insect that spreads aster yellows, another flax disease.

Best approach to the problem, according to the plant pathologists, will probably be development of new flax varieties resistant to the disease.

BLUE DWARF VIRUS TRANSMITTED TO OATS BY LEAF HOPPERS

Blue dwarf disease in oats is spread by the six-spotted leaf hopper--the same pest that carries aster yellows disease of flax.

This finding could yield a clue to control of blue dwarf, should it become serious.

Ernest E. Banttari and Matt Moore, University of Minnesota plant pathologists, put virus-free leaf hoppers on oats infected with blue dwarf, then moved the insects to healthy plants. Sure enough, the plants soon showed symptoms of the disease. The hoppers have been known for years to transmit the aster yellows virus, but this is the first time they've been shown to carry blue dwarf.

Blue dwarf infected about 5 percent of the

plants in certain fields in 1957, but wasn't quite as severe last summer. Its effect on yields hasn't been entirely determined. The disease was first noted by Moore in 1951.

The disease results in short stems and leaves and produces blue discoloration in leaves. It can't be detected from a distance. Plants need to be checked closely.

Plants infected with blue dwarf don't die immediately, but they don't produce much either.

Whether the disease will ever reach epidemic proportions is still a question, but at least it's cause for concern.

Only a few oat varieties have been tested but Sauk seems most susceptible to blue dwarf. The virus also infects barley and causes "crinkle" disease in flax--so-called because of wrinkles that develop in the leaves.

EFFECTS OF VIRUS INFECTIONS NOTED

Virus diseases don't need to kill crop plants to riddle a farmer's pocket book.

In clover, for example, viruses usually cripple plants in several other ways that mean reduced profits according to University of Minnesota plant pathologist Roy D. Wilcoxson.

In recent research, he says, most diseased red clover plants stayed alive. But they averaged 8 inches shorter, had 4 fewer branches and only two-fifths as many flower heads as did healthy plants.

The clover blossoms themselves weren't the same, either. Those on diseased plants averaged only 64 florets per flower head, compared to 99 on plants free from viruses. Florets are the tiny flowers that make up the red flower head of the clover plant.

Similar effects occurred on other legumes. On ladino clover, severe virus infection reduced the size of the leaflets by more than a third. It cut size of petioles in two. It reduced number of flower heads by more than two-thirds and again reduced the number of florets per flower head.

Flowers on severely diseased ladino clover plants produced only an eighth as much seed as did those from healthy flower heads.

Naturally, a clover field suffering all these individual effects won't do its best, even though few or none of the plants actually die. Reduced growth and fewer branches would severely reduce forage yield. And the effect on the flowers would reduce seed yields to only a fraction of what it would be if there were no virus infection at all.

Knowing the effects of the infection is useful information in finding ways to deal with the problem, according to Wilcoxson. Identifying the effect of the diseases points to things which plant scientists must find resistance against in development of new varieties. These studies were done in cooperation with plant pathologist R. W. Goth and agronomist H. L. Thomas.

CORN SMUT TENDS TO VARY WITH "CROP SEQUENCE"

Amount of tassel smut disease in corn seems to vary according to what crop was raised in the field the year before.

University of Minnesota plant pathologists Roy D. Wilcoxson and R. P. Covey found that true in three years of trials. Heaviest smut (13-14 percent of the plants) was in fields which had raised oats, soybeans or flax the previous year.

In corn following corn or wheat, though, only 8 percent of the plants had smut. The results did vary a little from one year to the next. The difference between the various crops was most marked in 1956 and 1957, but the trend was still there in 1958.

For example, 7-9 percent of the corn following corn or wheat was smutted in 1956, compared to 11 percent of that following soybeans, 12 percent following oats and 18 percent following flax.

The next year, percentage of smut was 12 percent following both corn and wheat and 19-21 percent for the other crops. In 1958, the figures were 3-5 percent following corn and wheat and 5-7 percent for corn after soybeans, oats and flax.

Smut is a common disease of corn in the U. S. It can be controlled with resistant hybrids, and up to now, little attention has been given to control by other means. The Minnesota tests give the first experimental evidence that crops other than corn might increase incidence of smut.

Entomology and Economic Zoology...

SCIENTISTS STUDY GREEN BUG AND VIRUS PROBLEMS

If the devastating green bugs sharpen their suckers and swoop into Minnesota in future years, they probably won't catch this state's farmers by surprise.

University of Minnesota entomologists have been studying ways to alert farmers of possible green bug invasions. An early warning would give farmers time to arrange for control. Weather maps seem to be the tools that'll do the trick.

In 1959, the green bugs were blown into Minnesota from southwestern states between May 1 and 5. Similar invasions took place in 1926, 1949 and 1953.

Although 1959 generally was a poor season for small grains in Minnesota, the green bug attack added to the troubles. In some southern counties -- Martin, Cottonwood, Brown, Nicollet, Sibley, Blue Earth and Jackson -- estimates of damage to oat fields ran from 25 to 70 percent. Green bugs were also reported in all other south-

western counties and in some spots north of the Twin Cities. And in many cases, the green bugs transmitted a virus to the grain plants -- causing red-leaf in oats and yellow-dwarf in barley and wheat.

Now the entomologists think they know exactly how the green bugs got here.

After studying official weather maps for the first week of May, the University men noticed an unusual stationary air-front stretching like a wall from Oklahoma's panhandle, where the bugs are most numerous, northeastward through Minnesota. Just the right combination of high and low pressure areas along the air-front scooted the bugs up to high altitudes. Then strong winds curved in from the Gulf of Mexico and carried the bugs here. As the winds petered out, the bugs were dumped in Southern Minnesota fields.

A check of 1926 weather conditions showed that almost the same kind of meteorological conditions existed then -- with about the same kind of frontal activity and wind movement.

Therefore, the entomologists conclude, if similar spring weather conditions are spotted in the future, Minnesota had better prepare for another visit from the green bugs.

DISEASES MAY BE FUTURE WEAPON AGAINST INSECTS

The day may come when man wages biological warfare against insects.

Marion Brooks, University of Minnesota entomologist, says diseases could become useful weapons for controlling insect pests. Diseases used this way would not affect humans at all, but would confine themselves to insects.

Scientists have already used a number of disease organisms this way. Two viruses cause wilt disease of European spruce sawfly and European pine sawfly in Germany and Canada. Another causes a disease in alfalfa caterpillars in California.

Organisms called protozoa--one-celled animals slightly larger than bacteria--cause diseases in the European corn borer. Certain fungi, like molds, are effective against some of the grasshoppers in Manitoba and against sweet clover weevil.

So far, however, there are some major obstacles to pitting diseases against insects.

First, it's difficult to produce the organisms that cause the diseases. This usually calls for raising live insects, inoculating them with the organisms and recovering them when the insects die. This is tedious and expensive.

Second, there are problems in putting disease organisms in the right place at the right time. Diseases won't develop properly under certain weather conditions. And third, the insect population itself needs to be dense, in order for a disease to spread from one insect to another after it's introduced.

Despite the roadblocks, Miss Brooks thinks there's a promising future in insect control through diseases. Much research is needed on this approach, she says, but where it can be done, it's usually cheaper than chemical control. It is less dangerous to man, domestic aminals and birds and is less harmful to insect predators.

Diseases that attack insects seldom affect other living things. Also, once a disease is established, it may perpetuate itself in the soil, on foliage or may be transmitted through eggs. If so, it may not need to be introduced again.

SYSTEMIC INSECTICIDE CONTROLS CATTLE GRUBS

Systemic insecticides can do a good job of keeping grubs out of the backs of beef cattle.

A group of steers treated with Co-Ral spray had 92 percent fewer grubs the next spring than did untreated animals. Co-Ral is one of several systemics now used this way.

All the cattle were from a grub-infested area of the West.

L. K. Cutkomp, University of Minnesota entomologist who conducted the experiments, used 0.5 percent Co-Ral wettable powder in a spray, under 200 pounds pressure. He sprayed the animals on November 12, 1958, and checked them in early April, 1959.

There were a total of 357 grubs on the 25 unsprayed animals, compared to only 28 on the same number of treated ones.

Getting rid of the grubs, however, didn't affect cattle weights a bit. Both groups averaged about 420 pounds at the start of the test and were about 203 pounds heavier at the end.

There's still good reason for doing the spraying, though. Many markets discount fat cattle that have grub-infested hides. Heavy infestations, like on the untreated cattle in this study, can make the hides worthless and ruin meat cuts which have to be trimmed away.

ENTOMOLOGISTS FIND HONEYBEE PREFERENCE CLUE

Scientists have turned up a clue to why honeybees prefer some legumes to others.

It isn't how sweet the nectar is, but apparently it's the kind of sugar in a legume flower that makes the difference.

Entomologists Basil Furgala, T. A. Gochnauer and F. G. Holdaway at the University of Minnesota found that combined amount of glucose and fructose (two types of plant sugar) in the nectar is directly related to bee preference.

The fussy appetite of bees results in consternation to many a legume seed producer in northwestern Minnesota. Without bees, a field of alsike clover, for example, won't get pollinated and won't bear seed. Bees, though, prefer sweet clover, alfalfa, alsike and red clover in that order.

This means that bees will go to alsike only in absence of both alfalfa and sweet clover, and so on.

Up to now, the big question has been why.

The entomologists analyzed nectar from the four crops in fields near Roseau. They found that content of sucrose (table sugar) couldn't

account for the difference in preference. The least-preferred of the four, red clover, had a higher percentage of this sugar in its nectar than any of the rest. Total sugar content didn't explain the differences, either.

Combined percentage of glucose and fructose, however, were directly related to the order of preference. These two sugars made up 51 percent of total nectar solids in sweet clover, 42 percent in alfalfa, 32 percent in alsike and 25 percent in red clover.

Important as this information is, though, it still means farmers themselves must deal with the problem posed by competing crops at pollination time. Best approach, say entomologists, would be for farmers to plan their seed production on a community-wide basis. Then alsike and red clover would be grown only where crops that compete for the bees' attention aren't as common.

Poultry Husbandry . . .

AMINO ACID SUPPLEMENTATION HAS BRIGHT FUTURE

Adding individual amino acids to feed may soon be common in the turkey business.

Paul E. Waibel, University of Minnesota poultry scientist, says such supplementing would reduce total protein requirement for turkeys. It would also make room for more high-energy feedstuffs, like corn.

Waibel's report typifies the growing interest in amino acid supplementation in livestock and poultry feeds. The amino acids would most likely be produced synthetically and would be added to complete feed mixtures at needed levels by feed manufacturers.

Proteins are made up of some two dozen individual amino acids--sometimes called the "building blocks" of protein. Some amino acids are considered essential for growth, and some are nonessential.

The problem is that some protein feeds do not contain all the essential amino acids in proper amounts. And requirements for different amino acids for turkeys are related to the level of total protein in the ration and with the amount of energy in the diet.

For example, Waibel says, soybean meal tends to be short in methionine, making that essential amino acid the first "limiting factor" in a corn-soybean meal type of diet, containing a relatively high amount of protein. This ration is also on the "Borderline" where lysine, another essential amino acid, is concerned.

In a feeding experiment, this meant that turkeys getting 28 percent protein in a corn-soybean diet from 0-4 weeks and 24 percent from 4 to 8 weeks of age needed only extra methionine. But when the percentage was dropped to 24 and 20 percent protein for the two periods, the birds needed even more methionine. And adding lysine helped after extra methionine was present. The reason is that with less soybean meal, the protein in corn becomes more important, and corn is low in lysine.

TRANQUILIZERS MAY HELP IN POULTRY

Tranquilizers may be of some help in poultry production, but research so far indicates rather limited benefits from them.

That is the consensus of a report from Ray E. Burger, University of Minnesota poultry researcher.

Research shows that two tranquilizers--reserpine and chlorpromazine--at low levels and under normal conditions, can cause slight increases in turkey and chicken growth. The effect is more pronounced at high temperatures, but what the drug is really doing in that case is reducing growth depression that would otherwise be caused by the heat.

However, Burger says most reports show little or no effect of tranquilizers on rate of egg laying.

Some research shows that reserpine may have some value for treating hemorrhaging disease in turkeys, when administered at levels known to depress blood pressure.

Tranquilizers have also been shown to reduce mortality occurring at high temperatures, according to Burger. But little such effect has been noted under normal conditions.

Actually, Burger says, the term "tranquilizer" is somewhat of a misnomer for these drugs. When used for poultry or livestock the dosage is generally below that used for sedative purposes. Whatever protective action they have, he says, is apparently due to reduction of activity in the sympathetic nervous system.

FINDS CLUE TO PEELING PROBLEM OF BOILED EGGS

Ever get annoyed by a boiled egg that won't peel?

University of Minnesota scientists have spotted the cause of this irritating problem.

It all results from the acidity level of the egg white, according to Milo Swanson, poultry researcher.

Most any farm housewife knows that an egg fresh from a nest is hard to peel when hard-cooked. Every time you peel some of the shell away, some of the egg white is apt to come with it.

About two days later, however, the peeling problem disappears.

A complicating fact is that eggs nowadays are sometimes sprayed with processing oil, shortly after taken from the nest, to protect their quality. Unfortunately, eggs so sprayed are hard to peel when cooked, just like fresh eggs.

Swanson found that what's really involved is the acidity level. Albumen, or the "white," of eggs freshly laid is just a little too acid to peel properly. But as the egg ages, carbon dioxide escapes and the acidity level goes down to a point where the egg peels easily.

Spraying, however, traps the carbon dioxide in the egg and keeps the acidity level above the critical level. Therefore, eggs so sprayed may be difficult to peel when sold in stores.

Swanson proved his point by taking eggs aged to the point where they would have peeled well and exposing them to carbon dioxide. The exposure raised the acidity level and made them hard to peel.

On the other hand, he found that eggs only 2 hours old could be made to peel easily by exposing them to ammonium hydroxide fumes, which made them less acid. Ammonium treatment doesn't affect oil-treated eggs, however. The pores are sealed and the fumes can't get through

the shell to lower the acidity level.

PROTEIN LEVELS STUDIED FOR DIFFERENT LAYING RATIONS

How protein and fat levels in a laying hen's ration can affect egg production and amount of body fat in hens has been studied by University of Minnesota poultry researchers.

F. R. Frank and P. E. Waibel note these research findings:

* Laying hens kept in cages and fed a low-energy diet (no added fat) averaged 58 percent production when they received 12.5 percent protein. Production was 41 percent when the protein content was lowered to 10 percent. Raising the protein level, though, did not increase egg production.

* Hens on a high-energy diet (10 percent added fat) averaged 67 percent production when they received 15 percent protein, compared to 55 percent at 12.5 percent protein. Increasing the protein content to 20 or 30 percent did not significantly increase egg laying.

* Regardless of the amount of protein, birds that received added dietary fat tended to have more body fat. Those on low energy diets (no added fat) varied from 10.4 to 16.8 percent body fat. By comparison, those with high-energy rations (10 percent added fat) had between 23.2 and 28.9 percent body fat.

Normally, it's desirable to use high energy diets for layers. However, based on their research, the Minnesota men question use of extremely high fat levels for birds in cages. They point out that such levels may produce overly-fat birds. And one of the problems in cage layer operations is fatty livers, which would be aggravated by high fat diets.

All these experiments were conducted on birds kept in cages, and fed corn-soybean meal-type diets. The low-energy diet also contained 10 percent oats, 5 percent wheat middlings, 5 percent wheat bran and 5 percent alfalfa meal. The high-energy diet had 10 percent animal fat added to the corn and soybean meal.

CALCIUM LEVEL AFFECTS FAT DIGESTIBILITY IN CHICKS

Amount of calcium a chick eats has a lot to do with how well the bird can make use of added fat in the diet.

University of Minnesota poultry researchers M. R. Fedde, P. E. Waibel and R. E. Burger found this true in recent research. They found evidence that it isn't wise to overfeed calcium. At high levels, it can make fat less digestible.

When calcium was fed at 1.24 percent, the normal level, beef tallow was 77 percent digestible. Increasing dietary calcium to 3 percent reduced tallow digestibility to 71 percent. But lowering diet calcium to 0.33 percent caused beef tallow digestibility to increase to 91 percent.

Too much calcium has other adverse effects, too. It can interfere with absorption of zinc, manganese and antibiotics. It can also tie up phosphorus in the feed, holding it in a chemical form that birds cannot readily digest.

Various sources of fat for chicks were also studied. Safflower oil and corn oil were each 92 percent digestible and lard was 91 percent digestible for birds 8 weeks old. Beef tallow at the same age scored 76 percent digestibility.

However, beef tallow digestibility increased when the birds got older, while there was no change from one age to another with the other fat sources. Tallow was 53 percent digestible at one week, and had increased to 80 percent by 12 weeks.

Adding ox bile to the ration tended to improve digestibility of beef tallow.

These experiments were conducted on supplemented corn-soybean meal rations.

COLOR LINKED TO BROILER GROWING ABILITY

Color of broiler chickens may become a selection guide for breeding flocks, University of Minnesota research has shown.

Poultry geneticist Robert Shoffner already advises breeders to eliminate boiler stock with any black color and birds with dark bars on their wings.

The reason: Five years of tests show that birds having black color or bars--along with some "dominant" white--average between 1/16 and 1/8 pound lighter than red, silver or mixed color birds at 10 weeks of age. Such a difference can hurt the producer's profits in a flock of 20,000 birds.

"Dominant" white is an inherited characteristic that inhibits color in offspring.

Just why certain color characteristics are linked with size reduction isn't known. But the differences are important. All-white birds, for example, are lighter at 10 weeks than colored ones. Yet, breeders don't want to eliminate white, because white pinfeathers do not discolor the skin and therefore make for a higher quality market bird. So the problem now is to find color combinations that include "dominant" white but still produce birds that grow well.

Like all inherited characteristics, color is transmitted by genes. Different color combinations result from different gene combinations. And the color combinations are linked to ability to grow. For example, birds with gene combinations for white, black and bars tend to be poorer gainers.

On the other hand, a combination of genes for white and silver color does not result in size reduction.

Shoffner is continuing the research to learn more on which gene combinations to keep and which to eliminate in poultry breeding. A similar problem may exist in laying hens, but this problem has not been studied extensively so far.

Rural Sociology ...

FARMERS HAVE MORE ACCIDENTS THAN TOWN FOLKS

Farm families have just about twice as many accidents as do those in town, a recent University of Minnesota survey shows.

Of 327 families interviewed in a southern county, almost a fourth reported recent accidents, compared to an eighth of the nonfarm families.

Rural sociologists George Donohue and Clarice Olien report the study.

Despite the difference in number of accidents, there was no difference between farm and town families in which member of the family was injured, time lost due to accident, causes, places and types of accidents, and costs.

The sociologists say it will take more study of the respective activities of farm and town families before the difference in accident numbers can be explained. But it's already clear that farmers need to be aware of the difference and look for ways to avoid the hazards.

Other differences from one family to another had nothing to do with accident occurrence, according to Donohue and Miss Olien. There was no tie-up between frequency of accidents and size of farm, where the father works, whether the wife is employed or number of children.

People who reported injuries said falls and slips were the most common accidents of all--36 percent of the total. A fifth of the accidents were from being caught in or between or being struck against an object. Injuries from flying or falling objects made up about 18 percent of the injuries.

About a sixth of all families said somebody in the household had been accidentally injured during the past 12 months. In this survey, "accident" was any injury requiring either treatment by a physician, a recovery period of one or more days, or both.

FARM WIVES GIVE REACTION TO LIVING IN N. E. MINN.

Farm wives in northeastern Minnesota are fairly well satisfied with their own lot, but they don't recommend it to their children.

University of Minnesota rural sociologists recently interviewed 431 farm homemakers in 13 northeastern Minnesota counties.

Practically all the women interviewed are satisfied with the community in which they live. On the other hand, about one in every five women considers recreational opportunities unsatisfactory for her family. Only a fourth feel opportunities for social contacts and social relationships are very good. Somewhat over half consider them moderately good, while the rest report that they are poor.

Many of the women would like better housing for their families. A fourth of the women consider their housing as adequate, half as satisfactory and the remainder as wholly inadequate or unsatisfactory. These are the most frequent complaints regarding their housing: lack of modern conveniences; inconveniently planned; in need of paint; cold in winter; inside or outside unattractive; too small; poorly furnished.

Though the majority of these women had been reared on a farm, almost a third had not. More than three-fourths of them had been employed before marriage.

Incomes of these northeastern Minnesota families are somewhat under the national average and vary greatly. At least half of them supplement their farm income with off-the-farm earnings.

About a third of the women are not completely happy with their farm work. According to one out of every four, the work is too strenuous. A third of the women feel the farm ties them down so they can't get away often enough.

The first concern of these homemakers is for their children's education and future. When asked what vocational advice they had given their children, about 40 percent indicated that they had never tried to counsel them on this point or that their children were too young for such advice. Of the remaining, most of the mothers advised their children to seek their future outside the area and in some occupation other than farming, to go to college or to trade school.

The study is reported in the current issue of Minnesota Farm and Home Science, a University Agricultural Experiment station publication.

GOODHUE STUDY SHOWS FAR-REACHING RURAL CHANGES

What's happening to the rural way of life within the "influence zone" of cities like Minneapolis and St. Paul?

For one thing, the rural resident is becoming more and more like his big city cousins, both in his social values and in how he lives.

How this and other trends affect one county is reported in "Changing Goodhue County," recently published by rural sociologists Lee Taylor, Marvin Taves and Gordon Bultena at the University of Minnesota.

From earlier surveys, census data and other information, the sociologists found these changes in Goodhue county:

* A steady rise in level of living for both rural and urban people.
* Fewer, larger and higher-priced farms.
* Fewer people on farms and more rural nonfarm residents.
* A shift from farm to nonfarm employment, with more women working.
* Disappearance of the rural district school.
* Decreasing population in communities farthest from main population centers, and increasing

populations in Red Wing and its suburbs.

Level of living in Goodhue county is above the state and national averages. Farm families there, on the average, are living well within the middle to upper categories. This means they now enjoy more of the conveniences which are ordinarily a part of city living.

While farm numbers have been declining in the county, there are actually more people living in the country than ever before. The reason is an expanding rural-nonfarm population, which increased by 29 percent between 1940 and 1950 and has been increasing even more rapidly since.

A third of Goodhue county's total population lives in Red Wing, a city of 11,200 people. This is an increase of 5 percent since 1950. Most population buildup in surrounding townships is really suburban Red Wing--typical of trends in similar cities elsewhere in the nation.

While Red Wing was gaining population, 19 of the 23 townships in the county lost population. The only ones to increase were those in the Red Wing suburban area.

Like all areas under the "urban" influence, Goodhue county has seen a big shift from farm to nonfarm employment. There was a drop from 3,000 to 2,800 farmers during the forties and a 43 percent decrease in paid farm laborers. At the same time, numbers of clerical, craft and operative workers all increased by more than 50 percent.

Standing out in the employment picture is the number of women employed--17 percent of the employed labor force in 1940, compared to 25 percent in 1950.

Again, this is a trend showing changes in human values, the sociologists point out. It's no longer a disgrace to the husband for the wife to be employed. As better equipment has been developed for housekeeping and cooking, more women have been freed to work outside the home.

With fewer people on Goodhue county farms, these farms have been getting fewer, larger and more valuable. Numbers decreased from 3,162 in 1935 to 2,698 in 1954. Average size increased from 147 to 164 acres in the same period, and average value of land and buildings soared from around $8,000 in 1935 to more than $18,000 now.

Typifying another trend in rural communities, Goodhue county has seen the one-room schoolhouse vanish. The number of districts declined from 155 to 16 between 1946 and 1958.

AG COLLEGE POINTS TO CAREER OPENINGS

Minnesota's high school graduates are missing a good bet if they don't check on professional opportunities in agriculture.

According to Paul Anderson, administrative assistant for the College of Agriculture, Forestry and Home Economics at the University of Minnesota, many good jobs go unfilled each year for lack of college-trained applicants. And salaries for these positions are going up.

Anderson recently completed a survey of 105 graduates of the 1957 class of the College of Agriculture. He found:

* A fourth were in commercial positions, with average annual salaries of $4,277 each.

* Slightly under a fourth were high school vocational agriculture instructors, averaging $5,712 per year.

* About a tenth were in agricultural extension work, 9 percent were in federal service and 7 percent were farming.

Overall average salary for the first year was $4,500 for the 1957 graduates, but going as high as $9,000.

Since then, Anderson has found definite improvement in salaries. The average starting income for December, 1958, graduates was $5,400 per year, with most of the increase accounted for by commercial salaries--up about $600 per year, on the average, from 18 months earlier.

Unfortunately, Anderson says, a good share of the commercial opportunities go begging. These positions vary widely and would appeal to many young men.

Of the December graduates, a number went to work for large grocery chains as management trainees aiding with business integration. Several were hired by farm chemical concerns--mostly in sales work and at good pay.

Feed companies hired several agriculture graduates, as salesmen and nutrition technicians. In fact, Anderson says livestock nutrition is one of the most rapidly expanding fields now, career-wise.

Several graduates took positions in soils and seed research. A feed company hired several agricultural economists to work in agricultural and industrial integration. Many rural banks hired farm economists, too. A few went to work for farm management firms.

Soils . . .

NEW TURF FERTILIZER MAY BE DEVELOPED

Soils scientists in the future may develop a better nitrogen fertilizer for turfs on lawns, golf courses and parks.

Work is now underway on an experimental product that, with one annual application, will give good, uniform turf growth throughout the summer. The new material is peat treated with ammonia under heat and pressure.

W. P. Martin, University of Minnesota soils department head, says most organic and even inorganic nitrogen fertilizers used now present two problems. First, they result in some nitrogen loss through leaching--particularly on light soil. Second, much of the nitrogen is lost through bacterial action before the turf can make use of it.

Turfgrass calls for a fertilizer that releases nitrogen slowly, so grass can make use of it as it becomes available. So far, urea-formaldehyde products come closest to meeting this ideal. The trouble with many fertilizers, however, is that more nitrogen is released soon after applied than the grass can use. Then, later on, there won't be enough and more needs to be added. On a golf course, this results in a good deal of extra work.

University tests have shown that only 40 to 80 percent of the nitrogen added to turf in fertilizer is taken up by grass, depending on whether the soil is sandy or not cropped. He added that the nitrogen loss was about the same for organic fertilizers--like activated sewage--as it is for inorganic nitrogen materials.

NITROGEN ADDED TO SOIL BY ALFALFA

Corn on land that raised alfalfa last summer will get a good boost from nitrogen which the legume left behind.

Over a three-year period, the contribution from the alfalfa can equal up to 140 pounds of fertilizer nitrogen per acre.

At the University of Minnesota's Southern Experiment station, Waseca, it took about 40 pounds of fertilizer nitrogen where corn followed grain or grass to get yields equal to where corn followed alfalfa and got no extra nitrogen. This was for first-year corn.

For the second year of corn, it took 80 pounds of nitrogen on the corn-after-grain plots to bring yields up to those from corn following alfalfa. And in the third year, it took 20 pounds nitrogen on the former grain plot to make the two yields equal. Agronomists A. R. Schmid and R. A. Briggs and soils scientist A. C. Caldwell made the studies.

For the first year of corn, adding nitrogen fertilizer was no help where the field had formerly raised alfalfa.

At the Rosemount station, corn following alfalfa yielded about 36 bushels per acre more than it did following oats. The nitrogen contribution of the alfalfa at Rosemount was equal to about 120 pounds over a three-year period.

POTASH SOLUBILITY HAS NO EFFECT ON YIELDS OF CROPS

The degree of "water solubility" of potassium fertilizer apparently has no effect on crop yields.

University of Minnesota recently fertilized corn with potassium metaphosphate and potassium pyrophosphate--two "low solubility" fertilizers. The corn yielded as well as fields getting potash in conventional high-solubility form.

Common form of potash in Minnesota fertilizers is muriate of potash. This is 100 percent soluble in water. In potassium metaphosphate, 45 percent of the potassium is water soluble and a fourth of the potassium in the pyrophosphate form is soluble.

J. R. Kline and A. C. Caldwell, soils scientists, checked two things. First was whether solubility differences would affect yields. Second was whether lower solubility fertilizer would make potassium more uniformly available to crops over a longer period of time.

The answer seemed to be "no" on both counts.

For example, potassium pyrophosphate of large particle sizes brought lower corn yields. But when this fertilizer was ground finely, corn yielded as well as it did from muriate of potash.

LIST ADVICE FOR "CONTINUOUS CORN"

Continuous corn is perfectly all right if you handle it carefully.

On level fields, it won't result in any more erosion than where corn is alternated with other crops in a rotation.

The idea is already becoming popular in Minnesota, according to soils scientists and agronomists at the University of Minnesota. It's a big help to farmers who need more corn and less land in forages--as with intensive livestock operations.

The soils men and agronomists have this advice for continuous corn:

Limit it to fields with no more than a two percent slope. Also, you need to shoot for high yields--100 bushels per acre or more--to make continuous corn pay off.

On sandy or medium-textured soils, plow in the spring and wheel-track plant the same day, if possible. If you use regular equipment and procedure, make sure the soil is packed about the seed. For fine-textured soils, plow in the fall. Disk only to control weeds and plant the same day you finish disking.

You need from 16,000 to 18,000 plants per acre of an adapted hybrid. It takes 15 percent more seed at planting time to give you an "effective" stand that high.

Test and lime the soil. For 100 bushels of corn per acre from continuous, you'll need to apply about 100 pounds nitrogen, 18 pounds phosphorus and 22 pounds potassium every year.

Use a complete starter fertilizer, and apply it to the side and below the seed. It may also be wise to broadcast additional phosphorus and potassium and plow it under or work it in before planting, either in fall or spring.

Nitrogen may be broadcast in the spring or may be sidedressed no later than second cultivation time. Whether you use gas, liquid or solid forms of nitrogen fertilizer should depend on price per pound of nitrogen, available equipment and soil conditions.

A good way to control both broad-leaved and annual grass weeds is by "pre-emergence" spraying at planting time. Use either 4-5 pounds Randox or 2-4 pounds Simazin per acre. You can reduce costs by confining the spray to a band over the row. After the corn comes up, annual broad-leaved weeds can be controlled with 2,4-D. This, however, won't affect annual grasses, like foxtail. Lay-by treatments at the last cultivation will prevent certain weeds from going to seed.

Aldrin or heptachlor can be applied to the soil before or at planting time to protect the crop from soil insects. If done as a broadcast treatment, you can apply 1-1/2 pounds of either chemical per acre, either in granular form or in a spray. Use only half that dosage if corn rootworm is the only insect causing damage. Work the chemical into the soil.

You can also apply insecticides at one pound per acre in a band over the row at planting time. However, the spray must not hit the seed directly and should be calibrated to give the right amount of spray per acre. Granular insecticides can be used in band or row treatments, too, if you have equipment to do the job.

EVAPORATION, CROP USE ARE ABOUT EQUAL IN MOISTURE USE

Which accounts for more soil moisture loss--crop growth or evaporation?

In some corn fields at Morris, Minnesota, last summer, the use was about half and half, a team of researchers learned.

They also found that if soil moisture isn't adequate by the first week of July, rainfall after that isn't apt to be enough to pull the crop through.

USDA soil scientist R. F. Holt made the studies in cooperation with George Blake, University of Minnesota soil physicist, and Roy Thompson, agronomist at the West Central Experiment station.

In corn that grew to maturity, Holt found that moisture loss from the soil totalled 10.14 inches from the end of June until harvest time. Where no corn was growing, the soil lost 5.10 inches of moisture--most of which clearly was due to evaporation. So he concluded that evaporation loss and use by the plant were about equal.

To double-check, Holt covered some soil with plastic to prevent all evaporation loss. Total moisture loss was about half of where there was no plastic.

Evaporation used up practically all the moisture which fell in rain after July 1. So if there hadn't been adequate moisture for the growing season in the soil by the end of June, rain after July 1 would not have been enough to mature the crop. This was in a year when rain was only two-thirds as great as normal.

SIDEDRESSING WITH NITROGEN MAY UP YOUR CORN YIELDS

Nitrogen may be the key to higher corn yields on your farm, according to John M. MacGregor, soils scientist at the University of Minnesota.

During the past eight years, Minnesota corn yields have averaged 48.6 bushels per acre. That's the highest average state-wide yield ever, but still a long way from the yields that are possible.

In recent research, sidedressing with 60 pounds of nitrogen per acre made good yield increases. For the average field, this was also the most profitable rate.

However, in low fertility fields, nitrogen in larger quantities was equally as profitable. Texture of the soil didn't seem to make any difference, though.

Additional phosphate and potash fertilizer in the starter improved the effect of the sidedressed nitrogen and brought further increases in yields.

MacGregor says the time of application, whether in fall or in April, May or June, had little or no effect on amounts of yield increase.

Contrary to popular opinion, moisture content of the ear corn was no higher where nitrogen had been applied--even at rates up to 300 pounds per acre.

Heavy applications of nitrogen did not result in more suckers, either. If anything, the trend was toward fewer suckers after using nitrogen.

Which form of nitrogen you apply for corn makes little difference, as long as it is properly applied. Field experiments show that availability of nitrogen for corn is about equal in all forms.

Effectiveness of nitrogen, MacGregor says, depends on rainfall, plant population and presence of other essential minerals. You can't control rainfall, but you can provide the other two.

WHEEL-TRACK PLANTING, FALL PLOWING GO TOGETHER

Wheel-track corn planting and other forms of minimum tillage fit in nicely in Western Minnesota--even on fields plowed in the fall.

Corn on fall-plowed fields at the University of Minnesota's West Central Experiment station yielded as well when planted in wheel tracks as when conventional procedures were used.

Up to now, wheel-track planting has often been thought of as something only for spring plowing.

Soil physicist George Blake and station agronomist Ray Thompson found that fields plowed in fall and worked up the conventional way--disked

several times and dragged before and after planting--yielded 81 bushels per acre. Where workers used minimum tillage and wheel-track planting, each acre produced 86 bushels.

The minimum tillage fields got only a light disking or dragging before planting--depending on which was needed to control weeds. They received only one cultivation during the summer.

Also, fall plowing resulted in better yields, regardless of manner of tillage, than spring plowing. There was no difference, according to amount of tillage, in how many corn plants provided.

Minimum tillage and wheel-track planting have become popular ideas in Minnesota in recent years. Main purpose is to avoid excessive, harmful compaction that results from overworking the soil. Several years of University research show that too much compaction can reduce yields and hurt crop quality as well.

Besides avoiding soil packing, minimum tillage saves time and expense--often up to $5 per acre.

PEAT SOILS CAN PRODUCE WELL

Minnesota's 7 1/2 million acres of peat are a virtually untapped source of rich farmland.

Not that we need more land in production now. But 15, 25 or 50 years from now there may be a different story--what with expanding population and more farm land being used for highways, factories, and suburban developments.

Soil scientist Rouse Farnham at the University of Minnesota, says that peat handled properly can nourish as lush a stand of hay or pasture as any other soil. It would pay many a farmer to shift from drouthy soils and pastures to peat land on the farm that may do much better.

Farnham and workers at the North Central Experiment station at Grand Rapids last spring harvested 2.7 tons of alsike clover per acre on peat--just from the first cutting.

The best loam soil would hardly do better. Other first crop yields were: alfalfa, 2 tons; timothy, 2.1; birdsfoot trefoil, 1.9 and ladino clover, 1.7 tons.

Besides most of these plots made good second crops.

Key to such yields on peat is proper fertilization, Farnham states. And, of course, it needs to be drained. You can't grow crops in a wet peat bog.

Farnham seeded these plots in 1958, after first laying down 10 pounds nitrogen, 30 pounds phosphate and 90 pounds potash per acre. Along with the fertilizer, the soil got a trace mineral mixture of copper, calcium, manganese, molybdenum and iron. The legumes got some more phosphate and potash this spring, and non-legumes also received 50 pounds nitrogen per acre.

Farnham recommends this procedure for establishing forages on peat:

Control the water level, usually by drainage. You need to maintain 18 to 24 inches of drained soil for shallow-rooted planted and 24 to 36 inches for deep-rooted crops.

Work peat soils as little as possible. This will decrease the rate of decomposing and will save moisture. Fertilize according to soil test and crop needs.

Roll the seedbed with a heavy roller before seeding, to conserve moisture and make for better germination. Roll after seeding to keep seeds from blowing.

Hay crops on peat can be handled the same as anywhere else. But grazing must be carefully controlled. Keep animals off peatland when it's very wet. Otherwise, you may damage the sod. Best idea for pastures is rotation grazing.

Clip weeds periodically. Chemical control helps, too.

Use supplemental top dressings of lime and fertilizer after establishing stands. Apply about 30 pounds nitrogen each spring on grasses. Add phosphate whenever tests show it's needed.

Finally, Farnham says, don't expect miracles the first year. But careful planning will mean good production. And value of the peat land will go up.

SOIL TESTING SAVES MONEY

HOUSTON--A $9 investment in soil tests meant a $286 saving in fertilizer costs for Orson Hempstead and son Dillon.

"Before we sampled out soil and had it tested, Dad and I guessed how much fertilizer 87 acres should have," says Dillon.

"Then Harlie Larson, Houston county soils agent, helped us sample our soil. He worked out fertilizer recommendations after the University of Minnesota had tested the nine samples. If we had fertilized by guess we would have applied phosphoric acid unnecessarily. We saved the equivalent of five tons of fertilizer."

Hempsteads got their first soil test eye-opener about seven years ago when son John, tested two samples of soil as part of a high school vocational agriculture project. Results showed the fields needed about 150 pounds of potash per acre.

"To correct the deficiency, we applied about 250 pounds of 0-0-60 per acre," says Orson.

Today, as a result of that switch in fertilizers, Hempsteads seldom find potash-deficient soils on their farm.

"In our certified seed operation, we often have to maintain long-time alfalfa stands for isolation. And potash really made the job a lot easier," Orson says. "For example, six years ago, when we seeded alfalfa on one field, we applied 200 pounds of 0-0-60 per acre. It got that alfalfa off to a good start. And by giving that field extra fertilizer every year, we're getting top-notch crops from that field yet this year."

This year's first cutting on the Hempsteads' six-year alfalfa stand yielded 120 bales per acre.

"Heavy fertilization is the key to getting that kind of production from alfalfa," Dillon says. "At least once every season, we top-dressed that field with 0-12-36. And last year we applied about 120 pounds of the same fertilizer after three of the five cuttings.

Orson sums it up like this: "We learned years ago that you can't afford to milk cows with-

out testing. Now we've learned the same lesson about crop farming and soil testing."

FERTILIZER HELPS IN DRY YEAR, TOO

Fertilizer is a big help to corn even in a dry year, a University of Minnesota extension soils specialist says.

Lowell Hanson says a preliminary summary of 79 field plots around the state last summer shows that fertilizer boosted corn yields by 11.4 bushels per acre in low rainfall areas.

That was a good increase--about 21 percent above undertilized plots. Where there was normal rain, fertilizing increased yields by 14.3 bushels per acre.

The demonstrations made it crystal clear, Hanson says, that soil tests save a farmer money.

Where fertilizer went on according to needs shown by soil testing, the cost was 28 percent less than where a "blanket treatment" of nitrogen, phosphate and potash was used. Yet, fertilizing by soil test brought yields just as high as the blanket application.

Nitrogen wasn't needed where corn followed a legume. In 13 fields of corn after legume, applying 100 pounds nitrogen per acre raised yields only 1 bushel per acre. But where corn didn't follow a legume, extra nitrogen boosted yields by 12.6 bushels.

In fields low in organic matter, 100 pounds nitrogen upped yields 15.8 bushels per acre. That was 6 bushels more of an increase than where the soil organic matter was above 5 percent.

In general, the demonstrations show the soil test does a good job of pinpointing soil nutrient needs. The lower the level of soil phosphorus as shown by soil test, the greater the increase was from adding 100 pounds phsophate fertilizer per acre.

There were fields, however, where the results were not what you'd expect judging from the test results. Hanson says these situations will need to be studied closely in the future.

The demonstrations were conducted in cooperation with farmers, county agents and the fertilizer industry.

PLOWING CROPS UNDER CAN INCREASE SOIL AMINO ACIDS

Adding manure or plowing a green crop under may release free amino acids in the soil, University of Minnesota research shows.

Soil microbiologists E. A. Paul and E. L. Schmidt definitely identified 24 different amino acids in soils in recent studies. They found up to 200 pounds of total amino acids per acre in the plow layer.

Amino acids are protein components. The Minnesota studies were concerned only with those that occur "free" in the soil--not hooked up with any complete protein. It's only recently that free amino acids have been found to occur in soils at all.

Paul and Schmidt added glucose (a natural sugar) to soil. The sugar stepped up activity of soil microorganisms, which in turn released the amino acids.

The effect of the sugar, according to Paul and Schmidt, is comparable to what a farmer would get by adding manure, crop refuse or any other carbohydrate source.

The next question: Would "amending" soils with manure or other organic matter--by releasing amino acids--increase the protein content of crops? Only more research can answer that question for certain, say the scientists.

They do point out, however, that plants could conceivably absorb the amino acids, if they occur near the roots. Or the amino acids could affect plant life in other ways.

Some amino acids might be used directly as a source of nitrogen. Certain microbes beneficial to plants might be increased by certain amino acids near the roots. Also, amino acids might make certain mineral nutrients more or less available to plants. Amino acids are known to react with calcium and magnesium, for example.

MISCONCEPTIONS ABOUT NITROGEN FERTILIZER ARE EXPLAINED

Some long-standing but twisted notions about nitrogen fertilizer got straightened out recently by a University of Minnesota soils scientist.

J. M. MacGregor says that contrary to some views, nitrogen for farm crops has the same effect regardless of its form. Liquid ammonia, ammonium nitrate, urea and other forms are all equally effective when properly applied.

The important thing is for a farmer to know how many pounds nitrogen he is putting on, and how much it is costing him per pound. MacGregor also dispells some other misconceptions concerning nitrogen:

1. It does pay to add as much as 100 pounds actual nitrogen per acre to corn--if the crop follows a non-legume, is on heavy land and there are enough plants on each acre. On the other hand, nitrogen may not help at all if the population is too low. Minimum should be 16,000 plants per acre on heavy soil, 12,000 on lighter land.

2. Nitrogen fertilizer won't do much good on water-logged land. It must be at least moderately well drained.

3. Nitrogen doesn't leach out of heavy soils as fast as some people think. In recent experiments in Sibley county, corn yielded 18 bushels more per acre where 60 pounds of nitrogen had been side-dressed the year before. In other words, nitrogen added in fertilizer does carry over from one year to the next on heavy soils.

4. Adding nitrogen fertilizer does not cause corn plants to produce more suckers -- at least at rates up to 300 pounds nitrogen per acre. In fact, there is some evidence that nitrogen reduces suckering.

5. If applied properly, losses from gaseous forms of nitrogen fertilizer are not as great as sometimes suspected.

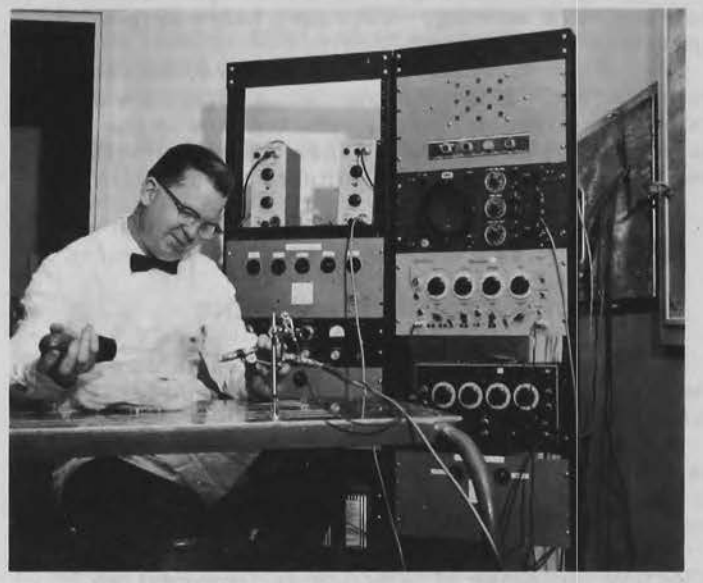
College of Veterinary Medicine...

TASTE DIFFERENCES IN ANIMALS EXPLORED

Chickens can definitely taste many of the things they eat, but they don't have a "sweet tooth."

This is contrary to some old beliefs; it was once thought these birds couldn't taste anything at all.

A University of Minnesota College of Veterinary Medicine anatomist, Dr. Ralph L. Kitchell, recently made these findings while conducting basic research at the Royal Veterinary college in Sweden. Now he is using these findings as a basis for further research at the University of Minnesota.



Dr. Ralph Kitchell conducting "taste testing" research. In the background is the cathode ray equipment used in the studies.

He points out that by understanding some of the mysteries of the taste mechanism, there is a more scientific basis for finding ways to coax livestock and poultry to eat their feed.

One of the key problems in livestock and poultry production is that animals often don't eat their feed, regardless of its nutritional value.

Some other findings Dr. Kitchell made:

* Artificial sweetening with saccharine wouldn't make feed any tastier to livestock. From what's known, only humans, monkeys and pigeons taste saccharine.

* Chickens can taste bitter substances like quinine, while pigeons can't. Thus, farm fowl may turn up their beaks at wild fruit which pigeons eat with relish.

* Cows, goats and sheep can't taste plain water, but chickens can.

* Calves can taste sugar--if they move their tongues around while eating it.

As Dr. Kitchell uses the term, taste refers only to the responses in the brain resulting from impulses from taste buds on the tongue. He adds that in the broad sense, "taste" is affected by many other things--temperature, odors, smells, appearance and so on. But he feels much basic study on the taste mechanism itself is needed before broader questions can be answered.

At the University, Dr. Kitchell is launching more studies on taste, using cathode ray equipment which measures actual taste responses from nerves which run from the tongue to the brain.

Dr. Kitchell explains that anatomical response to taste actually occurs in one certain area of the brain, where taste impulses are brought via certain nerves from the taste buds on the tongue.

SOYBEAN PRODUCT IS "TOOL" FOR RESEARCH

A soybean product has turned out to be a key tool for studying radiation injury.

The product is soybean oil extracted by the trichloroethylene (TCE) process. In 1951 it produced many fatal cases of aplastic anemia in cattle and has since been dropped from use in livestock producers.

But University of Minnesota scientists have since learned something else: The aplastic anemia resulting from this oil meal is very similar to the condition caused by gamma radiation, in which the bone marrow is also damaged. So the TCE-meal allows scientists to compare its effects with those of radiation injury.

The current studies are being directed by Dr. Jay Sautter in the College of Veterinary Medicine and Dr. M. O. Schultze in the department of agricultural biochemistry.

It all started in the early 1950's when several Minnesota cattle herds were hit by aplastic anemia. This condition results from the bone marrow being damaged to where it can no longer produce blood cells circulating in the body. The marrow produces these cells in the normal animal or man.

Animals affected by the anemia developed hemorrhages throughout the body and died in almost all cases. The trouble was soon traced to soybean oil meal extracted by the "Trichloroethylene" (TCE) process, which was immediately discontinued by feed manufacturers. Soybean oil meal extracted by other processes does not cause the fatal condition.

"This aplastic anemia condition had been noted before in Europe," according to Dr. Sautter, "but until the TCE-soybean meal problem came up here we hadn't seen much of it in this country. It has since been discovered that aplastic anemia is the same condition which is caused by gamma radiation."

With such a tool available, Sautter and his co-workers have launched a large scale study, working under a $60,000 3-year grant from the Atomic Energy commission.

"There are three known methods of producing

aplastic anemia," according to Drs. Sautter and Schultze. "one is gamma radiation, the second is TCE-extracted soybean oil meal and the third is an amino acid--which we call DCVC--obtained from the TCE meal. The DCVC is what we are actually injecting into animals to produce and study irradiation injury." Agricultural biochemists are synthesizing the DCVC for current studies.

Already, this research has brought some important findings. Drs. Sautter and Schultze have found that calves receiving gamma radiation, or the DCVC, can be restored to complete health if injected a short time later with a small amount of their own bone marrow removed before irradiation. Such a treatment, they say, has definite possibilities as a cure for gamma radiation injury.

Bone marrow is a fluid which could be collected from different types of animals--and humans, for that matter--and stored as a precaution against radiation dangers.

Dr. Isbin from the department of chemical engineering and Dr. Loken from the department of radiology in the Medical School are assisting in the project. This work, Dr. Sautter points out, is another example of effective cooperation of scientists in different parts of the University for the common benefit of all people.

A THIRD OF MASTITIS COULD BE PREVENTED

A third or more of the mastitis in Minnesota's dairy herds could be cured with antibiotic treatment--if dairymen used the treatment properly and wherever it's needed.

This would save some $5 million annually--which the disease is now costing dairy farmers in milk production and death losses.

Scientists in the University of Minnesota's College of Veterinary Medicine have confirmed studies from other states showing that the "strep" (streptococcus) form of mastitis can be eliminated with antibiotics now available. And the strep form accounts for between 30 and 40 percent of all mastitis in the state.

For the remaining 60 percent or more of mastitis, the answer isn't so simple. "Staph" (staphylococcus) mastitis, the most common other type, cannot be eliminated with antibiotics. But treatment will cure it temporarily in a third of the cases.

Drs. K. I. Loken and H. H. Hoyt, who are working on the problem, explain that "mastitis" really means any inflammation in the mammary system. About 90 percent of all cases are caused by the strep and staph organisms.

Mastitis can also result from physical injury. And worst of all, mastitis is most common in high-producing cows. Why? Because heavy-milkers have large udders, more udder tissue and therefore are more susceptible to both injury and infection.

Staph mastitis is usually more acute and more often kills cows than does the strep form. In some herds, Dr. Loken and Dr. Hoyt have successfully treated cows infected with staph mastitis, only to have the ailment show up again in the same cattle a week or two later. However, this temporary relief is sometimes enough to save the life of a cow with an acute case.

The Minnesota scientists have made some important headway on the problem. While mastitis has different forms, Dr. Loken and Dr. Hoyt have found that where a farmer raises his own replacements, the cause can usually be traced to a single type of organism.

This, of course, helps simplify the treating problem, since different forms require different types of treatment.

A farmer can't always completely stamp out this disease. But he can in many cases reduce the infection to a considerable extent. Based on current knowledge, Dr. Loken and Dr. Hoyt offer this advice:

1. Keep a close watch on individual cows. Those with swollen or inflamed udders or flaky milk should be milked last. This can help prevent spreading the infection from one cow to another.

2. Dip the teat cups in a disinfectant solution between each milking. This also helps keep down spreading of infection.

3. When mastitis occurs in a herd, call the veterinarian. If the streptococcus form is what's causing the trouble, every infected cow in the herd must be detected. Proper treatment with antibiotics can virtually eliminate the problem.

UNIVERSITY SCIENTIST PIONEERS USE OF NEW ANEMIA TREATMENT

Thousands of little pigs in Minnesota owe their good health to an English-developed treatment for iron-deficiency anemia.

However, the idea might not have caught on as quickly but for some pioneering by scientists in the University of Minnesota's College of Veterinary Medicine.

The treatment is the now widely-used and effective technique of injecting an iron-dextran solution into little pigs a few days after birth. It can prevent anemia and cure pigs already suffering from the ailment.

Dr. H. C. H. Kernkamp, veterinary pathologist in the College, was one of the first in the U. S. to try the treatment. He learned about it while browsing through some British veterinary journals one day in 1956. A quick letter to the British scientists brought him a small amount of the material and his tests were under way.

Since then, Dr. Kernkamp and his co-workers have tested the treatment on more than 500 little pigs. Results have been so favorable that the iron-dextran compound and other iron-containing preparations are now widely available.

This however, wasn't the first treatment for iron-deficiency anemia in pigs. Far from it. Dr. Kernkamp himself found in the late 1920's that little pigs could get enough iron from certain kinds of soil to prevent the ailment. Other researchers learned you could take care of the problem by treating the sow's udder with iron sulfate.

Both of the early treatments are still popular. So why use the injections? The reason, Dr. Kernkamp explains, is to have a method for

individual treatment. By injecting each pig with an iron compound, you're more certain he gets the medicine and in the right dose.

Also, injections bring about cures faster in pigs already suffering from anemia. Pigs with low hemoglobin levels--a measure of iron-deficiency anemia--could be injected with iron-dextran and have normal hemoglobin levels by a week later. Recovery would take longer with other treatments.

Current recommendations are for treating with injectable iron compounds when pigs are 3 to 4 days old.

Iron-deficiency anemia is a major disease problem in little pigs. It became more common as farmers changed to early farrowing, such as in February or March when pigs are confined. When pigs are farrowed outside, they get iron from the soil and the condition may never appear.

Iron-deficiency anemia is a reduction in the hemoglobin level and in the number of red blood cells. Symptoms in pigs are paleness around the eyes and mose, wrinkling of the skin over the neck and shoulders and sometimes diarrhea. The condition is often fatal and is most common between the third and fifth week. It most commonly affects the more rapidly-growing pigs on the farm.

Pigs don't get iron from their mother's milk. And until they are 3 to 4 weeks old, they don't eat much else. Therefore, some extra form of iron is necessary until they are on full feed and are eating enough iron.

VETERINARY SCIENTISTS SUGGESTS WAYS TO CONTROL SHIPPING FEVER

Beef calves that get the sniffles after a long trip are a major headache to Minnesota livestock producers.

The "sniffles" in this case are one symptom of shipping fever, a disease that hits many shipped-in feeder cattle and which can be hard on a cattleman's pocketbook. Fortunately, scientists at the University of Minnesota's College of Veterinary Medicine are recommending a procedure which can keep losses down.

The procedure: Keep a close watch on any cattle recently shipped from a distant area. If any show signs of the disease, call a local veterinarian immediately and treat the animals according to his recommendations. Several antibiotics are effective against the disease, if used in time.

Dr. Dale K. Sorenson is the veterinary scientist leading current research on shipping fever. He explains that the condition is an infection in the upper respiratory system, similar to the common cold. Besides runny noses, symptoms include high temperature, coughing, general sluggishness and failure to eat.

In severe cases, untreated animals with shipping fever may develop pneumonia or other complications and even die. Short of killing, the disease may become chronic, resulting in poor growth and loss in profit.

Dr. Sorenson's research shows that most animals trucked or sent by rail more than a few hundred miles get the disease. But only 10 or 20 percent normally show the obvious symptoms and need treatment. The rest have the fever in "subclinical" form and show few or no outward signs of illness.

The veterinary scientists recently kept close watch on 31 Hereford steers shipped from Aberdeen, S. D., to St. Paul. Twenty-five actually got the disease, but only 6 developed cases severe enough to be noticed and treated.

If an experienced stockman can't see signs of shipping fever, Dr. Sorenson says, he usually need not worry about it. Only the 10 or 20 percent getting the acute form need treatment. Since antibiotics are expensive, it wouldn't pay to indiscriminately treat the whole herd.

Dr. Sorenson's studies on shipping fever are part of a joint research project involving several colleges and universities.

One thing he has found is that animals shipped directly from first loading point to final destination--without stopping anywhere in between--are less apt to be bothered by shipping fever. But the more frequent the stops and the more time at each stopping point, the worse shipping fever may be in the cattle.

Also, cattle stopped at several points take longer to reach final destination. By then, the condition may already be so acute that treatment will no longer help.

Tranquilizers have been studied as a shipping fever preventive, but Dr. Sorenson says they need more evaluation before being generally recommended.

What causes shipping fever? This is the central question in Dr. Sorenson's current research. The exact organism to blame has not been determined, but evidence so far points to a virus.

"Pasteurella" organisms, present in respiratory tracts of most cattle, also raise some questions. They sometimes cause pneumonia, a common secondary infection that goes along with shipping fever.

Yet, Dr. Sorenson has found that pasteurella organisms themselves don't initially cause shipping fever. Instead, one current theory is that something else causes shipping fever to begin with--a condition which may "trigger" a pasteurella infection.

It's possible that in addition to the virus, some stress, such as exposure and fatigue from shipping, is necessary to make the animal susceptible to the secondary pasteurella infection which then leads to a severe case of shipping fever.

These questions, however, need a good deal of further study, Dr. Sorenson says. Only by answering them will it ever be possible to seek ways to immunize animals against shipping fever.

FEEDER CATTLE NEED VACCINE FOR "RED NOSE"

It may be funny on a circus clown, but red nose is no joke in beef cattle.

Instead, this ailment is a serious problem in the beef business. Best way to avoid it is to vaccinate feeder cattle as soon as they arrive in

feed lots.

That was advice given at a Minnesota post-graduate conference for veterinarians, by Dr. William W. Brown of Colorado State University.

Technical name for red nose is rhinotracheitis. It isn't common in Minnesota, but has shown up here.

Symptoms appear after cattle are in the feed lot for about 30 days. Affected animals cough, breath quickly with their mouths open and show a nasal discharge, sometimes bloody. Some animals may knuckle over on the front and rear legs.

Otherwise, the animals may be very alert, whic often helps distinguish this disease from shipping fever.

As a rule, economic losses due to weight reduction amount to more than those from deaths.

According to Raymond B. Solac, extension veterinarian at the University of Minnesota, secondary infections may result from red nose. It may weaken an animal and leave it more susceptible to another infection. If that happens, each animal must be treated individually.

If your veterinarian thinks it advisable, feeder cattle should be vaccinated soon after going into the feed lot. If they have had shipping fever, though, they shouldn't be vaccinated until after they have recovered.

AVOIDING CHILLS MAY KEEP FLU AWAY FROM HOGS

Keep your hogs free from chills during early fall days and you may avoid a costly attack of swine flu.

Exposure to cold wet weather can easily trigger off an attack of this acute, infectious and highly contagious disease, according to Raymond B. Solac, extension veterinarian at the University of Minnesota.

This doesn't mean you need elaborate housing. But animals should be well bedded and free from drafts. And it's wise to pen them inside the first few cold nights, to break them of the outdoor sleeping habit.

Swine influenza seldom kills many pigs, but it can indirectly hurt profits. It usually puts most of the herd under the weather. Hogs go off feed and become gaunt. After-effects may be more costly than the disease itself. A cough may hang on for 2 or 3 weeks afterwards and make it that much longer before the animals regain weight and condition.

Combined action of a virus, one type of bacteria, and chilling causes swine flue. Neither organism alone will produce the disease.

The disease usually strikes suddenly. Your hogs might be healthy at night and listless and uninterested in their feed next morning. By afternoon, most will be depressed and take to their nests. Next day, all may be sick.

Most sick animals lie on their sides. A few rest on their bellies almost in a sitting position, with the body propped on the front legs. They have a fever and breathe rapidly with jerks, or "thumps." You can walk among them without their being concerned.

Some may die and the rest will lose weight. A few days later, most get up with a cough and by the sixth day are improved.

Be sure to call your veterinarian if swine flu attacks your herd. Little can be done as specific treatment, but he may prevent complications and further losses. More important, he can distinguish between flu and other diseases like hog cholera and virus pneumonia.

Careful nursing for hogs with flu is important. They should have plenty of dust free bedding and fresh drinking water.

DIAGNOSTIC LAB KEEPS CHECK ON LIVESTOCK DISEASE

Minnesota farmers have their own "early warning system" for spotting sudden outbreaks of new livestock diseases.

The system is the Animal Diagnostic laboratory of the University of Minnesota's College of Veterinary Medicine and the State Livestock Sanitary Board.

Head of the laboratory, Dr. Reuel Fenstermacher, says the laboratory has accommodated "most any non-human creature that walks or flies" since he first came here in 1928.

Whether it's a cattle blood test for brucellosis, a hog autopsy or a post-mortem check on a rabid skunk, the laboratory is fulfilling a vital function.

Counting both serological (blood) tests and other analyses, the laboratory performs hundreds of thousands of tests yearly. It is the official animal diagnosis center for the state's 500 veterinarians, for the livestock industry and for the public.

Major facility of the laboratory is on the St. Paul campus. Willmar has a regional laboratory and another operates during the winter at Detroit Lakes--both primarily for testing turkey flocks for pullorum and paratyphoid diseases.

At the main laboratory, diagnoses were made on some 18,000 to 20,000 individual turkeys and on nearly 10,000 chickens in 1958. Other analyses included about 500 individual swine, around 400 cattle, more than 300 skunks (mostly rabies cases) and several other species of wild animals.

In addition, the lab makes thousands of blood tests.

From long-time summaries of diagnoses, the College of Veterinary Medicine keeps close tab on the livestock disease situation. For example, tests show that according to percentage of infection, tuberculosis and brucellosis in livestock are pretty well under control.

Looming as a serious problem, however, is leptospirosis in swine, cattle, horses and dogs. "Lepto" wasn't even recognized in this country until about 15 years ago. Last year, about 15 percent of 14,000 blood samples checked in the laboratory showed evidence of lepto infections.

In turkeys, blood tests show that a common problem is ornithosis, affecting about 13 percent of all breeding flocks.

Animals sent to the laboratory are never returned to prevent further spread of infections.