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

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

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

Agricultural Economics ...

FOOD FOR DEVELOPMENT PLAN PROMOTED BY U ECONOMIST

How a "food for development" plan could turn U. S. farm surpluses into aid for underdeveloped countries is explained by Willard W. Cochrane.

He urged consideration of a plan to use surplus food to help such countries to create productive capital and increase worker productivity.

Here's how the plan might work: A country like Bolivia or Libya might wish to build a highway. The country would plan the project, probably with United Nations help, and round up workers to do the job.

The U. S. would provide, from surplus stocks, food and clothing needed by the workers and their families for the duration of the project. A U. S. loan would permit the country to buy other materials needed.

The plan could also be used for vocational education and training or as part of a national plan of economic development

Critics of such a plan argue that it would perpetuate the surplus problem and is an inefficient way to help underdeveloped nations help themselves. They say it would be better to move toward freer trade and make dollar grants or loans to countries in need.

Cochrane said the free trade idea would work well "when economic sectors and resources are reasonably in adjustment. But these are serious maladjustments.

"Some countries are poor, while others are cursed with large surpluses. Almost none is interested in experimenting with a free-market, free-trade situation. They all seem to feel that the consequences are too rough."

Foreign surplus disposal is already big business, in fiscal 1958-59, U. S. farm exports under Public Law 480, mutual security programs and credit sales totalled $1.4 billion.

Cochrane's proposal involves these main points:

1. Except in famine situations, surplus U. S. farm commodities abroad would be used exclusively to finance economic development.

2. Once surplus commodities are committed to a development plan, they would no longer be regarded as surpluses. Instead, they would have recognized claims on U. S. production, just as the School Lunch program and International Wheat agreement have.

3. Food and fiber for development projects would be financed by means acceptable to the countries receiving them--grants, loans or sales for national currencies. Basic principle would be maximizing economic development, not returning money to the U. S.

4. Countries receiving food must show that such supplies from the U. S. don't reduce their normal purchases of the same type of commodities from other countries.

5. Since development food and fiber could finance only a part of every plan or project, complementary programs to finance purchases of hard goods, construction materials and services would be necessary.

6. Competing nations with surpluses--like Canada and Argentina--would be invited to participate in the "food for development" plan.

7. Until a world program was started, the UN Food and Agricultural Organization should have responsibility for conducting the plan. This would speed development where administrative experience and technical experiences are most lacking. It would also help free the U. S. of meddling charges.

FEEDER CATTLE RECORD PLAN AVAILABLE IN STATE

A feeder cattle "lot record project" has been set up by the University of Minnesota.

Cooperating farmers keep detailed records on type of feeding system followed, amount of feed used and market weights and prices. Records are then sent to agricultural economists at the University for analysis.

The project will give agricultural economists useful research information for advising farmers in coming years on profit prospects for different feeding systems.

The summary will show average profits for all lots of cattle, with breakdowns for each type of feeding program. Cooperators will have their own results for comparison with the overall average. They will also get periodic tips on market trends, feeding and general management.

EAT UP SURPLUS? ECONOMISTS SAY PROBABLY NOT

Can we eat our way out of the surplus problem?

Not entirely, says Martin Abel, agricultural economist.

But he adds that "demand expansion," coupled with other policies, does offer a partial solution. And if demand expansion enables people to eat more and better food, it could mean aiding health and productivity of American people.

"Demand expansion" has been a popular idea for some 30 years. Examples are the Food Stamp Plan of the late 1930's and early '40's, the present School Lunch program and the Special Milk program.

There are three broad approaches to increasing demand for farm food products.

1. Subsidize low income consumers to give them the food purchasing power of higher income groups. Abel says raising all per capita incomes to above $1,000 would raise total food consumption by 7.3 percent. That would almost account for the 8 percent surplus which we now have. However, this approach would mean a food subsidy to half the nation's people.

If all incomes were raised to $500--a more reasonable level--total food consumption would go up only 2.4 percent.

2. Reduce retail prices of food and pay producers differences between resulting price and an established "fair" price. A 20 percent drop in price of livestock and livestock products would increase food consumption 3.3 percent. However, that would mean a 40-50 percent decline in farm level prices for livestock and livestock products. This would take a large subsidy to farmers to make up the difference between the new low farm price and an established fair price. And the price approach still wouldn't completely eliminate farm surpluses.

3. Make everyone's diet nutritionally adequate. This approach doesn't work out the way you might think. If you wound up with all diets about like that of families whose income was between $4,000 and $4,999 per year, total food consumption would actually go down 5.5 percent. That's because you would be eliminating high-calorie foods for many people.

If all diets were on the level of families with incomes between $6,000 and $6,999, consumption would increase 2.3 percent. But that would be a high cost diet--again unreasonable.

FEED CONTRACTING REASONS VIEWED

Contract feed selling--one type of vertical integration--often results from a dealer's attempt to give better service and boost sales without price-cutting, says Oswald P. Blaich.

Contract selling to a hog producer, often means supplying feed and credit on contract, with the farmer agreeing to follow certain management steps.

A feed processor needs to increase sales. Yet, he seldom resorts to cutting prices.

Most established firms would rather turn instead to promotion and new product ideas.

But other firms soon copy improvements in a new formula. Extending credit began as one form of non-price competition, too, but now practically all dealers do it and the competitive advantage has been lost.

Seeking another way to compete, many dealers hit on the contract idea. It started when feed processors began to give farmers management advice. This was harder for competitors to copy.

Feed contracts have three main clauses: (1) extending credit; (2) exclusive use of the company's feed; and (3) specification of management practices. The last clause brings this type of contract under the "vertical integration" classification--and raises objections.

The integration clause opens up possibilities for improvement: it gets some hog men to use more formula feed than before, and it opens new market possibilities for producers who never previously used formula mixes.

LARGE BEEF HERDS TAKE LESS TIME PER ANIMAL

Twice as many feeder cattle don't call for twice as much work.

Farm economists R. G. Johnson and T. R. Nodland found that true in a study of 59 farmers in southern counties. For example, 40 head of cattle required 423 hours per year, while 80 head used 630 hours--less than 50 percent more.

The increased efficiency in boosting herd size wasn't simply a result of bigger equipment, either. Even with the same facilities and feeding methods, large herds took less time per head.

In general, Johnson and Nodland found that average amount of labor per head drops rapidly for lots up to 50 head. After that, boosting herd size still increases efficiency, but not as much. However, the amount of labor a farmer uses annually isn't as important as amount used in a particular season.

On an example 160-acre farm the economists found the farmer would have more than 230 hours of labor per month available in January, February and March. In June, however, the press of field work would leave this same farmer with only 28 hours that he could spend on the cattle.

In that particular case, 38 head of feeder cattle would use about 28.4 hours per month, meaning that herd size would be the maximum for June on this farm.

DAIRY HERD SIZE AFFECTS FORAGE FEEDING TIME

A dairy farmer who triples the size of his dairy herd won't have three times as much work as a result.

Earl Fuller and Harald Jensen made that finding in a study of dairy farms with loose housing systems--where cattle are fed in an open lot, with a loafing shed or barn for shelter.

They found it took 1.3 hours labor time per week to feed baled hay once a day to 30 cows. For 90 cows, the requirement was 2.8 hours.

For both winter and summer hay feeding, labor time for the job was about the same whether hay was stored at ground level or overhead. It was also about the same for cows as for young stock.

What did make a difference was whether cows were fed once or twice a day and whether hay was baled or chopped. In winter, feeding chopped hay from nearby storage, for large herds, took a little longer than feeding bales once a day from adjacent storage.

They found that with horizontal silos, labor time for silage feeding didn't vary much with herd size. About the only difference was that with 55 cows or more, the feeding gate needed to be moved twice daily rather than once.

For silage feeding and winter hay feeding in small herds, hauling forage by wagon to bunks took little more time than feeding from storage next to the lot. Also, the study showed that a silo unloader was not as much of a time saver as it was an energy saver.

Time needed to care for cattle on pasture wasn't affected much by herd size. There was a good deal of variation, but it was due mostly to distance of pasture from the barn, location of water and shade--and even whether the farmer had a good dog.

On the average, herds fed fresh green-chopped forage required 1.4 hours labor per week, for herding from the green chop lot, besides the chopping and feeding itself. Regular pasturing took 2.3 hours labor per week and daily rotational pasturing required 3 hours.

The economists say there are two kinds of chore labor. First is "fixed time," which isn't affected by changes in herd size. If you feed silage by hand from an upright silo, it takes so much time to climb up and down the silo regardless of how many cows you have.

Second is the "variable" time, which in case of silage, would be the time required to actually throw the silage down. This varies with the number of cattle.

Fixed time accounted for a large share of total time in feeding forages. Average feeding time is bound to decrease with bigger herds, because you then spread the fixed time over more head.

FARM CORPORATIONS GAIN INTEREST AMONG FARMERS

Many farm families are wondering if it pays to incorporate.

They have many things in mind--limited liability, transferring from father to son, possible tax advantages and other reasons.

Before drawing up incorporation papers, however, get a lawyer's advice first and take a hard look at the pros and cons.

A corporation is a separate legal entity under state law. It may transact business, make contracts and hold property in its own name. It can sue and be sued.

Today, there are 90 of 137,000 Minnesota farms that are corporations. Two-thirds of them have been formed since 1950.

According to University of Minnesota farm economists Philip M. Raup and Hal Routhe and law student Robert Beck, advantages of incorporation are:

. It's easier to transfer property within the family. Shares of stock are simpler to distribute among heirs than land, buildings, livestock and equipment.

. Children no longer on the farm can own an interest in the property and help finance the operation--with the management still left up to stockholders on the farm. Stock ownership may change hands but the business keeps going.

. Under certain conditions, a stockholder has "limited liability"--i.e. he may be liable only to the extent of his investment.

. A clear-cut separation of several business activities, while permitting ownership to remain in the hands of the same individuals or families, is possible.

Corporations have some drawbacks, too. They are: The possibility of double taxation--having income taxed as corporate income and again as personal income when distributed as dividends to stockholders.

. Possible red tape. Formal meetings must be held. Records must be maintained, with serious consequences possible if they aren't. If courts, in a law suit, can find no evidence of corporation records, regular meetings and minutes, they may rule that no true corporation exists. That would mean losing the limited liability feature and other advantages.

. Initial incorporation costs sometimes mount up. Filing and attorneys' costs could easily be $400 or more for a corporation with an authorized capital stock of $100,000.

. A minority stockholder is subject to majority rule on management, payment of dividends and his withdrawal. He might be "locked in" the corporation if he has no prior agreement with the corporation to buy back his stock if he wishes to withdraw.

PRODUCTION COSTS ARE KEY TO EGG PROFITS

With a farm laying flock it takes top notch management and efficient, low cost quality egg production to make a good return, says Hal Routhe.

Egg prices in the past five years have averaged about 29 cents a dozen. And Routhe predicts they won't average any higher during the next five years, either.

That's going to hit the family-sized laying flock pretty hard.

The answer depends on egg production costs. With average annual production of 216 eggs per layer, total cost would be 29 cents a dozen without any return for labor. With efficient production--230 eggs per layer--cost without labor is 24 cents a dozen.

The flock owner who has adequate buildings and equipment already paid for, and little alternative use for these buildings and labor, can justify a small, well-managed flock.

Buildings depreciate whether they're used or not. If you ignore ownership costs, and figure the average egg price at 29 cents, you'll make about 7 cents a dozen. That would mean about $1.30 an hour for labor from a well-managed flock.

An alternative is to convert the buildings to more profitable uses--such as hogs. During the past five years, labor returns for hogs were more than $2 an hour. But, returns from small laying operations with average production were only about 50 cents an hour.

Only flock owners with better than average results should consider expansion. There is still a place for an efficient family sized flock on Minnesota farms. But you'll have to utilize buildings, carefully use family labor, and produce quality eggs.

IMPROVED MANAGEMENT BOOSTS RETURNS

A dozen farm families in northeasten Minnesota are showing how to step up farm profits even though agricultural income in general in that area is declining.

The families have nearly tripled their farm earnings since 1954 without, in most cases, buying more land--the improvement was in general management.

The farms also show that an annual return of $5,000 to labor and capital from 100 tillable acres and 20-25 cows producing milk for a grade A market is still possible.

Each farm took part in a special demonstration started in 1954, in cooperation with county agents and University of Minnesota extension economists.

Reports farm management specialist Paul Hasbargen: As a group, the 12 farmers made these increases from 1954-58: $67,860 worth of farm products produced; $47,410 earnings expenses; $40,450 on farm purchases in their communities; another $10,000 spent for household and personal goods and services; $3,600 more paid in federal and $500 in state income taxes.

Key to the improvement was better management. The project shows real potential for the farm and home development educational approach in helping farm families.

Many of the farmers shifted from part-time to full-time farming. Their non-farm income dropped by 41 percent. Yet, farm income went up enough so that total family earnings increased $2,284 per farm.

Added income did not call for changes in land, labor and capital to any extent. The farms averaged 254 total acres in 1954 and 261 in 1958. Tillable acres went up from 82 to 112. Number of workers stayed the same and total farm capital increased from $18,932 in 1954 to $22,862.

More important was that the farmers grew more and higher quality feed, supported more cows and boosted production per cow--they made more efficient use of their basic resources.

The farms averaged 16 milk cows each in 1954, were up to 23 in 1958. At the same time, total milk per farm zoomed from 120,000 to 210,000 pounds.

The results show that to receive a $5,000 return to capital and labor from dairying, a farm in northeastern Minnesota needs enough tillable land to feed enough good cows to market at least 200,000 pounds of milk in a grade A market.

For most farmers, this would mean about 100 tillable acres and at least 20 cows producing over 10,000 pounds of milk each.

Hasbargen recognizes that farmers selling milk for manufacturing do not have as good an income potential--as was the case with five of the 12 demonstration farms. But even with a poorer market, farmers can also better their income with better management.

PROBLEMS OF FAILING CREAMERIES ANALYZED

Nearly half of Minnesota's creameries have gone out of business since 1938.

And those hoping to stay alive would do well to take a careful look at reasons for the failures, say Victor F. Amann and E. Fred Koller. They report that creamery numbers dropped from 874 in 1938 to 460 in 1959.

Meanwhile, butterfat volume per plant soared from 319,000 pounds in 1938 to 683,000 during the past year. The number annually receiving less than 400,000 pounds of butterfat decreased 70 percent; plants handling 750,000 pounds or more jumped from 42 to 122.

Amann and Koller studied 41 creameries which closed down recently. Major reasons for failure were low volume, high operating costs, poor financial condition and failure to keep up with the times.

During their last year of operation, the 41 plants averaged 126,780 pounds of butterfat receipts. Average volume for all state plants in 1955 was more than four times that much.

Processing costs for plants closed since 1950 averaged 9.71 cents per pound of butterfat. That was 2.41 cents above the state average in 1954.

The creameries were steadily losing patrons. Average number was 52 during the last year of business, down from 128 in their best year.

Thirty of the 41 plants received only farm-separated cream when they closed. Only

11 had shifted to whole milk. In other words, the plants had failed to keep up with the times. Larger-volume patrons who wished to sell milk were often forced to shift to plants which had milk receiving equipment. As a result, the creameries lost volume, suffered financially and finally closed.

Most of the plants were in poor shape financially and physically.

Total assets of the plants averaged $30,760 at closing time, a third as large as the 1950 state average. Total debt at closing averaged $13,297; net worth, $16,384, leaving $1.21 of net worth for each $1 per debt. A ratio of $2 to $1 debt is a much safer minimum.

Thirty-four plants were able to pay all commercial creditors in full when they closed. Five defaulted in part.

Sixteen plants were able to repay all preferred and common stockholders and holders of book credits in full. Stockholders received no repayment in 14 plants.

Amann and Koller conclude that creameries with declining volume have three main choices:

(1) Improve operations to attract more volume; (2) Merge with other plants for higher volume and lower costs; (3) Dissolve and sell off their assets.

TURKEY PRODUCTION INCREASES GREATLY IN MINNESOTA

Nowhere in Minnesota has agricultural change been more striking in the past 20 years than in the turkey industry.

Minnesota's turkey production increased from 4 million birds in 1950 to about 15 1/2 million in 1960--making the state first in the nation in number of turkeys.

Economists Turner Oyloe and Darrell Fienup surveyed 800 members of the Minnesota Turkey Growers association and hatcheries and processors. They found that:

. The number of large-scale turkey producers is climbing rapidly. Only 1 percent sold 50,000 or more birds in 1955. This year, 10 percent will reach that level of production.

. Turkey operations have become more specialized. Of producers marketing 10,000 or more birds in 1959, half had no other source of income. And of the large producers who did have other enterprises, most depended on turkeys for the major share of returns.

Small producers weren't quite as specialized. Of those marketing under 10,000 birds annually, three-fourths said turkeys accounted for half or less of their income.

. Three hatcheries in 1958 turned out more than half of the total hatch and 11 accounted for more than 75 percent.

. Processing has been more concentrated, with more than 75 percent done by 10 plants in 1958.

. Turkey production, hatching and processing have become spread more evenly around the year. In 1957, only 76 percent of Minnesota turkeys were hatched in the first 6 months of the year, compared to 94 percent in 1951. Three forces were behind the shift from seasonal turkey production.

1. Consumer's habits have changed. Turkey is no longer simply a holiday treat.

2. Farmers, hatcheries and processors are trying to spread their operations over a longer period to more fully use their investments.

3. The industry has found it easier to adjust production to market needs and opportunities through vertical integration--of many kinds.

Growth of the turkey industry is due to many incentives. Efficiency has shot up. Turkey death rates have dropped. Credit has been widely available; only 18 percent of the growers surveyed provided all their own financing.

The shift of retail marketing to chain stores and other large retailers has helped concentrate turkey production among a rather small number of producers, hatcheries and processors. Large producers are best able to furnish supplies, uniform quality and even size which these retailers want.

HOG FARROWING "EVENING OUT" IN STATE, U. S.

Hog farrowing is becoming more evenly spread around the calendar--a definite change for the better. The result is more even marketing and less variation in seasonal hog prices, according to K. E. Egertson, extension livestock marketing specialist.

In the period, 1947-1949, half of all sows farrowed in the March-May period. A smaller peak farrowed in August and September, but only 8 percent farrowed between November and January.

By 1957-59, national farrowings between March and May were down to 37 percent of the yearly total. A larger percentage was farrowed between June and November. December-February farrowings increased from 11 percent of the yearly total to 20 percent.

Minnesota is following the trend, too. Ten years ago, 71 percent of all sows in the state farrowed in March, April and May. By 1957-59 farrowings in that period fell to 46 percent. On the other hand, December-February farrowing increased from 3 percent to 16 percent of the yearly total. Fall farrowings, June to November, also increased from 26 percent to 38 percent.

Egertson points to four major reasons for these shifts:

. Improved knowledge of seasonal price variations, causing more hog producers to adjust farrowings to take advantage of normal high price periods.

. Improved feed supplements, permitting more winter confinement feeding and less dependence on pasture.

. Better housing and the expanded use of heat lamps, making more winter farrowing possible.

. A switch to multiple farrowing, by many producers, to use fixed equipment for more than two litters, and to market more than twice a year.

SIZE OF STATE'S DAIRY HERD SHOW RAPID CHANGE

The number of dairy herds in Minnesota is dwindling, while herd size is on the increase.

The total number of cows remains about the same. Minnesota farmers built their dairy herds to a peak of almost 1.9 million cows in 1934 and again in 1944. Since 1948, however, the total number of cows remains near 1.5 million.

According to S. A. Engene, agricultural economist, the number of herds with 30 or more cows doubled between 1955 and 1959. In the same period, herds of 1 to 9 cows dwindled by one-third. And herds of 10 to 19 cows decreased by almost one-fourth.

The number of dairy herds will probably continue to decline, says Engene. Fifty percent of the dairy cows in Minnesota could be in herds of 30 or more by 1970. More herds will probably have over 50 cows. And many of the larger herds will be on farms with two or more workers.

Engene says the rapid change is due to several factors. Those favoring smaller herds are:

1. The number of small farms (120 acres or less), has dropped sharply. Many such farms had small dairy herds.

2. Some farmers who had small dairy herds have put their farms into the soil bank.

3. Often the increased fixed investment that has gone with improvements of dairy production--for new or remodeled milk houses, bulk tanks, milking parlors, gutter cleaners and the like--has been too large to be carried on some small herds. Also, modern forage harvesting machinery involves large investments and often can't be justified when a herd is small.

4. Fewer and fewer people are willing to be tied down for two milkings a day, seven days a week, especially on small farms where there isn't enough help to allow an occasional day off.

Factors favoring larger herds are:

1. Relatively low labor requirements with modern equipment, together with today's potentially high rates of production per cow, may make dairying profitable for a farmer whose herd is large enough to handle the overhead.

2. Once the up-to-date equipment has been installed, the extra labor or cash outlay for extra cows is comparatively low. Many farmers then expand their herds even further than they had intended.

3. Modern forage production and harvesting methods increase both the quality and quantity of forage, making it possible to feed larger herds.

ECONOMISTS DISCUSS NEW RURAL ZONING AUTHORITY

Problems like junk yards next to rural homes may be easier to avoid in Minnesota as a result of the state's zoning legislation.

Rural areas in 1959 were given broader authority to plan for land use. How the new legislation works is discussed by R. B. Morrow and P. M. Raup, University of Minnesota agricultural economists.

The 1959 legislature enacted a statute whereby any township may pass zoning laws.

Counties may plan and zone if their population is under 300,000 persons.

The economists expect that counties will be most active in rural zoning. They are better able, in most cases, to raise funds for preparing development plans and employ planning personnel.

Zoning can help avoid a number of problems resulting from city expansion, highway improvement and suburban development.

Here's the procedure by which counties may plan and zone:

The board of county commissioners must first pass a resolution declaring its intent to proceed with planning and zoning. Next, the board should prepare a comprehensive plan for orderly development of the entire county or for parts which they wish to zone.

The board is not required to submit the plan to the voters, but hearings must be held.

Once plans are adopted, counties may enforce them under their general authority to protect and promote the general health, welfare and safety.

These ordinances generally have three main features.

First, they establish zoning districts. Certain areas are restricted to given uses, such as residential, agricultural, recreational, industrial or others. Some areas may be zoned for a combination of uses.

Second, the ordinances guide building location, height, set-back and size of yards or service areas of activities designated for the district. Regulations must be similar for all property classes within a district, but may differ from one district to another.

Third, the ordinances include maps showing planned location of roads, parks, streets and service facilities, such as schools, playgrounds and water and sewage systems.

A county board adopting official controls

must also set up a board of adjustment, to act on questions which may come up on administration and interpretation of the maps and ordinances. Decisions from this board aren't necessarily final. Dissatisfied persons may appeal board rulings to the district court.

On the other hand, persons injured through lack of enforcement may bring action against responsible officials to put the ordinances into effect.

Counties which had zoning authority before 1959 now have the option of zoning under either the old law or the new statute.

HOW FARMERS ADJUST TO INTERSTATE HIGHWAY TOLD

How does the Interstate Highway affect the size and shape of a farmer's fields? Are payments for land used in highway construction high enough to cover the damages to farm operation?

These questions are answered in "How Farmers Adjusted to an Interstate Highway," a report issued by the University of Minnesota departments of agricultural economics and geography in cooperation with the Minnesota Department of Highways and the U. S. Bureau of Public Roads. Walter Gensurowsky, agricultural economist, and Everett G. Smith, Jr., geographer, made the study.

The report concerns an 8-mile segment of the Interstate Highway system built through a rural area between Faribault and Owatonna during 1956-58. This freeway took land from 28 farms along the route. In 13 cases a farmer's land was trimmed; in 15 instances farms were split up by the new construction. Farms that were trimmed lost an average of 5.1 acres. Farms that were split up lost from 9 to 68 acres each; the average taking was 20.1 acres. Average land loss to all farms fronting the freeway was 13 acres.

Farmers have adjusted to the change in various ways, according to the study. There is more buying, selling and renting of land as farmers try to re-establish the most favorable conditions of land use. However, this follows a general trend of changes in agriculture which have been underway for some time.

Payments per acre for right-of-way land along the interstate route were higher than the market value of the land. This is because damage payments to farmers must compensate for such things as denial of access to the limited-access highway and damage resulting from inefficient farm operation. Inefficient operation results from roundabout travel to severed portions of the farm and from reduced farm size.

Agricultural Biochemistry...

SOYBEAN PROTEIN ONE SOLUTION FOR WORLD FOOD NEEDS

Soybeans may turn out to be one major solution to world food needs.

They're already popular in human diets in crowded Asian nations. And a University of Minnesota agricultural biochemist, D. R. Briggs, believes soybean protein may some day replace some of the steak, pork chops and other meat right here in the U. S. Here's why.

It takes as much as 6-10 pounds of vegetable protein fed to livestock to supply a pound of protein in lean meat. With present surpluses in the U. S. that's no problem now. But growing population could in the future mean a different story, Briggs says.

Where food supplies are really pinched, it makes sense to eliminate the animal as a "middleman"--to some degree, at least--and put soy protein directly in human diets.

Soybean protein is good because it's so high in quality--quite comparable to casein, the major milk protein. Few other vegetable proteins measure up to that in the soybean.

Proteins are made up of amino acids, often called the "building blocks" of protein. Some amino acids are essential in the diet, others non-essential. If a human diet doesn't contain enough of the essential ones, result will be inability to build up body proteins--leading to disease or even death.

Soy protein, however, has enough of all the essential amino acids for animal or human growth.

One problem is that soybean meal developed a bad name during World War II. When used in breads, breakfast foods, soups, sausages and other food, soybean meal caused flavor, color and texture changes which consumers didn't like.

Now, though, Briggs says it's possible to extract and purify a protein from soy flour that has no taste whatsoever and very little color. It can be used to enrich bread, for example, with no unhappy effects. Some bakers have put up to 9-12 percent soy protein in flour with little or no change in the bread's desirable characteristics.

So Briggs sees good possibilities for adding soy protein in commonly used foods.

Briggs and other biochemists at the University are doing a number of basic studies on soybean proteins. They recently found, for example, that the major soy protein, glycinin, has three main components.

Studies on the individual properties of these components are now being conducted. Results of such research, Briggs says, can be expected to increase the usefulness of soy proteins for food and industrial purposes.

BIOCHEMISTS FIND MILK PROTEINS AFFECT BREAD LOAF

Many a housewife knows heated milk makes a better loaf of bread, but University of Minnesota research shows why.

The reason is that heating overcomes the effect of a certain protein that would have caused trouble otherwise.

That certain protein was recently discovered by agricultural biochemist Robert Jenness. It's called "component 5" and it's one of the whey proteins of milk. There are two kinds of protein in milk--whey protein and casein.

Studies that led to identifying component 5 go back to an old problem in breadmaking. Housewives and bakers learned years ago that unheated milk would result in soft and slack dough, and a small loaf.

Minnesota biochemists and dairy industry researchers later found that heating would eliminate the depressed loaf problem. For example, the milk could be heated to 165 degrees for 30 minutes, or 250 degrees for 30 seconds.

The scientists also worked out tests for determining whether a specific lot of nonfat dry milk is of satisfactory baking quality.

This solved the immediate problem, but Jenness and other researchers still wanted to know what caused the trouble in the first place. They separated out the five most prominent whey proteins and studied them in baking experiments. None affected loaf volume.

Then they found a sixth protein--one not known of before. They found that 5 parts of this protein in 10,000 parts of high protein flour would reduce loaf volume by as much as 15 percent. This, then, was the culprit. Jenness named the protein "whey component 5" and is now attempting to purify it and find out just what it does chemically in the bread dough.

NEW USES FOR STARCH MAY HELP REDUCE SURPLUSES

Reduction of food surpluses through new industrial uses of starches may result from fundamental research under way on the University's St. Paul campus.

The project involves "remodelling" of corn starch molecules, reports Fred Smith, University biochemist. Heating corn starch either alone or with a small amount of an acidic substance brings about what is called dextrinization to produce compounds with gum-like properties. Compounds of this type are now used on a vast scale in the adhesive, mining and textile industries.

The University researcher traced the discovery of this gum back to a fire in an Irish

starch plant in 1821. The fire roasted the starch, and when water was poured on the flames the result was a gum which was found useful for such things as sealing envelopes.

Until University of Minnesota researchers began recent investigations, however, no one knew exactly what chemical changes occurred during the roasting process.

When various compounds are mixed with the corn starch during dextrinization, it was found the added compound forms an integral part of the remodelled corn starch molecule, resulting in a variety of entirely new substances. They are the forerunners of new types of adhesives which may prove to be the beginning of a new industry based on starch.

What can be done with starch from corn can also be done with starches from potatoes, wheat and other crops which are in surplus as foods.

University researchers hope their efforts will directly result in, or stimulate industry to find, new chemical uses for starch.

BIOCHEMISTS STUDY EFFECTS OF LOW TEMPERATURE ON DRY YEAST

Agricultural biochemists at the University of Minnesota have found the major reason why housewives must be so careful about water temperature when mixing dry yeast for baking bread.

The temperature should be around 100 degrees Fahrenheit. If the water's too cold, something goes wrong with the membranes, or outer covering, of the yeast cells and some of the cell material leaches out.

When that happens, the yeast produces less gas and the bread won't rise properly.

One of the escaping substances that causes trouble is called glutathione. When free in the water suspension, it causes slack, soft dough.

Bakers and housewives have known all along that water temperature is important for mixing dry yeast--technically called "active dry yeast." Up to now, though, the reason hasn't been clear. Compressed yeast can be mixed at a wide range of temperatures with no ill effects on the dough.

To get some answers, biochemists J. G. Ponte, Jr., W. F. Geddes, and R. L. Glass studied what happened to the dry yeast cells and the material inside them at different mixing temperatures. At 104 degrees, they found that cells lost only 5 percent of their material and the least amount of the glutathione.

At 68 degrees, the loss of solid material was three times as great as at 104--enough to seriously reduce the yeast's ability to ferment and make dough rise.

The glutathione does no harm as long as it stays within the yeast cells. However, when it escapes into the water, it interacts with proteins in the flour, making the dough sticky and poor in quality.

The lower the water temperature, the more solid material and glutathione the yeast cells lost. Compressed yeast, however, lost the least amount of cell material at 68 degrees. Also, compressed yeast lost no glutathione at any water temperature.

U SCIENTISTS SEEK WAY TO COMBAT GRAIN MOLDS

Drying before storing and keeping a close watch afterward is the only safe way discovered so far to combat molds which attack grain in the bin, Robert L. Glass, assistant professor of agricultural biochemistry, says.

For absolutely safe storage grain should not contain more than 13 percent moisture. U researchers have found that a certain species of mold, Aspergillus restrictus, will grow at moisture levels as low as 13.2 percent. At moisture levels of 14 percent and higher, many other species of molds will grow rapidly, particularly at temperatures between 85 and 95 degrees.

This does not necessarily mean that grain placed in an elevator at 13 percent moisture will remain at that level and keep indefinitely. Often moisture will move through a bulk of grain, producing accumulations of water and pockets of mold growth with resulting heat and spoilage.

The moisture moves because of temperature differences caused by rodent and insect activity or the sun's rays. As a result, the air moves slowly from warm areas to cool ones. As the air moves, it deposits moisture on the cooler grain.

If this continues long enough, moisture will accumulate for molds to grow, producing heat as well as moisture. The moisture will then be carried to another part of the grain, where the process will continue. To prevent such local "hot spots," stored grain can be turned at intervals or cooled by low rates of air flow.

Mold-damage in grain shows up in lowered percentage of germination. A later stage of damage in damp wheat is known as "sick wheat." Such grain has a dull appearance, and the germs show discolorations ranging from light brown to black. This grain will not grow and when milled yields flour of inferior color and baking quality.

As damage continues, fats are destroyed, liberating fatty acids which may readily be determined. The sugars disappear later in wheat, although in corn this occurs prior to a change in fat acidity. As these processes continue the grain will eventually be almost completely consumed, although it is commercially worthless long before this.

Agricultural Engineering ...

NARROW CRIBS STORE WET CORN SAFELY

What you do with the corn you harvest in the fall will depend a lot on the moisture content. If you're storing your corn in cribs over 5 feet wide, better be sure the moisture content is below 20 percent.

But research and experience show that wet corn can be stored in narrow cribs with minimum losses. Extension agronomists and engineers say ear corn with moisture content as high as 35 percent may be stored in cribs no more than 5 feet wide with little or no spoilage.

University specialists stress these points for successful ear corn storage in narrow cribs:

. Keep crib width 4 1/2 to 5 feet.

. Put in a concrete floor to raise the floor to prevent rodent damage.

. Locate your crib away from buildings or other obstructions to make best possible use of natural air movement.

. Build your crib at right angles to prevailing winds.

. Remove husks, loose kernels and other debris from the corn.

If you're storing high-moisture corn in wide cribs you already have, put in some ventilators. This cuts down on the distance the air must move through the mass of corn.

It takes wind pressure to force air through the corn. This means the air path through the ventilator should be horizontal, with the ends of the ventilator exposed to outside air. Vertical, flue-type ventilators are not effective.

SIMPLIFIED TYPE OF HAY DRYER BEING DEVELOPED

An experimental, inexpensive hay drying unit is being studied at the University of Minnesota's Northeast Experiment Station, Duluth.

The unit is a "batch" dryer, constructed of wood and big enough to dry up to five loads of baled hay at a time. Apart from the blower itself, materials for the structure cost only $300. A farmer could put one up in a day or so.

The structure offers real help to farmers hoping to get hay in quicker and with less loss of hay leaves. Here's how it works:

A farmer cuts the hay, goes over it with a conditioner, and bales it the following day at 35 to 45 percent moisture. He than hauls the bales to the dryer, puts them in by elevator, and turns the blower on.

With heated air, the hay is dryed down to about 15 percent moisture by the following day. Drying time varied from 10 hours for hay put in at 30 percent moisture to 22 hours for other hay put up at 45 percent. Then the bales are moved by elevator from the drying unit to the barn mow for permanent storage.

The structure, made of a 2 x 4 frame with plywood inside the members, is 12 feet wide, 12 feet high, and 24 feet long. Drying air comes from a portable dryer, a type common in Minnesota.

Air blows in from one end under a slatted floor, rises through the hay and escapes at the top. The structure is open at the top and during drying is loosely covered by a tarpaulin.

John Strait, agricultural engineer, designed the structure in cooperation with Ralph Grant, station superintendent.

One limitation of the structure is its size. It dries one batch of hay--12 to 15 tons--in one day. A farmer with a large acreage could be limited in how fast he gets his hay harvested.

However, the structure perhaps could be made at least 12 feet longer with little or no loss in drying ability. In that case, the unit could handle 6 or 7 loads at a time.

The structure as it is now has a flat slatted floor. Grant and Strait say it may be modified to have sides slanting in, with a conveyor down the middle. That way, the bales after drying could be moved out and into an elevator entirely by mechanical power.

Bales used in the studies are short, 20-pound bales which don't need to be stacked.

POINTERS GIVEN ON INSULATION FOR BUILDINGS

Insulating a new farm building means much more than having a "dead air space" between two walls.

In fact, the idea of a dead air space being a good insulator isn't necessarily correct, according to extension agricultural engineer D. W. Bates. Air tends to fall on the cold side of an air space and rises on the warm side. Therefore, the air circulates and carries heat away from the warm side.

However, if the space is filled with a light, fluffy material, millions of tiny air pockets will form and trap the air. Then, the air is really "dead" as far as movement is concerned, and resists passage of heat.

There are four general types of thermal insulation--rigid, flexible, loose fill or "pour," and reflective.

Rigid insulation, in addition to blocking passage of heat, has structural strength. But the stronger the material, the less its insulation value. So strictly from the standpoint of insulation value, rigid insulation is quite expensive. It should be used mainly where its structural strength is needed.

Flexible insulation comes in bats or blankets that fit between studs or ceiling joists

of common spacings. Blanket insulation, for example, usually comes in thicknesses of 1 or 2 inches and in rolls of 50 or more square feet. It usually is made up of a vegetable or mineral fiber between two sheets of paper, with paper on one side being a vapor barrier.

Fill, or pour, type insulation may be either home processed--sawdust, wood shavings or chopped straw--or commercial material.

Reflective insulation has no bulk. Its value instead comes from its ability to reflect radiant heat. To be most effective, the bright surface must face an air space 3/4 inch or more in width. Reflective material will not insulate when both sides contact the building or other insulating materials.

Plan Sheet M-129, "How Much Insulation Do I Need?" gives more details on insulation material.

DIESEL TRACTOR MAY SAVE COSTS FOR HEAVY WORK

Is a diesel tractor more economical than a gasoline model?

In some cases, yes--if the tractor runs more than 500 hours a year and does a good amount of heavy work.

But for less use than that and for lighter pulling, a gasoline tractor is usually a better choice, according to Arnold Solstad, agricultural engineer. He bases this rule on a purchase price $600 higher for a diesel tractor--compared to a gasoline model of the same power rating--and on a fuel cost averaging 5 cents per gallon less in favor of diesel.

So while the diesel tractor is more expensive to buy, it becomes more economical the more it is used. If the tractor is to be used more than 750 hours per year, Solstad says, the diesel will almost certainly save money.

Diesels have some other advantages, too. They have more lugging power in rough going, meaning they are better able to pull through a tough spot without shifting.

Diesel fuel, in addition to being cheaper is more efficient than gasoline. It burns slower, making it less hazardous to handle. But on the other hand, diesel oil must be kept very clean. Diesel engines have high cost precision parts that can be easily scratched by dirt or rusted by water that may condense in the fuel.

If you have a diesel tractor, never use any other type of fuel. Diesel oil lubricates the fine parts of the engine pump and injectors. If you put gasoline in the engine, these parts will be ruined.

A diesel engine may also be harder to start in cold weather. If both the incoming air and the engine are cold, it may not be possible to get enough heat to ignite the fuel.

All diesel engines should be operated and serviced strictly according to specifications. They all run rather dirty, and therefore need a heavy duty oil.

Also, unless you're an expert, don't try to adjust the injectors and pumps.

HAY CONDITIONERS DIFFER LITTLE AMONG TYPES

With reasonably good drying weather, using a hay conditioner right after mowing alfalfa can cut a day off the field drying time. This saves more of the valuable leaves and reduces the weather risk.

However, University of Minnesota farm engineers say the type of hay conditioner you choose makes little difference as far as effect on hay drying is concerned. Crushers and crimpers are equally effective, research shows.

More important is to have the machine properly adjusted, say the engineers.

John Strait, A. K. Solstad, K. J. Albrecht and L. L. Dibley recently compared five types of hay conditioners. They were (1) crusher with smooth steel rollers; (2) a conditioner with rolls with tire carcass stamping; (3) a bar type crimper; (4) crimper-crusher with one smooth steel roll and another roll with steel bars welded to it in a spiral pattern; and (5) a 12-foot swather with 4-foot crimper rolls.

With good drying weather and no rain, conditioned first crop hay was usually down to 25 percent or less moisture within 29 hours. 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, since it didn't dry as fast.

Even after a rain, conditioned hay reached a safe storage moisture content several hours before the untreated forage.

The differences which engineers did find among different types of conditioners were due mainly to adjustment, rather than design.

Purpose of a hay conditioner is to either crush or crimp the hay stem so it will dry faster. In this way, stems are more likely to dry at the same rate as leaves; ordinarily, by the time stems are dry, leaves are so brittle they shatter and fall off.

SMALL BALE MAY HAVE FUTURE

Light, 12-inch hay cubes--"meal-size" chunks for dairy cows--may become popular on farms in the future, John Strait, agricultural engineer, believes.

University scientists put up 10 tons of hay in the small, 10-15 pound bales in 1959. They were easy to handle mechanically and dry artifically.

Hay in small bale form has almost twice as much exposed area per pound as hay in the larger conventional bales. Also, nearly nine-tenths of the hay in small bales is within 3 inches of the surface, compared to about two-thirds for conventional bales.

As a result, hay in small bales can be dried with duct-type mow dryers, using either heated or unheated air, almost as easily as the same amount of hay in chopped form.

Another advantage of small bales, is that --unlike conventional bales--they do not have to be stacked or arranged any particular way when put in a barn mow equipped for drying. They can be dropped and left where they fall.

Small bales would have to be one of several procedures in a complete haying system. This would include cutting at right stage of maturity, crushing or crimping the hay to speed drying, raking at about 50 percent moisture content, baling at 30-35 percent moisture and artificially drying the small bales to a moisture content safe for storage.

When hay is baled at that moisture content, the protein-rich leaves are tough and won't shatter.

To make the small bales, Strait and other engineers modified a baler originally designed to make conventional bales. They changed the size of the bale chamber, designed and built a new plunger and made several other adjustments in the machine.

Agronomy and Plant Genetics ...

GRANULAR FORM OF WEED KILLERS USUALLY EFFECTIVE

Are granular weed killers as good as the same chemicals in spray form?

In most cases, yes, according to Richard Behrens, agronomist. But he adds that granules so far don't eliminate the need for a sprayer.

Reason: Effective as they usually are as soil treatments, granules don't do the job when applied to leaves. Behrens recently studied a variety of granular weed chemicals and found they have many good points.

First, they're ready to use as they come from the container. You don't have to mix or measure them.

Second, granular applicating equipment is simpler to operate and keep up than sprayers. Instead of nozzles, screens, hoses, gauges and a pump, a granular applicator has a simple metering device.

However, granular applicators are not foolproof. They require careful calibration and close attention to insure uniform application at the proper rate.

Weed killers in granular form have some disadvantages, too. They're limited to soil treatment; are more expensive than liquids; are difficult to apply uniformly to a rough seedbed and take more storage space because of lower concentration of active ingredients than in liquids.

Behrens recently compared a number of granular mixtures with the same chemicals in sprays. The two forms were about equally effective for 2,4-D, TBA, silvex, Randox, Eptam, Amiben and Atrazine.

Simazine, though, was consistently less effective as granules. When used as a pre-emergence treatment at 4 pounds per acre, simazine spray reduced weed population 86 percent. The same amount of chemical in granules killed only 53 percent of the weeds.

Behrens concludes from these and other tests that most weed chemicals should be successful as granules. Each granular form, though, will need thorough testing before it's recommended for farm use.

GRAIN SORGHUM GOOD CROP INSURANCE

Grain sorghum can be good crop insurance in years of low rainfall and for soil that dries out quickly, says University agronomist R. G. Robinson.

Sorghum won't quite match corn yields when there's plenty of rain. But let a drouth come along, and sorghum can outdo corn completely.

Robinson said 1957-59 average yields at three locations in Minnesota were 81 bushels per acre for corn and 73 for sorghum. However, during the 1959 severe drouth at the Morris station, sorghum hybrids went 36-45 bushels per acre, while corn averaged only 12.

Sorghum is no complete replacement for corn. But sorghum is a good bet for light, drouthy soils or for areas that stay unusually wet. Also, sorghum might be wise for the small farmer who wants to save on machinery. With other grain and sorghum, rather than corn, one drill and one combine would do all planting and harvesting. With corn, a farmer would also need a planter and a picker.

For best results, Robinson says:

1. Use good hybrid varieties. The old, open-pollinated varieties simply don't yield as well.

2. Use chemical weed control. Recommended treatment is 4 pounds Randox per acre at planting time, to control annual grass weeds. If broadleaved weeds show up later, a 2,4-D amine application may be necessary.

3. Dry sorghum grain artifically. The maximum moisture limit for sealing under the government loan program is 13 percent, and 15-16 percent is the maximum for safe home storage in winter. Since sorghum rarely has less than 20 percent moisture when harvested, it must be dried to avoid spoilage.

Extensive experiments on sorghum growing practices are being conducted at the Morris, Waseca and Lamberton stations. See Miscellaneous Report 40, "Grain Sorghum Variety and Herbicide Trials in Minnesota."

ASTER YELLOWS DISEASE SOLUTION POSSIBLE

Flax varieties from foreign lands may eventually give Minnesota flax growers an answer to the dreaded aster yellows disease.

Another possible solution might be chemicals which, if applied to flax seed before planting, kill the leaf hoppers that carry the disease.

U. S. Department of Agriculture agronomist V. E. Comstock says flax selections which show some resistance to aster yellows may be used in development of new varieties.

Aster yellows is a constant threat. While losses haven't been severe recently, the disease wrecked 20 to 30 percent of the Minnesota flax crop in 1957. Severity depends on numbers of 6-spotted leaf hoppers early in May, and whether the hoppers carry the virus. Not all of the hoppers do.

Comstock said aster yellows-resistant varieties won't be available for several years.

Until recently, such resistance wasn't thought to exist.

The first break came when Canadian scientists found resistance in two selections from the World Flax Collection at St. Paul. One of the selections is from Ethiopia and the other is from North Dakota. However, the battle against aster yellows is far from over. Even the most promising of the two resistant selections wouldn't do as it is. It doesn't resist rust or yield well. So the aster yellows resistance of this flax must be combined with favorable characteristics of other varieties.

In addition to breeding resistant varieties, research is being done by Richard Fredericksen, USDA plant pathologist, St. Paul, on controlling leafhoppers--and therefore the disease, too--by use of systemic insecticides. This technique would involve treating either the soil or the seed with a chemical which later produces in the flax plant a substance poisonous to hoppers. This method, however, is only experimental and needs further testing before it can be recommended.

OATS CROP MORE VALUABLE AS SILAGE

Harvest oats as silage and you'll double their value. That claim is from William Hueg, extension agronomist.

Oats have been the lowest on the income scale of grain crops. But oats make a good companion crop for legumes and grasses, are well adapted to a wide range of soil and weather conditions, and provide straw for bedding.

Besides doubling their value, making silage out of oats will:

1. Make an excellent feed. They're not a direct replacement for hay silage because they are higher in energy and lower in protein. However, if properly supplemented, oats silage can be used by all classes of livestock.

2. Give legumes and grasses a better chance to get established because oats are removed early. You might even get a cutting of hay later on if weather conditions are good.

3. Cut costs because it costs less to make silage out of the oats. Harvesting costs run about two-thirds as much for oat silage as for the same oats harvested as grain.

4. Allow you to harvest your corn as grain. In most years you'll get a greater return from your corn than you would from your oats crop.

With good fertility, you will get about 1 ton of silage for every 7 or 8 bushels of oats which the field would have produced of grain. For example, a field capable of producing 70 bushels of grain would yield 10 ton of silage.

Here are some tips that will help you get better quality silage:

Start cutting before the oats have reached the stage you want. Then by the time you're done, the entire field will average out about right in overall maturity. The correct stage for direct cutting is late milk to early dough stage.

. Chop short for ease in packing.

. Pack well to force air out and prevent spoilage. Then cover the silage with plastic, sawdust or wet weeds.

Hueg points out that early harvesting might be advisable if weather is unusually dry, when early lodging has occurred, or when oats are badly infested with rust.

PIPER SUDAN OUTDOES MILLET IN PASTURE TRIALS

Piper sudan outproduced four different varieties of Pearl millet in pasture trials in 1959 at the University of Minnesota.

Agronomist A. R. Schmid found that Piper sudan produced a total of 3.65 tons of dry forage per acre in three cuttings or grazings. The best any of the Pearl millet varieties could do was 2.53 tons, and one produced only 1.67 tons per acre.

In fact, Piper sudan produced more than any other sudan variety, and also contained much less prussic acid.

As a result, Schmid concludes that Piper sudan is the best supplemental pasture grass of those he tested. The Pearl millets have given high yields in southern states--apparently much more than here. The reason for the difference could be the climate, Schmid says. In the South, Pearl millet sometimes gets as high as 6 feet. However, it didn't grow that tall in the Minnesota trials.

EARLY HARVEST CAN IMPROVE FLAX SEED CROP

Flaxseed quality if highest when you harvest the crop a week or two before it's ripe, according to J. Harlan Ford, U. S. Department of Agriculture agronomist at the University. Research on flax has revealed several significant facts.

Yield was reduced only slightly when flax was harvested 2 weeks before maturity. And if all the light seeds could be saved, Ford doubts whether the yield would go down at all.

When harvested one week before ripening, flax produced slightly higher yields than when harvested a week or two later.

When agronomists delayed harvesting until after flax was ripe, yield varied widely--partly because of the weather. Also, there was more danger of pasmo, a flax disease which is most troublesome at harvest time.

In some cases, germination suffered when

harvesting was a full 2 weeks before the crop was ripe. On the other hand, germination also went down if harvesting waited very long after seeds matured.

Oil content and drying quality of the oil also reached a maximum before the flaxseed was ripe.

EARLY CUT HAY HAS MORE VALUE

If you wait too long before cutting your hay, much of the feed value will weather away.

University of Minnesota agronomist William Hueg says that for each day you delay cutting after early bloom--the time to cut--the crop loses 1 percent of its feed value. In most of Minnesota, this means hay should be in the barn by mid-June.

Don't wait until the crop is fully grown and matured. You may get more yield from that cutting, but you'll lose heavily on feed value.

Alfalfa reaches its top feeding value at least 10 days before it makes maximum yield. Also, cows don't like late cut hay as well, and late forage is harder to digest.

Cornell University researchers compared hay cut in early bloom with hay harvested in late bloom. Cows on early hay ate 28 pounds daily, compared to 21 for those on late cut hay. The early hay was 67 percent digestible, compared to only 51 percent for the other.

Cows on hay cut in early bloom produced 43 pounds of milk per day. The same kind of cows at the same average stage of lactation but getting late hay gave only 31 pounds of milk daily.

Some farmers feel that early cutting means too much of a yield loss to offset the increase in feed value. However, with recommended forage varieties--like Vernal or Ranger alfalfa--early cutting can mean three hay crops a year compared to two otherwise.

The University of Wisconsin found that taking two cuttings of alfalfa per year--with each cutting at late bloom--meant 3.3 tons for the whole summer. Early bloom cutting and three crops meant 3.1 tons. The big difference was that protein averaged only 15.8 percent for the late hay, compared to nearly 22 percent for early harvesting.

Hueg says the extra protein in the hay cut in early bloom could replace about $25 worth of soybean oil meal.

NARROWER SOYBEAN ROWS INCREASE YIELDS

Farmers who have proper equipment may wish to plant early maturing soybeans in narrower rows. In a 3-year study at Waseca, soybeans in rows 24 inches apart yielded up to 6 or 7 bushels more per acre than beans in 42 inch rows.

J. W. Lambert, who directed the studies, says greater yields in narrower rows are due to higher numbers of plants per acre. The studies also showed that in narrower rows, the best seeding rate is 100-110 pounds of soybeans per acre.

In a three-year study at Waseca, Lambert compared the two row spacings for Capital soybeans which are early in maturity--and for Blackhawk variety, which is a bit later. The advantage in narrow rows showed up mainly in the earlier maturing soybeans.

Capital, for example, averaged 36.1 bushels per acre when planted in rows 24-inches apart and seeded at 90 pounds per acre. The same seeding rate in 42-inch rows resulted in 32.3 bushels, and even less at lower seeding rates.

With the later maturing Blackhawk variety, however, there was less advantage from narrow row spacings.

In earlier studies, Lambert and other researchers found that seed weight was slightly higher for wide rows. Also, narrow rows had fewer seeds per pod and fewer pods per plant.

Agricultural researchers in other states also have evidence that narrow soybean rows will raise yields. One thing holding the idea back so far is lack of equipment for handling narrow rows. But where farmers can adjust their equipment for narrow spacings, it seems to be a workable idea.

EARLY CUTTING AND FERTILIZER HELPS ALFALFA

You can do two things in the fall that will give your alfalfa stand a better chance to survive the winter and get an early start next spring.

Make your last cutting early--no later than the first week in September. And, if you haven't already done so, fertilize your alfalfa.

William Hueg, extension agronomist says a 1959 survey of alfalfa growers showed a greater loss of stand for each week that cutting was delayed after September 1. The heaviest loss came when stands were cut between September 15 and 30.

If they're to survive, alfalfa plants should go into the winter with good food reserves in the roots. Late cutting causes the roots to give up their food reserves so the plant can regain its growth. If cutting is late and a killing frost comes early, the roots don't have a chance to stock up with food.

The survey also showed that farmers who fertilize their alfalfa stands each year get good results. In addition to heavier yields, these farmers report only a slight plant loss due to winter injury.

Your alfalfa can still get a lot of good from a fall application of fertilizer containing phos-

phate and potash. You'll get best results if you fertilize according to a soil test. If you don't test, apply at least 200 pounds 0-12-36 or 0-10-30 per acre.

If you're growing alfalfa on soil that's sandy or low in organic matter you'll have more insurance against boron deficiencies if you use special boron-containing fertilizer. They are designated by the letter "B" following the potash analysis, as 0-12-36B.

NEW WINTER RYE PRODUCING WELL IN STATE FIELDS

Elk winter rye is giving a good account of itself in Minnesota fields.

Extension agronomist Harley Otto says Elk is a good variety for farmers to plant early in September. Recommended seeding date for any winter rye is about September 1 in northern Minnesota and September 5-20 in southern counties.

In northern areas, Elk has consistently outyielded Adams and Caribou, the other recommended varieties by about 12 bushels per acre.

The difference isn't as great farther south. Elk is ahead by 2 or 3 bushels per acre in southeastern counties. And since it's less winter hardy, Elk yields no more than the other two varieties in southwestern Minnesota fields.

Caribou is the most winter hardy of all three and Adams is in between.

Elk is slightly later maturing than the other two, has larger kernels, has medium height and good lodging resistance.

Otto says seeding rates should be based on seed size. Since Elk has large seed, he recommends 6 or 7 pecks per acre of that variety, compared to 5-6 pecks of Adams or 5 for Caribou.

CHEMICALS MAY SOME DAY BE USED TO ESTABLISH LEGUMES

Chemical weed-killers may some day replace oats and other companion crops for establishing alfalfa stands.

The practice could mean more forage the year of seeding and less competition from weeds, University of Minnesota research shows.

So far, though, the idea is only experimental. The most promising chemicals for the practice have not yet been cleared for this use.

Agronomists A. R. Schmid and Richard Behrens tried the method in 1958 and 1959. They seeded the alfalfa alone in early spring, then applied dalapon and 4-(2,4-DB) shortly after the legume seedlings came up.

Alfalfa sprayed with the chemicals produced 1.78 tons of forage in two cuttings in 1958, and alfalfa seeded and sprayed in 1959 produced 1.83 tons. In comparison, unsprayed alfalfa last summer yielded only a ton of weed-free legume per acre.

Spraying rates were 1 1/2 pounds of each chemical per acre in 1958 and 1 pound of dalapon and a half pound of 4-(2,4-DB) in 1959.

The 1959 studies showed that in addition to getting more forage the year of seeding, spraying also raised forage quality. The unsprayed field was only 23 percent alfalfa, while the rest was grass and broad-leaved weeds.

In the sprayed plots, all but 4 percent of the growth was alfalfa.

Common practice in Minnesota has been to seed alfalfa with oats, flax or some other crop. While this helps control weeds, the companion crop itself keeps alfalfa from growing much the same year. As a result, such legume produces little pasture, hay or silage until the second summer.

Some have tried seeding alfalfa alone, without chemicals, in mid-summer. This works in many cases, but extremely dry weather then can result in failure.

TEMPORARY PASTURES FOR SHEEP

A simple emergency pasture that can produce nearly $60 worth of lamb per acre has been described by Walter F. Wedin, U. S. Department of Agriculture agronomist, and Robert M. Jordan, University livestock scientist. They reported two years of trials with an oats-rape mixture.

About a dozen lambs grazed each acre of the pasture from June to late summer. Gains averaged .39 pounds per lamb daily, and 295.5 pounds total gain for the grazing season. At 20 cents per pound, these gains were worth $59 per acre.

Each year, the mixture was seeded in mid-April at 3 bushels of oats and 6 pounds of rape per acre.

A big advantage of this mixture, Wedin and Jordan said was its ability to grow back rapidly after being eaten down. It provided grazing over a longer period than any other pasture studied.

Other mixtures studied included oats and peas, alone and together; sudangrass and soybeans, alone and in combination; rye and solid-seeded corn.

Daily gains were about the same for all pastures. Biggest variation was in length of grazing period.

Sudangrass furnished a lot of grazing. But it grew so fast the lambs picked out only the young, juicier stems, leaving the rank, mature plants.

Solid-seeded corn produced well--for a short time. Once eaten down, though, it didn't recover well. Lambs on this pasture had, on the average, from 25-35 days grazing.

Animal Husbandry . . .

CALVES PREFER CORN OR BARLEY TO OATS

If you're thinking now about a creep-feeding program for the suckling beef calves you'll pasture next summer, you may be money ahead if you add corn or barley to their ration. And if you want to squeeze extra gains from grain you feed, implant your animals with stilbestrol when they go on pasture.

In University of Minnesota trials during 1959 and 1960, researchers found calves ate little oats when they could also choose from corn or barley. And the older they got the more they went after the corn.

Animal scientist J. C. Meiske reports that calves preferred barley or corn in place of oats, even from the day they ate their first grain.

From 60 to 120 days of age, the 48 calves on test in 1959 ate an average of .03 pound of oats, .44 pound of barley and .40 pound of corn per day. Fifty calves on the 1960 trials consumed an average of .11 pound of oats, .43 pound of barley and .63 pound of corn daily.

While on pasture in 1959--a period of about 4 1/2 months--the calves put away each day .05 pound oats, .81 pound of barley and 1.67 pounds of corn. The 1960 calves ate .04 pound oats, 1.00 pound barley and 2.15 pounds of corn each day.

During the pasture season calves cleaned up 2 1/2 to 3 1/4 pounds of grain daily. All grains fed were rolled and were of comparable quality both years.

Each year some of the steers were implanted with 12 mg. stilbestrol when they went on pasture. Average daily gain was 1.95 pounds for implanted calves, 1.82 pounds for calves not implanted. Meiske says the .13 pound difference is significant and amounts to $3 or $4 extra value in summer gains.

Calves implanted with stilbestrol graded as well as non-implanted calves at weaning time and performed similarly in a postweaning feeding period.

LOW-ROUGHAGE CATTLE RATIONS PROVE EFFICIENT

Beef cattle can be fed with either no hay or a small amount during the high silage, restricted corn phase of feeding, reports O. E. Kolari, assistant professor of animal husbandry.

In trials at the Rosemount Experiment Station either no hay, 2 pounds, 4 pounds or 6 pounds were fed. When no hay was fed more supplemental protein was required. Then either 2.5 pounds for the heifers, or 2.9 pounds for the steers, of a 34-36 percent protein supplement was needed to balance the ration. On the other hand, only 1.4 pound of protein supplement was needed to balance the ration for both the steers and heifers when 6 pounds of hay was fed.

Protein content of the hay fed was low--12-14 percent. Had a higher quality hay been fed, less supplemental protein would have been required, says Kolari, who pointed out that corn silage is low in protein.

The average daily gains of steers and heifers fed 6 pounds of hay per head daily were 14.8 and 7.6 percent less, respectively, than the steers and heifers fed no hay.

Weight gains of steers and heifers fed no hay, 2 pounds or 4 pounds of hay were almost the same.

ALL-CORN DIET DOESN'T PAY FOR HOGS

Feeding your hogs a straight corn diet won't save you any money.

In fact, eliminating protein supplement will boost the total feed bill for getting your pigs to market weight, says Robert E. Jacobs, extension livestock specialist.

Without protein, it takes more than twice as much corn to put on 100 pounds of gain. The extra corn more than offsets the protein cost.

A few years ago, University researchers compared a protein-supplemented ration with a diet of corn and minerals only. They started with pigs averaging 50 pounds.

Figuring present day prices, it would have cost about $25 to produce a 200-pound market hog on the supplemented ration, and about $33 using the unsupplemented diet.

Jacobs figured corn at $1 per bushel and minerals and supplement at $5 per 100 pounds.

Pigs on the supplemented ration ate 5.2 bushels of corn and 52 pounds of protein feed to produce 100 pounds of gain. Hogs fed corn and mineral only ate 12.1 bushel of corn and 21 pounds of mineral.

As a result, feed cost for 100 pounds of gain was $7.80 on the supplemented ration and $13.15 for the ration without extra protein.

Other costs should be added, too.

1. Labor, veterinary expenses, taxes, and equipment. About $2.85 per 100 pounds of pork produced.

2. Sow feed from the time the sow is bred until she weans her pigs--about $4 per pig for a sow raising seven pigs per litter.

3. Creep feed up until 50 pounds in weight, about $4 per pig.

Adding all these figures, a 200-pound hog on the supplemented ration would have required $8 up to 50 pounds weight for sow feed and creep

feed; $5.70 for labor and other miscellaneous costs and $11.70 for feed for the last 150 pounds of gain. Total would be $25.40.

Costs on 200-pound hog on the unsupplemented ration would be $33.42. All costs would be the same as for the supplemented ration, except for feed from 50 pounds on.

ALTERNATE DAY FEEDING SYSTEM OK FOR EWE FLOCK

If a sheep producer is pinched for time and help, he might cut corners by feeding his ewes only three times a week.

Of course, he'll have to give the ewes as much total feed. And that will mean more at each feeding, which might result in some feed waste--but not necessarily a great deal.

University of Minnesota researchers R. M. Jordan and Harley Hanke recently compared daily feeding with three-times-per-week feeding for wintering ewes. Two lots were on each system for 99 days.

Ewes fed only three times weekly gained a little slower, but the difference wasn't serious. One lot on that system averaged 19.2 pounds per head and the other averaged 17.9 pounds each for the 99-day period.

Ewes fed daily gained about 23 pounds per head.

However, ewes fed three times per week produced as many lambs and as much wool as ewes fed every day.

The researchers noticed certain things about the alternate day feeding. Ewes cleaned up their feed the day they received it and went without eating the next day. They also rooted some of their feed out of the bunks and trampled it into the ground.

The waste could explain why they gained a little slower than those fed every day.

Jordan concludes that alternate day feeding should be all right where there's a labor shortage. It might be especially helpful for drylot feeding during the summer.

FERTILIZER UPS PROTEIN CONTENT IN CORN GRAIN

Fertilizer can definitely boost the total protein content in corn. And, up to a point, the increase can mean a cost saving in protein supplements for hogs.

But, the matter isn't as simple as it may sound. High-protein corn may require less protein supplementing. However, it may also require a different kind of supplement than corn with normal protein levels.

A pair of University of Minnesota scientists, J. M. MacGregor in soils and R. J. Meade in livestock research, explain the situation this way.

Protein is made up of 20 or more amino acids. At least 10 of these amino acids are essential for normal animal and poultry growth and must be present in adequate amounts in the diet.

Corn fertilized with nitrogen may contain 11 percent or even more of crude protein (composed of amino acids), compared to around 9 or less for unfertilized corn.

But here's the catch: More of the protein increase was in the so-called non-essential amino acids, rather than in the essential ones that count more in planning rations. In other words, as protein content of corn goes up because of nitrogen fertilizing, its overall quality actually goes down as far as non-ruminants are concerned.

MacGregor and Meade say a hog producer can't ignore this unequal effect of fertilizer. Corn higher in total protein has relatively less lysine, tryptophan, and methionine--all essential amino acids--per unit of protein than corn with normal protein levels.

This means that to take advantage of fertilized corn and hereby reduce supplement costs, a producer must choose protein supplements which are high in the essential amino acids which the corn lacks. Fortunately, such inexpensive supplementing is possible.

At present, there's probably a practical limit to the amount of protein one should try to have in corn or other grain for hogs. Probably 11 or 12 percent is high enough, but this is higher than most Minnesota corn now contains. Corn of higher protein will call for nearly as much protein supplement, because as total protein content of the corn goes up, deficiencies of certain essential amino acids are even more pronounced.

In time crystalline amino acids might be used to supplement corn which contains high percentages of low quality protein. However, these amino acids are not available as yet or are too expensive.

COOL HOGS ARE PROFITABLE HOGS

Showers and shade for your hogs could mean hundreds of pounds more pork this summer.

Ray Arthaud, extension livestock specialist, says some experiments have shown that hogs kept cool gained up to a third of a pound more per head daily.

In Minnesota, keeping cool could easily make 8 to 10 pounds difference in hot weather, Arthaud believes. In a 100-hog herd, that could mean an extra half ton of pork at market time.

Hogs need shade whether they're on pasture or in dry lots. Trees are ideal in pastures, but portable or permanent shelters will do.

They should have at least 6 square feet per animal for hogs up to market weight. If you have sheds or finishing houses, open the sides to let the aid move freely.

A thin, mist-type spray is a good cooling device. One nozzle should be set up for every 25-30 hogs. Nozzles should be 4 to 6 feet above the floor and 6 to 8 feet apart.

Water spray does most good under shade; and it should also be over concrete. In pastures, spray rigs should be portable so they can be moved often to prevent mud wallows from forming. In finishing houses, they should be kept away from bedding. Fans should be used if there isn't adequate air movement.

Many hog producers still use concrete or wood wallows. While not as good as sprays, wallows do help. The main problem with wallows is keeping them sanitary. They need cleaning two or three times a week and must be filled frequently. Hogs often drink from the wallow rather than go to the waterer.

Sows that farrow in hot weather also need cooling. Sprays aren't satisfactory in the farrowing house, but a sow can be sprinkled several times a day, and a fan can be put in to keep the air moving.

SELECT WITH CARE WHEN PICKING SWINE BREEDING STOCK

Future profits from your swine herd depend a lot on the breeding stock you select.

. Select breeding stock from litters of 10 or more. Ray Arthaud, extension livestock specialist, says litter size is only about 10 percent heritable but is so important that it must be continually emphasized.

. Look for gilts with at least 12 sound, functional nipples. A boar also should have 12 or more sound nipples; he will pass the trait to the future sow herd he sires.

. Set your minimum standards for growth rate for 180 day growth at 240 pounds or more for boars, at least 220 pounds for gilts.

. Make backfat measurement by probing when hogs weigh about 200 pounds. At that weight a boar should have 1.2 inches or less, a gilt not over 1.4 inches.

. Use testing station results on litter mates or other relatives whenever possible. Test data includes rate of gain, efficiency--a pound of gain on 3 pounds of feed or less--and carcass data. Based on live slaughter weight, a 35 percent or better yield of lean cuts is a good goal.

. Select both boars and gilts that show thick, deep, plump hams, thickness and fullness in the back and loin, considerable length from front to rear and freedom from fat.

. Select breeding stock sound in feet, legs and other body parts, and free from defects, particularly heritable traits such as hernia and cryptorchidism (undescended testes) in the male.

HORMONE IMPLANTS UP LAMB GAINS

Here's evidence that hormone implants can boost gains in lambs. A combination of estradiol and testosterone increased gains by about 36 percent in recent research at the University's West Central Experiment station, Morris.

The increase was practically the same for ewes as for wethers.

Treatment was 3 milligrams of estradiol and 36 milligrams of testosterone per animal.

The hormones increased gains regardless of how the lambs were being fed. For example, daily gains of lambs in drylot were .44 pounds for those without hormone and .51 for lambs getting the implant. In one lot of lambs turned into a field of mature corn, implanting resulted in gains of .44 pounds per day, compared to .35 for untreated lambs.

The studies were done by Harley Hanke, Morris station animal husbandman, and R. M. Jordan, livestock researcher on the St. Paul campus.

PELLETING UPS LAMB GAIN IN RECENT RESEARCH

Pelleting a complete ration boosted lamb gains by as much as 46 percent in recent feeding trials, says Harley Hanke and R. M. Jordan, livestock scientists.

Pellets made the most difference in high-roughage rations. For a mixture with 85 percent alfalfa, lambs getting the pelleted form gained .57 pounds per day, compared to only .36 for those fed the same feed in ground form.

Pellets increased gains markedly in each case, though not quite as much for low-roughage mixtures. The increase over ground feed was 39 percent when the ration was three-fourths hay, and 22 percent for half corn and half alfalfa.

Lambs fed pellets ate from 10-20 percent more feed per day than lambs on ground feed. That, of course, was one reason why pellet-fed lambs gained faster.

Pelleting lowered feed costs in this trial. Lambs on pellets required 15-30 percent less feed to put on 100 pounds of gain. The reduction was more than enough to offset the added cost of pelleting the feed.

Hanke and Jordan emphasized, however, that these studies compared pellets with ground grain and ground hay. Earlier studies have shown that pelleting is still more expensive if you compare it with long hay.

SHEEP PRODUCTION SHIFTING TO DRYLOT

Like beef and hog feeding, sheep farming will be shifting from pasture to drylots in coming years says Robert M. Jordan, sheep expert. However, drylot feeding is practical only in combination with early weaning.

Early weaning followed by drylot feeding has several advantages. It can mean a higher percentage of 90-pound lambs ready for market in June. Internal parasites in drylot are less troublesome. A farm can carry more sheep. And with careful attention to details, this system can raise profits.

Several basic steps must be followed if early weaning and drylot feeding are to pay off. The lambs must have the ability to gain rapidly. Grain feeding is a must. The lambs must be sold on the high market of late May to July. And cost of feeding ewes not nursing lambs must be held to a bare minimum.

In the past, common practice has been to keep lambs with ewes on pasture from birth until market time. But this system is in for some changes.

He said for sheep farming to be financially sound in the future on high cost tillable land, it will need to be intensified. "The size of the average 'farm flock' will increase, perhaps double or triple," he said. The method of producing sheep will change from pasturing to greater use of grain and drylot feeding.

These changes will be most practical and profitable for farmers who wean lambs early, according to Jordan. "This means lambs would be creep fed and marketed at 4 to 5 months of age as choice 90-pound lambs--rather than at 7 to 8 months of age and of questionable quality."

HOGS NEED PROTEIN SUPPLEMENT WITH NEW CORN

Feeding new crop corn without protein supplement is throwing away profits, according to extension animal husbandman R. E. Jacobs.

Too many farmers feed corn without protein supplement because they feel it is cheap, especially in the fall. But a hog on a corn-only ration needs 2 1/2 to 3 times as much corn per pound of gain as a hog fed corn and protein supplement.

Protein supplement need not be mixed with corn or grain. Let hogs help themselves to corn or protein supplement and don't worry if they eat up to 3/4 pound protein supplement each per day. There is little danger of overeating protein supplement; hogs will balance their own rations.

The most efficient way to feed new corn is on the ear--as long as hogs have free access to protein supplement. When bad weather makes ear corn feeding unhandy, shell the corn and feed it in self-feeders.

There's no need to grind shelled corn until the moisture content drops to about 14 percent and pigs have trouble handling the hard dry kernels.

A 40-pound feeder pig with free access to both corn (14-15 percent moisture) and protein supplement will finish at 240 pounds on about 600 pounds of corn and 100 pounds of 36 to 40 percent protein supplement, gaining 1.5 to 2.0 per day. Hogs on a corn-only diet do well to gain half-a-pound per day.

KEEP CHECK ON PROTEIN CONTENT IN SWINE RATION

Don't judge the value of a hog ration by how well the porkers like it. As with candy for a child, the feed a pig savors most may still not give him all the nutrients he needs.

Of course, a ration must be eaten well for good growth. But even more important is what the feed contains, according to Ray Arthaud, extension livestock specialist.

First, make sure the feed has enough protein. And correct amount depends on size. Pigs up to 40 pounds need 16-18 percent protein. Reduce it to 14-16 percent between weaning and 100 pounds, and figure 12 percent protein from then to market.

Second, feed good quality corn or barley or other grains to make sure the hogs get all the energy they need.

Third, provide minerals and trace elements. Each 100 pounds of supplement should contain about 8 pounds steamed bonemeal or its equivalent, 2 1/2 pounds of high zinc trace element salt, and a vitamin-antibiotic premix, added according to label directions.

Get the vitamin-antibiotic premix from a reliable dealer, and make sure it's high in vitamin B_{12}.

Fourth, give the hogs plenty of water. It's the cheapest feed they get, but still important.

Arthaud says research in many states has shown that soybean oilmeal is a good protein supplement. Soybean protein is high in quality and hogs take to it well. Besides, it's usually the cheapest supplement you can get.

If tankage is a good buy, it can be used to replace up to half of the soybean oil meal in the ration.

SOYBEAN OIL MEAL HELPS BALANCE SWINE RATIONS

Swine rations based on corn and soybean oil meal and complete in other nutrients are seldom improved by replacing part of the soybean oil protein with protein from another source. So reports R. J. Meade, professor of animal husbandry.

Soybean oil meal is unique as a protein supplement because it supplies enough of the

essential amino acids--the building blocks of protein--to balance a ration based on corn. The ration, however, must contain enough total protein for the weight group of pigs to which it is being fed.

Protein supplements are added to rations to correct deficiencies in the energy portion of the ration, usually corn.

University experiments show that replacing part of the soybean oil meal with tankage, fish meal or whey fails to improve either rate or efficiency of gains by swine.

Soybean oil meal has also shown excellent results when used as the only supplemental protein in barley rations. Weanling pigs fed 14 percent protein pelleted barley rations throughout the growing-finishing period gained as rapidly and as efficiently when soybean meal was the only supplemental protein as they did when blood meal, tankage or fish meal was fed.

In studies at U of M branch experiment stations, soybean oil meal was used as the only supplemental protein. Purpose of these studies was to see if the level of dietary protein influenced the rate and efficiency of gain and carcass quality.

SHELLED CORN SILAGE IS OK FOR LAMBS

Shelled corn silage is good feed for lambs, but it's apparently no higher in feed value than dried shelled corn.

If there's an advantage for putting the shelled corn up as silage, it would be mostly from greater yields--through reduced harvesting loss--less harvesting hazards, and the fact that it makes early fall plowing possible.

That sums up recent research reported at the West Central Experiment station, Morris. Robert M. Jordan and Harley Hanke fed dry shelled corn to one group of lambs and shelled corn silage to others.

Corn for silage in this trial was cut at 35 percent moisture, shelled, and put in air-tight plastic bags. The other corn was cut at the same moisture level, but shelled, dried to 15 percent, and ground.

Some research in other areas indicate that making silage from high-moisture corn boosts its feeding value, through pre-digestion and enzyme action occurring in the fermentation process. The Minnesota studies don't bear that out.

Dairy Industries . . .

EXTRA NONFAT DRY MILK SOLIDS AID BLUE CHEESE QUALITY

Adding nonfat dry milk solids to milk for Blue Cheese might help maintain quality of the cheese, report L. A. Richardson and H. A. Morris.

They said that putting skimmilk powder in the milk before processing almost cut moisture loss of Blue Cheese in half.

Five experiments were made by Richardson and Morris. In each experiment, two lots of Blue Cheese were compared. One lot was made from ordinary milk, with total fat content on a dry basis ranging as high as 54 or 55 percent. The other lot was made from milk "standardized" with added nonfat dry milk solids. This meant bring the total fat content to at or near the 50 percent requirement for Blue Cheese.

After curing in cold storage for three, six or nine months, the researchers held the cheese for 48 hours at 70 degrees--conditions under which moisture loss is apt to be more pronounced.

On the average, Blue Cheese made from unstandardized milk contained 41.91 percent moisture after being held at 70 degrees, compared to 42.82 percent in the standardized lot. Both lots had averaged about 45 percent at the start of the trial.

The extra protein in the added milk solids is what prevented part of the moisture loss.

However, standardizing with nonfat milk solids is only a partial answer to moisture loss in Blue Cheese. It was still impossible to prevent all of the loss. Also, ability of the cheese to retain moisture--even with added solids--was reduced as the cheese ripened.

FOIL PACKAGES PROTECT COTTAGE CHEESE QUALITY

Aluminum foil containers could mean better quality protection in cottage cheese sold from self-service refrigerator cabinets.

J. W. Sherbon compared different types of containers for cottage cheese. He found that foil containers kept the product an average of about 6 degrees F. colder during storage in self-service cabinets. The difference, he said, should mean a longer "shelf-life" for the cheese.

The difference is important for the rows of cottage cheese cartons near the top of the cabinets, where temperature is higher and more variable.

In fiber containers near the top of the cabinet, cottage cheese temperatures were often above 45° F. In contrast, cheese in ribbed foil or foil-wrapped packages stayed under 45 degrees--which is generally considered the upper limit for safe storage.

Organisms that cause quality loss become more of a problem at temperatures above 45 degrees.

Sherbon said lower temperatures in foil wrapping probably are due to the fact that foil conducts heat more readily from the warm upper regions of the cabinet to colder areas.

Shape of the container is also important. As far as temperature is concerned, a flat carton would be better than the common round container. Reason is that cheese in flat cartons won't change in temperature as much when the product is temporarily removed from refrigeration during distribution.

As a result, flat, foil-surfaced cartons should mean lower cottage cheese temperature and better quality control in retail markets.

FINDINGS ON DRY MILK REPORTED

One of the reasons why some dry milk powder is easier to mix with water than others has been pinpointed by University of Minnesota dairy industries researchers.

C. H. Pyne and S. T. Coulter say it has to do with the size of the powder particles and--more important--the open space between the particles.

Researchers and manufacturers had known for several years that larger particles would make dry milk easier to reconstitute. Why this was true, however, wasn't clear.

Pyne and Coulter suspected that it had something to do with the "interspaces" between the particles. These spaces, they reasoned, could be acting as capillaries. Water on which the powder is placed probably rises into the powder by capillary action, much the same as kerosene rises in a lamp wick.

Research proved this theory correct. Pyne put powders of different particle size in glass tubes, then put one end of each tube in a special liquid and measured its rise in the tubes. The rate of liquid rise was just about what he had expected, based on size of the particles and capillaries. The larger the particle, he found, the larger the capillaries and the faster the liquid rose.

In being reconstituted, milk powder goes through three phases.

First, the powder particles are wetted. Second, the particles must separate and third, the particles themselves must go into solution.

The first two steps involve "dispersion." And this dispersion is what is speeded up by larger interspaces and faster capillary rise of the liquid.

Pyne and Coulter found that small changes in size of the capillary made for large changes in dispersion of the particles. The greater the dispersion, the greater the rate of reconstitution.

Important as this finding is, however, it still doesn't answer all of the problems in making an easy-to-reconstitute dry whole milk.

Nonfat dry milk powders have been successfully manufactured for some time. Dry whole milk, however, contains fat which makes the particles nonwettable by cold water. So in this case, even though openings into the powder mass are large enough to admit water, flow is blocked by the fat.

The Minnesota researchers have concluded that to make dry whole milk easy to reconstitute, it should have a particle structure which gives the greatest amount of surface in relation to its mass. Such a structure, they say, might be a hollow sphere like a ping pong ball.

Pyne and Coulter have experimented with a product which has a ping pong ball type structure. They made it by spray drying a foamed or whipped condensed milk. Both products were more readily dispersible than conventional powders--even though neither are yet completely satisfactory.

Another problem with dry whole milk is the flavor. It has a characteristic taste and deteriorates quite rapidly during storage unless gas-packed to eliminate oxygen. Again, the fat is the key to this problem.

The recent findings have grown out of long-time studies at Minnesota on improved ways to manufacture and store whole milk products. Further research is being conducted.

RESEARCHERS STUDY DRY WHOLE MILK

A dry whole milk powder which, mixed with water, tastes as good as the original fluid--that's the goal of research at the University of Minnesota.

Dairy industries researchers S. T. Coulter and C. H. Pyne point out that nonfat dry milk is already a success. Many housewives use it to supplement fluid milk.

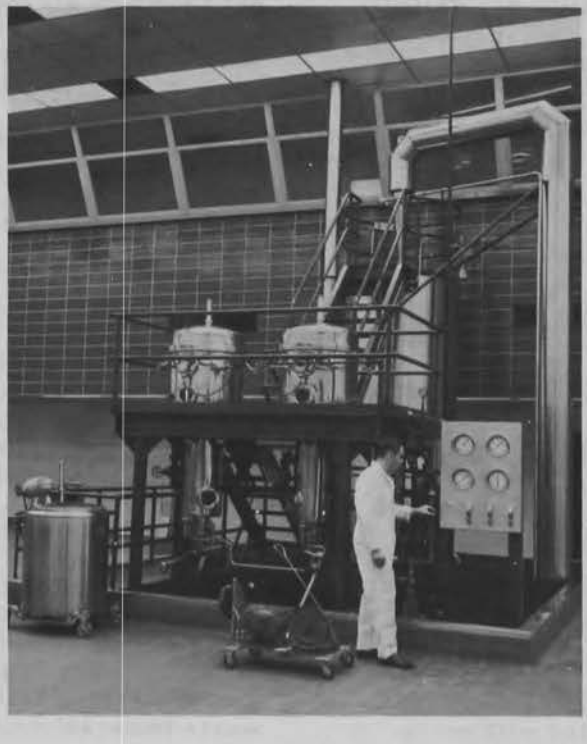
If dry whole milk were as successful as the nonfat product, dairy farmers would overcome some major problems. Dry milk is more economical to ship to out-of-state markets, where 80 percent of Minnesota's milk is sold.

Milk fat is the big block to producing a completely satisfactory whole milk powder of beverage quality. Here's why.

Particles of nonfat dry milk are "easily wettable" and go into liquid form quickly when water is added. Dry whole milk, however, has fat which makes the particles nonwettable. Even though the particles have openings large enough to let water in, the flow is blocked by the fat.

Coulter and Pyne feel the answer lies in the structure of the powder particles. What's needed, they say, is a structure which has the greatest amount of surface in relation to its mass. This could mean a hollow sphere structure--like a ping pong ball.

This approach has led to some progress. By spray drying foamed or whipped condensed milk, Minnesota dairy scientists have produced a dry whole milk which stimulates the ping pong ball structure.



Dairy Husbandry...

EARLY WEANING OF CALVES FOUND GOOD PRACTICE

Weaning herd replacement calves at four weeks can save marketable milk or purchased milk replacer, W. A. Olson and J. B. Williams dairy researchers, have found. In their tests all but a few calves have responded well to early weaning.

In their experiments, all liquid feeding was stopped when the calves reached 28 days of age. During the pre-weaning period, the calves gained an average of more than one-half pound per day. During this time they ate an average of .37 pound of grain supplement per day.

For the two weeks after weaning, the calves ate 2.35 pounds of grain supplement daily while gaining more than one pound per day.

Most calves adjusted rapidly to the decrease in nutrient intake from the milk or milk replacer part of their diet by increasing grain consumption.

Points to remember are:

1. Feed limited quantities of milk or milk replacer to four weeks of age. In the University tests not more than four pounds of liquid per 100 pounds of body weight per feeding were given.
2. Have grain supplement and water available from the first week. A simple ground grain supplement was offered from the fourth day of age in the University tests.
3. Offer fresh, good quality hay daily.
4. Watch to see that the calf is healthy and is eating grain and hay after it is weaned. If a calf does not eat one pound of grain per day after weaning, it may still require milk or milk replacer.

CHANGES IN MILKING PROCEDURES RECOMMENDED

Many precious minutes spent in milking can be saved or lost each day because of the way the job is done.

To compare the time needed to do the job with different milking systems and different size herds, Earl Fuller and Harald Jensen, agricultural economists, have studied a wide variety of milking procedures, equipment and parlor or milking area arrangements.

They came up with several suggestions for improving the milking chores.

The researchers say average unit-on-cow time can be reduced by:

1. Developing a simple, quick and easy-to-follow milking procedure, using no more milking units than can be handled without injuring the cows, practicing rapid milking, by breeding and culling for a fast-milking herd and sometimes by installing worksavers.
2. By using a two-sided parlor so that cows can be ready to milk as soon as a unit is available, by using a pipeline or extra milker pail to cut the service time of units between cows, or, in some cases, by adding a helper.
3. Adding more units or more stalls if they won't simply add more problems or result in excessive operator fatigue.

These suggestions are generally good for any parlor system and for most other milking arrangements as well.

PASTURE CAN BE STRETCHED IN 3 MAIN WAYS

There are three main ways to make those pasture acres go farther in summer.

The systems are rotation grazing, strip grazing and green feeding.

Rotation grazing is the simplest. Simply divide the pasture into several grazing areas with an electric fence. Then adjust grazing area and number of cows per pasture to best maintain the seeding.

Of course, plant growth varies during the season. During the flush spring growth, cows may not graze each plot completely before the next one is ready, so some plots can be made into hay or silage. Later, as plants grow slower, you may be able to move the herd through all the pasture lots fast enough to have them back in the first by the time it is back to the right height.

Strip grazing is really an intensified form of rotation grazing, usually set up so each strip provides grazing for a single day--in which case it's called "ration-a-day" grazing. This means less fluctuation in production, but means more bother in moving the electric fences oftener.

Bloat is less likely to occur in strip grazing than where cows are on a single area for a longer time.

Strip or ration-a-day grazing, on 10 northeastern Minnesota farms in recent years, resulted in up to three times as much feed value as continuous or unmanaged grazing. And when farmers combined ration-a-day grazing with fertilizing, the grass pasture yielded as much feed value per acre as there is in 89 bushels of corn or about five times as much as unmanaged and unfertilized pasture.

Green feeding is most practical and profitable for herds of 35 cows or more. It means confining cows to a lot and hauling fresh chopped forage to them daily. This system helps avoid waste from selective grazing, trampling, and

manure droppings, since cows never go near the field and all of the plant is fed.

Green feeding fits in well where pasture land is scarce and where there's no labor problem. However, well-managed rotation grazing can mean as much production per acre as green feeding.

In some cases, green feeding success comes not only from taking cows off pasture, but also from changing to high yielding forage crops. Actually, some studies have shown that rotation grazing, strip grazing and green feeding all result in about the same efficiency for a given type of forage.

Green feeding requires a good deal of skill. And it also involves more risks than grazing. Machinery breakdowns and wet weather can mean trouble. You can offset these dangers some by having emergency pastures near feedlots, or by having hay or silage on hand.

Green feeding also raises some other problems, that aren't involved in other grazing systems. For a green feeding system, you may need to haul manure from feed lot. You should have a surfaced feed lot. And there may be more of a sanitation and disease problem as a result of confining livestock.

DAIRYMEN OBSERVE FIFTIETH YEAR OF DHIA TESTING

Back in 1910, 28 Freeborn county farmers, anxious to improve their dairy herds, formed the first DHIA group in the state. Today 4500 farmers with 127,000 cows belong to DHIA.

The Albert Lea dairymen banded together under the direction of Theodore Sexauer to hire a test supervisor. The supervisor--H. C. McMurray--visited each farmer once a month to weigh and sample each cow's milk, test the milk and fill out the record form. Members used the records to select their most profitable cows and as a guide for culling out the poor ones.

In 1910 the average production per cow in the Pioneer association was 189 pounds of fat. Each cow gave her owner back $27 over the cost of her feed. In 1959 the average Minnesota cow on DHIA test produced 400 pounds of fat and returned her owner $228 over the cost of her feed. Average production for all cows in the state was only 267 pounds of fat.

The idea of cow testing as a means of herd improvement caught on. Three new units started operating in Freeborn county within the next year.

In 1912 the Agricultural Extension Service was formed and Will McKerrow became the first extension dairyman. By 1916 McKerrow had brought the total up 22 active associations.

The number of cow testing associations in the state remained about the same until just after World War I. Then dairymen picked up the idea in earnest.

The Agricultural Extension Service continued to work closely with DHIA, with first McKerrow and then L. V. Wilson active in organizational work. E. A. Hanson joined the extension staff in 1921 and helped set up new associations.

Hanson, working with Wilson and H. R. Searles, saw the associations grow from 23 in 1921 to 87 in 1925. That year Ramer Leighton joined the staff as DHIA fieldman. Leighton was later put in charge of DHIA work and worked closely with the program until his retirement in 1960. Now extension dairymen Ralph W. Wayne and Clifford Wilcox supervise the program of 185 supervisors.

ELECTRONIC DHIA PROGRAM MOVING FORWARD

Yellow Medicine with 44 members was the first Minnesota county to have all Dairy Herd Improvement association herds on the new electronic computing systems.

The plan works this way: The DHIA supervisor weighs, samples and tests the milk (or just tests the milk for owner-sampler herds). He enters test results and feeding, breeding, dry and milking date information on a report form. The state extension dairy office at the University checks the report and sends it to the electronic computing center. The herd owner gets a typed report a few days later. Besides complete milk and butterfat production for each cow and the entire herd, the report tells how efficiently each cow converts feed to milk, return over feed costs, feed cost per hundred pounds of milk, return per man working with the herd, recommended feed per cow, date to breed, and time to dry off the cows.

The electronic system makes for more accurate and complete records which are easier for farmers to use. It costs a bit more than the old system, but farmers using the new plan say it's worth it.

GRASS, FERTILIZER ADD UP TO HIGH DAIRY RETURNS

Fertilizer and bromegrass took over nicely when alfalfa winterkilled on a Wright county dairy farm.

Gahart Decker in 1959 harvested nearly 3 1/2 tons of topnotch hay per acre from his bromegrass and timothy. The fields had originally been seeded to grass and alfalfa, but the legume failed to survive the tough 1958-1959 winter.

Cows on the same grass needed less than an acre per head for the summer.

These are striking results for an "emergency" forage plan---especially with

some unusually dry weather and below par yields.

Careful fertilizing and pasture management were the clue to these returns. The bromegrass returned a good $2 in extra profits for every $1 of added fertilizer.

Decker had first tried fertilizing grass in 1957 when he put 150 pounds of ammonium nitrate on each acre of his bluegrass sod. The grass turned a deep green and produced such lush grazing that in 1958 he started fertilizing his alfalfa-brome field. At the same time, he rationed his pastures out to the cows in chunks just big enough for a day's grazing.

Then in the winter, 1958-59, cold, dry weather and lack of snow cover spelled doom to the alfalfa in practically all of Decker's alfalfa-brome fields--34 acres in all.

What should he do? Plow the fields up and plant other emergency crops? Or try to make the remaining brome and timothy do? Decker took the latter choice. He tested the soil and came up with a moderate but effective fertilizer treatment: 50 pounds of potash fertilizer (0-0-60) in spring and two treatments of 50 pounds of actual nitrogen, one in early spring and another in late July.

The results were impressive. "We harvested the first hay crop from all 34 acres and took a second and third crop from 7 acres," Decker says. "The 27 acres left was enough for 30 milk cows for the rest of the summer."

The grass averaged about 3 1/2 tons per acre. Considering the dry weather, that would have been a good yield even for the best alfalfa-grass mixture.

His fertilizer treatment cost $14.25 per acre. So figuring it doubled the yield, the fertilizer meant more than 1 1/2 tons extra hay per acre, worth enough to return $2 for each $1 of fertilizer.

The brome-timothy pasture and hay was tops in quality, too. Gahart's herd averaged 365 pounds butterfat last year and is running ahead of that average now.

MINNESOTA BULLS CULLED BY NEW ORLEANS MACHINE

An electronic computer in New Orleans silently scans a magnetic tape and then provides Minnesota dairymen with a complete, up-to-date way to measure their herd sire's value.

In the past, sire improvement--and herd improvement--depended mainly on daughter-dam comparisons. These were made from data reported by Dairy Herd Improvement association supervisors and were simply comparisons between the production of a sire's daughters and their dams.

For a long time dairy scientists and cattle breeders have known that the dam-daughter comparisons don't always tell the whole story of a sire's genetic value. The skill of the man who handles the herd and the quality of the feed the cows eat may have a lot more to do with the record than the transmitting ability of the sire.

This new evaluation method is furnishing dairymen with more reliable data than they've had in the past. The computer can scan a master file of over six million DHIA records in less than six working days. At the same time it can bring the file up-to-date with current lactation records as they are reported.

The machine stores DHIA lactation records and herd data on large reels of magnetic tape--as many as 150,000 records on a 2,400 foot reel of tape. It handles data from the tapes at the speed of light, making thousands of logical decisions per second and printing sire lists and proved sire records at the rate of 600 lines per minute.

It scans the master file of records and selects dam and daughter records by sire and by herd, picks out stablemates of daughters of a sire or the other cows in the herd and automatically processes the records.

Entomology and Economic Zoology...

FISH CATCHING DEPENDS LARGELY ON LAKE FOOD SUPPLY

The hungrier fish are, the better they bite--which explains why catching is better earlier in the summer when there's less plant food and small lake life for the menus of bigger fish. But for lake fish, water temperature alone doesn't explain why fish bite better at some times than others.

Fred E. Lux, now with the U. S. Fish and Wildlife Service, and Lloyd L. Smith, Jr., from the University, checked the catch of northern pike, crappies and bluegills throughout the fishing season at Linwood Lake in Anoka County. They also kept records on water temperature, availability of fish food in the lake, food in stomachs of fish caught and other factors.

Fishermen had their best success in June--based on number of fish caught per man hour of fishing time. Catching then dropped off during July, hit a low point in August, and changed little from then on, except for a slight improvement in October.

Northern pike catching was best when stomachs of the fish were the emptiest. As the season progressed and fishing luck went down, stomachs examined had more food.

Bluegills were getting more lake food later in the summer, and they also changed their diet some as time went along. Early in the season, they ate more invertebrates--small animals--and less plant material than later on.

Crappies, on the other hand, ate more fish as the season progressed and as the small fish on which crappies prey became more abundant.

In mid-summer, lake water warmed up as fishing became poorer. However, there wasn't much change in September when the water cooled --meaning water temperature doesn't explain fishing success.

CORN BORER DAMAGE MAY BE FROM CHEMICAL CHANGE

Those tunnels that corn borers make in corn stalks may not be the major source of trouble after all.

The real damage may be from a chemical change that borers cause when feeding on young leaves, University of Minnesota entomologists have found. They have evidence that borers either deposit a toxic substance in the leaves or change the physiology of the plant.

H. C. Chiang and F. G. Holdaway discovered that growth stunting in the corn plant begins when the young borers are feeding on the leaves--before they get into the stalk to make tunnels.

The finding gives further support to a key principle in corn breeding: developing new hybrids which resist leaf feeding. Scientists have known for some time that corn with such resistance is less apt to suffer yield loss from borers. The finding made by Chiang and Holdaway helps explain why.

Corn borers are well-known for the tunnels they bore in corn stalks. Any farmer who has had a borer attack in his crop will tell you the pests can wreck the yield. In a severe borer epidemic, plants may not even produce ears.

In the past, scientists figured tunnelling injured the plant. Then Chiang and Holdaway decided to try to measure the injury.

First, they mechanically bored tunnels in corn stalks--tunnels like borer larvae would make. The tunnels didn't affect yields at all.

Chiang and Holdaway figured the next step was to find when the growth stunting started; they knew that stunting is linked to yield loss. So for three years, they put borer eggs on corn plants, watched them hatch and kept close records on where the borers fed and what happened to the growing corn plant during the process.

Normally, borers hatch from eggs laid on the underside of leaves. The larvae first feed on the young leaves in the plant "whorl" and then move into the stalk where they make tunnels.

The entomologists compared borer-infested corn plants with other plants free of borers from the beginning of the experiments on. They found that most growth stunting started occurring when the larvae, shortly after hatching, fed on the young leaves.

Borers ate only a fraction of the material in corn leaves, so the feeding alone couldn't be stunting the plant. Instead, Chiang and Holdaway figured the borer emits a toxic substance, perhaps in its saliva, that causes a harmful change in the plant.

Many sucking insects, like leaf hoppers, are known to leave harmful saliva in crops, but this is the first evidence that borers may do it, too.

The problem now is to isolate the toxic material, or whatever it is, that borers are putting into the leaves, or to determine what changes the borer makes in the plant.

RADIO-TRACKING METHODS FOR WILDLIFE RESEARCH

CLOQUET--How radio tracking methods are being used in wildlife research was demonstrated at the University of Minnesota's Forest Research center.

Scientists showed how they harness a matchbox-size, 1 1/2-ounce, radio transmitter to a porcupine, turn the animal loose, and then follow its movements with directional radio antennae.

Making it work on porcupines represents an important breakthrough in wildlife research.

Biologists W. H. Marshall, Gordon Gullion and Robert Schwab, in charge of the studies, kept continuous radio contact with a mother porcupine and her daughter in the Cloquet Research center forest.

Already, they have found the technique far superior to older methods for getting detailed information on habits of wild creatures. Numbered tags, colored bands and other devices have been helpful, but do now allow researchers to positively locate animals without handling them.

Originally, the scientists planned to use two fixed radio receivers, which were set up with directional antennae on towers. However, they soon found that a light, portable receiver gave them additional flexibility, making it possible to walk up to the animals and watch them closely.

Here are some findings already made with the radio-packing porcupines:

. The animals can be located within as little as 15 minutes in the 5-square mile forest, even when they're in dens, brush or trees. Since the study began, the researchers have made 150 "contact records" with the two porcupines. A contact record is each time the animal is tracked by radio, then actually found.

. The young porcupine doesn't stray far from its mother, usually keeping within 200 feet or less. The little one apparently got lost for 8 or 10 days, but in that time the mother seemed to be searching for the offspring as hard as the researchers were.

. During the summer, porcupines do most of their feeding at night, on the ground and in swamps. In clear weather, they move back to uplands during the day, and climb trees to sleep and escape mosquitoes. In rainy weather, they use the nearest fallen tree, brush pile or underground dens.

. Porcupines apparently don't move very far. One animal stayed within one 40-acre area during a one-month period.

. The animals tend to avoid mature pine stands, and instead prefer young mixed hardwood forests with dense hazel underbrush. They have definite preferences for different tree species, but the preference varies from one porcupine to another.

SAFE USES LISTED FOR CHEMICALS ON DAIRY FARMS

Keeping insecticide residues out of milk is crucial to the well-being of dairy farmers and public health.

The important thing is to use insecticides specifically according to label directions, according to John Lofgren, extension entomologist.

If chemicals are used incorrectly, residues may show up in the milk. Milk containing such residue may be seized, and the person selling it may face court action.

Residues in milk may result from incorrect use of chemicals on cows, on crops, in barns or sheds, and around feed, water or equipment.

For direct application to cows, you may safely apply a 4 percent malathion dust, at least 5 hours before milking. Methoxychlor 50 percent wettable powder may also be used dry on the cows. Other approved chemicals for use this way are pyrethrins mixed with syngerists (like piperonyl butoxide or MGK 264, rotenone, thiocyanates (Thanite or Lethane) and repellents (Crag, Tabatrex, MGK R-11 and MGK R-326).

If you wish to spray the barn or shed and cattle are in the buildings, the only approved treatment is the pyrethrins-synergists mixture used as spray or fog. If cattle are not in the barn, you may also use Diazinon, malathion or Korlan spray or bait, or dipterex or DDVP bait for residual action against flies.

At least five recommended chemicals are cleared for use on forage or pasture. But with each, there is a specific waiting period between treatment time and cutting, feeding or grazing.

With either malathion or methoxychlor, you must wait 7 days before harvesting or grazing. Other waiting periods are parathion, 15 days; demeton (Systox) 21 days and Phosdrin, 1 day.

Don't pasture fields sprayed with DDT, dieldrin, heptachlor or toxaphene, and don't feed silage, stover or cannery wastes treated with any of those chemicals.

Corn may be fed or put in the silo 15 days after treatment with EPN or parathion, but not until 45 days after treatment with endrin.

LABELING LAW GUARDS USERS OF CHEMICALS

That label on the chemical container is the best guard you have against misuse, according to John Lofgren, extension entomologist.

Federal law requires labels to specify uses and give directions that won't result in toxic residues in food or feed--regardless of the type chemical involved.

So when you buy any farm chemical, check the label. It should tell: (1) Name and address of manufacturerer or selling agency; (2) Name, brand or trademark; (3) Net weight, volume or measure of contents; (4) Statement of ingredients; (5) Poison labeling if the product is "highly toxic to man"; (6) Precautionary warnings to prevent injury to persons, animals, or vegetation. This warning may appear separately or in addition to the required poison labeling; (7) Complete directions for use.

School of Forestry ...

CHEMICALS HELP IN CLEARING STUMPS

The best way to get rid of a tree stump is to kill the tree with chemicals before cutting it down.

Otherwise, fresh sprouts may grow from the stump and make it hard to get rid of. So says Marvin Smith, extension forester.

Chop a ring of gashes around the tree at about stump height. Be sure to cut through the inner bark and slightly into the sapwood. Then pour a solution of 2,4,5-T in fuel oil or ammonium sulfate in water into the gashes. Be sure the cuts are made so they'll retain some of the solution.

Use either one pint of 2,4,5-T in 3 gallons of fuel oil or 4 to 6 pounds of ammonium sulfate crystals (sold as "ammate") in a gallon of water to make the solution.

Trees under 6 inches in diameter can be killed by soaking the ground line and the lower 2 feet of the trunk with the 2,4,5-T mixture.

The herbicide will kill the tree at any time of the year, but the best sprout control comes when it is applied from July to October.

If you have to cut down a living tree and want to kill the stump later, either solution will still work. Spray or brush the mixture on the top and sides of the stump. You can use ammate crystals alone if you wish. Just let them dissolve on top of the stump, around the outside edge, where the bark and wood join.

CHEMICAL WEED KILLERS SHOW PROMISE FOR TREE PLANTING AREAS

Chemical weed killers like those used in farm crops can also do some good on tree planting sites, University foresters report.

They found that simazine and other chemicals can help keep bothersome quackgrass under control. This grass is known to reduce survival of red pines especially where the land formerly raised field crops.

Foresters H. L. Hansen, W. R. Miles, M. E. Smith and Parker Anderson in 1958 and '59 tried several chemicals in Anoka and Sherburne county tree plantations. They sprayed in May in places where red pines had been planted a year or two earlier.

While results varied, chemicals did show some promise. For example, simazine applied in 1958 at 5 pounds per acre killed only 15 percent of the quackgrass that year. However, 50 percent of the quack was gone by fall, 1959.

In other words, simazine had an important "residual" effect.

In 1959, the foresters controlled 74 percent of the quackgrass by applying 10 pounds of simazine per acre the same year.

Amitrol was the most effective quackgrass killer in 1958 tests. That year, 5 pounds amitrol per acre killed up to 70 percent of the grass. However, in 1959, this chemical gave little late summer control.

Dalapon was moderately effective in 1958, and apparently left no residual effect for 1959.

Both dalapon and amitrol caused minor tree injury where spray drifted to needles.

Treatments were applied to the ground surface in a 2-foot radius around each tree.

The greatest quackgrass kill in all trials came from diuron. However, that chemical also caused the most tree damage--too much for the material to be practical at the rates tested.

HARDWOOD TREES GOOD SOURCE OF PROFITS

If you have some black walnut trees on the back forty, don't market them until they're well past 60 years of age.

Reason: A black walnut tree 85 years old is worth nine times as much as one that's just turned 60, a University of Minnesota study shows.

Forestry researchers found that at 85 years, black walnut trees in southeastern Minnesota averaged 355 board feet of logs each--worth $124.20 on the current market. At 60 years, the same kind of trees averaged only $13.20 worth of logs, and contained a mere $1.20 worth at 35 years of age.

A similar difference held true for basswood, black cherry and red elm trees--though not quite as striking. Basswood, for example, averaged 37 cents worth of log per tree at 35 years, $2.25 at 60 and $25.60 worth at 85.

Older trees went up in value for two reasons. First, they contained more board feet. Second, the wood becomes more valuable with age. Trees sold when 35-60 years of age would have to go as saw logs. But later on, they would sell as veneer--bringing higher prices per board foot.

All four tree species the foresters studied --basswood, black cherry, black walnut and red elm, can make veneer, furniture, paneling and other products. They're in good demand and bringing high prices nowadays.

The hardwood market is one that could bring extra profits to many a Minnesota farmer or woodland owner.

The study made it clear that it doesn't pay to cut trees too early. After 60 years of age, the trees made about as much growth in board feet during each 5-year period as they did in their entire first 35 years.

JACK PINE RESEARCH COULD OPEN UP NEW MARKETS

Jack pine lumber may become important for new homes if research turns out well at the University of Minnesota.

The jack pine is a good potential resource for structural material, according to forester Walter Wallin.

All that is needed is to find out the best and cheapest way to improve the manufacturing and processing of the lumber.

The big problems with jack pine lumber are the knots and "compression" wood which shrink and swell to a different extent than normal wood. That means that much distortion can take place in a single piece of lumber if moisture content changes very much.

For example, if jack pine studs are used in the wall of a home, the lumber will eventually dry down to a moisture content of 6 to 8 percent, based on dry weight. But, in commercial practice, practically none of the material is dried below 15 percent. And since jack pine shrinks while drying, the shrinkage after use in the house could mean a 2 or 3 percent change in dimension.

The result might be nail popping, plaster cracking, warped door frames, and other problems.

What's the answer? Wallin and other researchers are trying to find out if kiln drying the material to nearly the same moisture content as that under actual use conditions would eliminate most of the warping.

They hope that through kiln drying, the distortion will show up before the lumber is used, or at least stabilized to the point where changes in moisture content will cause only minor warp.

University researchers take measurements of warp, bow and twist on each piece before drying, after drying and after use in the home. They also wish to see if the additional cost of kiln drying would be justified and also what portion of the stock would be usable after this process.

Cracking the home building market with jack pine lumber of good quality would mean more efficient utilization of this tree.

Marketing channels and methods of distribution have to be determined, too. Enough material must be on the market so that home builders can consistently use it without having to switch to another material in the middle of a job.

NEW WOOD MEASUREMENT TECHNIQUE DEVELOPED

Selling pulpwood by the cord may soon go the way of Paul Bunyan and the hand-operated crosscut saw.

In its place may be a new measure recently developed by University of Minnesota Forest Products Engineers James Benson and Walter Wallin.

Their method is based on "fixed average density." It gives a close estimate of the amount of dry fiber in a load of wood--just what a paper company needs to know. Paper is made from fiber.

Should the new method work, it will be valuable for the entire pulp industry and perhaps for other wood processors. And it could mean a better pricing system for the buyer and seller of the wood.

Most pulpwood is sold by the "cord," a volume measure. A cord is a pile of wood 4 feet high, 4 feet wide, and 8 feet long, supposedly containing 128 cubic feet.

But a cord varies in actual volume. There's always some air space between the sticks. How much depends on how big and crooked the sticks are. In practice, a cord of wood varies from about 80 to 110 actual cubic feet of solid wood, but nobody even knows just what the actual figure is.

A few years ago, mills found that weight was better than the cord measure for green wood. But with wood partly dried, fiber content was still hard to estimate. Pulp mills could check actual moisture content in a laboratory, but that would take too long.

Benson and Wallin checked aspen from a variety of sources and found the average amount of dry fiber in a ton of green wood. This is the basis for determining the "fixed average density" and is the basis for their measure. Here's how it works:

A truckload of pulpwood comes in to the mill. A worker pulls out from one to six sample sticks and drops each in a water tank mounted on a scale. Next, he notes the weight of the stick. Then he pushes the stick down in the tank. From the weight of the displaced water, (the amount of push necessary to sink the stick) the worker can tell how many cubic feet of dry wood are in the stick.

From the volume, weight, and "fixed average density figure," the worker can quickly calculate the percent of actual fiber. If it comes out to 40 percent, for example, and there are 8,000 pounds of wood in the load, the seller would be paid for 3,200 pounds of dry fiber.

FORESTER REPORTS NEW INVENTORY SYSTEM

A new method for taking inventories in large forests could give owners of large forest tracts a better idea of the type of trees, quality, stage of growth and potential volume of wood products in the area. C. J. Shiue, forest researcher, has explained the system.

Old systems do not always take into account the sharp variations that might occur within a forest. For example, long narrow ridges with poor quality trees may not be measured and the owner may get an inaccurate picture of the total area.

The new method gives much more reliable information. It involves selecting sample inventory plots which can be checked every five years and thereby provide a continuous record of the growth and development of the forest.

Finding more efficient inventory systems is crucial to large forest management. If a paper company owns 400,000 acres, for example, it's obviously not practical to check every tree. But with a good sampling system, a few hundred small plots can produce a reliable estimate for the entire forest.

Forest owners have been strongly concerned about this problem; even by sampling, an inventory for 100,000 acres could easily run into five figures in expenses.

Shiue developed his system at the University's Cloquet Forest Research center. The system makes it possible to estimate volume and growth in 3,300 acres by checking only 8,000 trees--a mere drop in the bucket in comparison to an estimated 488,000 trees in the forest.

JACK PINES PUT IN EXTRA HOURS AT GRAND RAPIDS

As far as daylight is concerned, one forest plot at the North Central Experiment station at Grand Rapids is practically in the land of the midnight sun.

University of Minnesota forestry researchers are using floodlights to stretch the daylight hours in a stand of 96 jack pines. One eventual result could be a better jack pine variety for Minnesota woods.

Studies already show that longer days make jack pines grow taller--about 10 percent higher than their unlighted neighbors.

The foresters begin the floodlighting in early May. A control turns the lights on for about an hour a day at first, gradually increases to nearly three hours per day by June 21, then gradually cuts the light to an hour a day by mid-September when the growing season ends.

This approximates day length for the same period at 55 degrees north latitude, or the area around the southern part of Hudson's Bay.

Conservative by nature, the jack pine begins to grow early in May, grows for about 65 days, then stops growing in height. It continues to lay on wood but the branches begin to get ready for winter dormancy.

Researchers hope the study will give them greater knowledge of the effect of day length on the seasonal growth pattern and the inheritance of this response on jack pines. If so, they may some day be able to manipulate the genes--units of inheritance--by controlled mating and artificial selection.

This could lead to development of a variety for this latitude which would grow for a longer period each season and produce more fiber than present varieties.

Plant Pathology and Botany . . .

SMUT TESTING AIDS STATE BARLEY GROWERS

Minnesota barley growers are ahead by about a half million dollars this year, thanks in part to a seed testing program at the University of Minnesota.

In 1959, about 6 1/2 percent of the barley grown in Minnesota was infected by loose smut, a seed-borne disease. Losses to growers were estimated at $1.5 million.

The winter of 1960, barley growers were invited to send in samples of their seed for laboratory test. Testing pointed out infected seed which otherwise might have been planted in 1960 and helped chop loose-smut losses in Minnesota this year.

Loose smut can't be controlled by chemical seed treatment. Best way to avoid heavy losses from the disease is to avoid planting infected seed. That's where the University's seed testing program comes in.

Herbert Johnson, extension plant pathologist, says it definitely pays a barley grower to have his seed checked before it is cleaned and treated. That way there is no risk of complete loss if barley should be useless for seed, and chemical treatment has already made it unusable for feed.

Samples for testing should be marked "Smut Test" and sent to the Minnesota Crop Improvement Association, University of Minnesota, Institute of Agriculture, St. Paul 1.

Be sure your name, return address and sample identifications are plainly visible or enclosed. A check in the amount of $5 per sample should be made out to the Minnesota Crop Improvement Association. The samples are turned over to the University for testing.

Each sample should contain about one pint of seed, and must be a random and representative sample of the seed lot.

MORE RESEARCH REPORTED ON QUACKGRASS HARM

Quackgrass is a convicted villain--at least when it shows up in an alfalfa field.

University of Minnesota scientists learned four years ago that quackgrass produces a substance poisonous to alfalfa and other crops. Alfalfa in quack-contaminated soil didn't grow properly. Plants were stunted and weaker.

Now, agricultural botanists have more findings to sew up the verdict against quackgrass. J. H. Ohman and Thor Kommedahl recently found that water extract from quack reduced alfalfa seed germination by 5 to 15 percent.

Alfalfa seedlings in soil contaminated with the quackgrass water were 65 to 80 percent shorter. If these laboratory results are applicable to a farmer's field, that could mean a big drop in hay yield.

This research started several years ago. Scientists and farmers alike wondered why alfalfa and grain often do poorly on soil infested with quackgrass the year before. In early tests, Kommedahl found that new alfalfa on soil free of quack the previous year produced up to three times as much dry matter per acre as a nearby plot that had been full of the grass.

It later became clear that quackgrass causes trouble in at least two ways. First, it produces some kind of toxic substance. Second, quackgrass rhizomes--underground stems--may harbor organisms harmful to alfalfa. And, like any weed, quack competes for soil fertility and moisture.

In their most recent research, Ohman and Kommedahl also found that quack seedlings are about as harmful as mature quackgrass.

NEW STRAWBERRY DISEASE REPORTED

Minnesota strawberry growers have a new bacterial disease to contend with--angular leaf spot.

The new disease was described by two University plant pathologists, Bill W. Kennedy and T. H. King.

Angular leaf spot was first identified in Minnesota in 1959. The disease was then found in 9 of 26 commercial berry fields examined in southeastern Minnesota. In 1960 it was found as far north as Crookston and Grand Rapids.

It cuts berry yields by reducing the photosynthetic activity--the manufacture of plant food in the leaves--of the plant and by causing a general decline in plant vigor.

All commercial varieties of berries tested are susceptible to it.

Angular leaf spot gets its name from the dark green, water-soaked, angular spots which first appear under the surface of the leaves. The disease later becomes visible on the upper leaf surface as red or brown spots of varying size.

The spots are covered with a milky slime when wet and have a thin, clear, scaly covering when dry.

Factors that promote vigorous plant growth seem to aid the disease. Plants with lush growth are usually first to be infected. Rundown plants appear to be the most resistant.

The disease apparently winters in dead leaves and spreads on droplets of moisture. Leaf loss becomes greatest when humidity is high. Consequently, infection is usually most severe in fields where sprinkler irrigation is used.

ASBORPTION OF ANTI-WEED CHEMICAL IS CLUE TO EFFECTIVENESS

Whether a chemical kills a certain weed may depend partly on how fast the plant takes it up.

Botanists R. A. Herrett and A. J. Linck reached that conclusion after studying effect of amitrol on Canada thistles and field bindweed.

They applied the chemical to bindweed and Canada thistles under a variety of conditions. Then they checked the amount of chemical still on the leaf surface at regular intervals after application, to see how much was absorbed.

While amitrol was still in solution, both weeds absorbed it at about the same rate. Once the solution on the leaf dried, though, uptake was much slower in bindweed than in the thistle. By 12 hours after application, absorption on the thistle was more than twice as great as on the bindweed. This, then, seemed to be one key to why the chemical was more effective on thistle; it got inside to do the job.

If the uptake difference proves to be important in further studies, it may provide a way of predicting effect of chemicals like amitrol on different weeds.

CHEMICAL CONTROL OF GRAIN RUSTS MOVES CLOSER

The day when rust diseases in small grain crops may be controlled by chemicals is closer because of a recent finding by University of Minnesota plant physiologists.

Arne S. Andersen and J. B. Rowell have devised a successful means of measuring the effective life of chemicals used for systemic rust control. Systemic control means the chemical is taken up by the plant system and fights rust from inside the plant. The main advantage of this method is that rain can't wash protection away.

Systemic control isn't a new idea. German scientists were studying this method over 20 years ago. Finding the right chemical to do the job has been--and still is--a problem. The ideal control must do several things: enter the plant easily, act as an eradicant (by removing rust infections already present), remain active in the plant over a long period of time, be inexpensive, and leave no toxic residue.

Scientists have known that nickel chloride readily enters the plant system--but when used alone remains effective only for a day or two. Andersen and Rowell find the cycloheximide derivatives--chemicals already in limited use to control white pine blister rust--will fight rust from inside a grain plant for as long as three weeks. Two treatments could see a plant safely through a rust epidemic.

The problem is that the cycloheximides are slow to enter the plant and are too expensive for practical use.

However, Andersen and Rowell's measurement technique now gives scientists a tool which may help them learn more about the mechanisms in a plant which affect chemically induced rust resistance. This in turn may lead to discovery of a low-cost rust control chemical which combines the easy entry of nickel chloride with the lasting ability of the cycloheximides.

The main approach in rust control has been in developing new varieties which resist prevailing diseases. This approach will continue to be important. But chemical measures could play an important role in controlling diseases between the time new races or strains first appear and the time new, resistant varieties are developed.

SMUT PERCENTAGE GOES DOWN IN HIGH CORN POPULATIONS

Stepping up the number of corn plants per acre won't necessarily increase the amount of smut disease. Higher corn populations actually had a lower percentage of smut in three years of University of Minnesota research by plant pathologists Roy D. Wilcoxson and R. P. Covey.

In plots with only one plant per hill, smutted plants or plant parts were twice to 16 times as common as in hills with four plants each. Also, smut on plant stalks was three times as severe in the thinner stands as in the higher populations.

Putting one plant in each hill was equal to about 6,000 plants per acre, compared to more than 20,000 in the plots with four-plant hills.

Many farmers are shifting to higher plant populations for greater yields per acre. However, some diseases are more severe in the heavier stands. This is one reason why farmers so far are advised to plant not more than 18-20,000 plants per acre.

By finding which diseases cause trouble at higher populations, scientists are better able to develop new disease-resistant corn varieties better suited to heavier stands. The studies by Wilcoxson and Covey, for example, indicate that smut may not be a problem.

Poultry Husbandry . . .

DEHYDRATED FISH SOLUBLES OK FOR CHICKS

Fish solubles dehydrated without a "Carrier" material--such as soybean meal--are just as effective as solubles that have the carrier in feeding growing chicks, says Elton Johnson, head of the University of Minnesota poultry husbandry department.

Carrier-free dehydrated solubles are cheaper in the long run; the carrier would raise transportation and storage costs.

Fish solubles are fed because they contain "unidentified growth factors" important in speeding up gains. In the past, dehydration always meant using a carrier, like soybean oil meal, to preserve these unknown factors.

Recently, however, a new process was developed for dehydrating without a carrier. The question then was whether the solubles would still have their growth-boosting effect. Johnson's studies showed they did.

In three-week studies with chicks, Johnson and P. E. Waibel found that birds fed 1 percent dehydrated fish solubles without carrier gained 5 percent more than chicks without solubles. In comparison, a ration containing 2 percent fish solubles dehydrated on soybean meal brought a 3.2 percent increase.

At lower levels of supplementing with fish solubles, the response was proportionately similar.

Fish solubles include material left over after fish processing. The new dehydrating process, Johnson said, will provide a compact source of the material. Freight costs will be cut in half for the same amount of unknown factors, compared to drying on soybean meal.

EGGS TREATED WITH OIL KEEP FRESH APPEARANCE LONGER

Eggs treated on the farm with processing oil are more apt to still have that fresh look when the housewife breaks them in the skillet.

University poultry researchers G. W. Froning, M. H. Swanson and J. H. Skala make that claim. They say the finding gives one more good reason why it pays egg producers to use the oil.

Earlier Minnesota studies had shown that on-the-farm spraying with oil kept eggs at grade A level much longer than untreated eggs. The more recent findings show that spraying helps retain fresh appearance, too.

Both results can mean more acceptable eggs to consumers and more profits for producers. At present, about 5 percent of all Minnesota eggs are treated on the farm.

In the current studies, researchers sprayed eggs with oil six hours after laying and left others untreated as a check. Some eggs in each group were stored for 14 days at room temperature and the rest were held 30 days at 55 degrees.

In each case, oiled eggs after storage had whites that stood up better than untreated ones. Treated eggs didn't spread out as much in the fry pan and showed less change in protein composition from when they were fresh.

Processing oil protects egg quality through keeping the natural carbon dioxide in eggs for a longer time. Normally, carbon dioxide gradually escapes through the shell, and loss of this gas causes quality to drop. The oil leaves a film that prevents carbon dioxide from escaping.

General recommendation for producers is to use 3 or 4 grams of oil on every "filler flat" of eggs in the packing case, within a day after gathering. With a hand sprayer, this means about a gallon of oil for 95 cases of eggs containing 30 dozen each. The oil also comes in aerosol pressure bombs.

GOOD CARE IS ESSENTIAL FOR NEW BABY CHICKS

Chick management begins before the chicks even arrive, says Terry Kinney, University poultry researcher. He has these suggestions:

1. Clean, wash and disinfect the house. If you use a disinfectant like carbolineum, heat and ventilate the house before the chicks arrive, to get rid of the fumes.

2. Check for rats, mice or other rodents.

3. Make sure you have the right type of heating equipment. For a few chicks, infrared lamps are okay for brooding. For several thousand, a central heating system is better.

If you have only a few hundred chicks and once you set the brooder up, spread 3-4 inches of litter on the floor. Then form a circular fence around the brooder with corrugated cardboard to keep chicks from leaving the source of heat. Leave around 2 1/2 or 3 feet between the edge of the hover and this fence, and make the circle larger as chicks get older.

When chicks are two weeks old, you can remove the cardboard circle entirely.

4. Use chick-size feeders up to 3 or 4 weeks of age, change to intermediate feeders until birds are 8 weeks, and then switch to full-size feeders. Arrange the feeders around the hover like spokes on a wheel, with several inches of the feeder under the hover. Space the waterers close to the hover, too. Move the feeders and waterers away from the stove as the fence is expanded.

This wheel-spoke setup, Kinney says, allows chicks to move toward heat or away from it without piling up against the feeders. This is important especially at night.

To get chicks started on seed put a few pieces of cardboard or egg case flats around the hover for the first 2 or 3 days, and sprinkle feed on them. Chicks can eat this feed, then, until they're used to feeders.

5. Provide right amount of space. In general, this could be a half square foot of floor per bird up to 4 weeks of age, 2/3 square foot up to 10 weeks and a full square foot from then to 14 weeks.

For feeder space, Kinney suggests about an inch per bird up to 4 weeks, 2 inches from 4-10 weeks and 3 inches after that. For water, 2 feet of space per 100 chicks up to 10 weeks is okay.

6. Keep temperature right. Start chicks with the temperatures about 95 degrees at the edge of the hover and drop the temperature 5 degrees each week until it's down to 70. Then keep it near room temperature for the rest of the brooding period. Don't keep the temperature high too long. If you do, chicks will feather slowly and the brooding period will be too long.

7. Plan your management to avoid cannibalism, a problem in brooding. It can result from overheating, overcrowding, not enough feed and water space, improper ration, slow feathering and other things.

8. Take steps to help stop picking. You can try hanging up a cabbage or pine bough, darkening the house, using a special salve or other treatments. The most effective method is debeaking--removing a half to 2/3 of the upper beak.

9. Watch the birds' health. Most important thing is to detect diseases early--and get a diagnosis from a veterinarian.

MANAGEMENT HELPS PROTECT HIGH EGG QUALITY

Producing high quality eggs is one thing, but getting that quality to market is another.

There are a number of ways you can keep eggs tops in quality while they move from community or individual nest to the community store, says University poultry scientist Milo Swanson.

Gather eggs at least three times daily from conventional nests and twice from roll-away nests and caged birds. Reason: eggs shouldn't be exposed any longer than necessary to henhouse temperatures and fumes. Both hasten breakdown of quality.

Cool eggs promptly to below 60 degrees. To do this, gather them in wire baskets and put the basket in the cooler. Keep the cooling cabinet or walk-in refrigerator door tightly closed to cut down carbon dioxide loss from eggs. The faster carbon dioxide leaves the egg, the faster quality goes down.

Clean soiled eggs as soon after gathering as possible. Shell-treat eggs within 6 to 24 hours of laying with oil or oil and water emulsion . This treatment seals in natural carbon dioxide. But talk to your buyer before treating. Some outlets won't buy eggs sprayed with processing oil.

Pack cooled eggs small end down in clean, precooled cases. Then hold cased eggs below 60 degrees and at about 75 percent relative humidity. Finally, market eggs frequently--twice a week, if possible.

In Minnesota, natural refrigeration works fine in some months. But Swanson says mechanical refrigeration is a must for uniform high quality around the calendar.

For 1,500 birds or less, a cooling cabinet is all right. Six-case cabinets cost around $400 or less, with 12-case cabinets running about $500. Some can be bought at discounts through organized quality egg programs.

For larger flocks, Swanson says a walk-in refrigerated egg room is best. It can be equipped to give complete automatic control over both temperature and humidity.

TRANQUILIZER MAY HELP REDUCE TURKEY LOSSES

A tranquilizer called reserpine may, in some cases, help reduce losses in turkeys from an internal bleeding disease, according to Paul E. Waibel, University poultry scientist.

In two of four trials with farm turkey flocks, Waibel said reserpine appeared to reduce occurrence of the hemorrhaging--also known as aortic rupture. The reduction is probably a result of the tranquilizer lowering the blood pressure in turkeys. There was no effect in the other two flocks.

Also, Waibel reported feeding reserpine to young turkeys in which the internal bleeding was experimentally produced. In one case, feeding reserpine at 1 ppm (1 part per million) in the diet seemed to reduce the severity of the condition.

In another experiment, feeding 2.2 ppm reserpine during the period of hemorrhaging also reduced severity.

Waibel said that while more study of the condition is needed, reserpine definitely holds promise as a possible way to deal with the hemorrhaging.

Aortic rupture has hit many turkey flocks in Minnesota in recent years, often causing heavy losses. It occurs when one of the large blood vessels near the kidney breaks, but the actual cause of the rupture isn't known.

WHAT'S MOST PROFITABLE TURKEY FEED?

The most profitable turkey feed isn't always the one that puts on the cheapest gains. A better guide to follow, say University poultry researchers, is total profit you stand to make at market time.

The more expensive rations may bring you more return above total feed costs--especially if turkey market prices average 21 cents per pound or more. The difference is that the more expensive feeds usually bring faster and greater total gains. The higher the market price, the more difference this can mean.

Here's an example. In recent trials at the Northwest Experiment station, Crookston, E. L. Johnson, P. E. Waibel and A. M. Pilkey compared several rations on turkeys from 0-8 weeks of age.

A "Minnesota Standard" ration with .1 percent added methionine made the cheapest gains. Birds on this meal averaged 7.52 cents ingredient cost per pound of gain at 8 weeks of age.

However, there was actually more profit from birds fed a prestarter and a starter that cost 8.21 cents per pound of gain at the same age. The reason was that birds on the more expensive feed were heavier--4.68 pounds each, compared to 4.12 for those on the cheaper Standard meal.

Figuring each pound of bird worth 21 cents, the birds on the more expensive ration had made the equivalent of nearly 60 cents profit per bird above feed costs at this age, compared to 55 cents for those on the less expensive mix.

The same principle would have held true after 8 weeks of age.

Johnson suggests this general rule. If you expect turkey market prices to average 21-22 cents per pound, the more complex and expensive formulation will probably give better results than a cheap ration.

On the other hand, if prices drop below 20 cents, a turkey grower might want to take a second look and maybe select the feed that costs the least per pound of gain.

LOW FEED COSTS FAVOR TURKEY GROWERS

Minnesota's national lead in turkey numbers will probably go unchallenged for years to come.

One reason: Turkey feed in the Midwest is at least $10-15 per ton cheaper than in Utah, California or other major western turkey areas.

Elton Johnson, University poultry department head, says low feed costs give this state a big competitive edge, since the turkey business operates on close margins.

Cheaper feed here is due to heavy corn and soybean production in the Midwest. These crops cost the Utah or California grower more because of transportation expenses.

As a result, Johnson expects the turkey business here to stay strong and probably get even bigger. Minnesota growers raised 14.4 million birds in 1959--more than any other state. California still leads in total pounds, though. California keeps a greater number of turkeys to mature weights (20-pounds) instead of being sold as fryer-roasters at about 10 pounds weight.

With the difference in production costs, Johnson expects Minnesota, Iowa and Wisconsin to make up the major turkey-surplus area of the future. California for the first time in 1959 was not a turkey exporting state. Growers there couldn't compete with the lighter, cheaper birds from the Midwest.

Johnson also lists other reasons for Minnesota's turkey lead. One is increased know-how among a greater number of growers and improved buildings and equipment. Better turkeys are being bred. And Minnesota is closer to eastern markets than California.

Although many Minnesota turkeys are lighter (fryer-roaster size) than those farther west, the state's flocks are still nearly 80 percent heavy breeds. Average live weight of all turkeys sold is about 15 pounds--ranging from a little more than 8 pounds for broilers to 24 for heavy toms.

DAY LENGTH AFFECTS LAYING HABITS OF TURKEY HENS

The ever-widening selection consumers have of turkeys is due to year-round marketing. This recent innovation in the turkey industry is due in part to University research of turkey habits.

Turkeys, like many other birds, are phototropic. That means some of their habits are governed by day length. It's phototropism that makes wild geese fly south as fall days grow shorter and return to the north in the spring.

A tom turkey doesn't pay much attention to the changing rhythm of longer and shorter days. As long as he has 12 hours or so of daylight per day he's ready to do his part to perpetuate the race.

But it's a different story with a turkey hen. She won't begin to lay eggs until a period of short days is followed by increasing day length.

That complicates matters for turkey growers. In the past a turkey hen laid eggs in the spring, the eggs hatched and little turkeys grew up during the summer and fall. Most were marketed around Thanksgiving. Some hens were kept over winter, laid eggs the next spring and the cycle went on and on.

But consumers began to show an interest in fresh turkey at seasons other than Thanksgiving and Christmas. Turkey growers were anxious to supply the demand, but eggs were hard to get during the summer, fall and early winter, making off-season production too costly to be practical.

To study the possibility of practical year-round egg production using artificial light, R. N. Shoffner, poultry researcher at the University, housed three groups of turkeys born in November in windowless houses under strictly controlled light conditions.

. One group had artificial light for 24 hours a day; another artificial light corresponding to hours of natural daylight; and another only 6 hours of light per day.

By April the birds were mature but still not laying. As long as the experimental conditions were maintained, the 6 hour and 24 hour day groups would never be expected to lay. The group on regular daylight hours would be expected to pass through the period of shorter days in the fall and begin laying as days grew longer in the spring.

But by extending the day length for the 6-hour group and first shortening for three weeks and then lengthening the "daylight hours" of both other groups, Shoffner brought all of the birds into production in May.

Once the birds began to lay they continued as long as their "day-length" remained unchanged.

Therefore, after a turkey grower's hens reach maturity he can start them laying as he pleases by first shortening and then lengthening their hours of daily light. In this way he can regulate his flock for year-round egg production, hatching and marketing.

EGG PROFITS DEPEND ON QUALITY

The day may be near when poor quality eggs not only miss top prices, but don't get sold at all.

So to be successful, poultrymen need to keep egg quality at a constant peak. Milo H. Swanson, University poultry scientist, has some views on flock management to help do it.

Egg quality means a number of things, he says. Eggs should have normal shape, strong, clean shells and uniform shell color. They need firm, upstanding whites, round yolks free of defects, no blood or meat spots and a mild flavor and odor.

Contrary to popular belief, freshly-gathered eggs aren't all tops in quality. Swanson says getting this quality requires several steps.

1. Choose a strain of birds noted for high egg quality. Most breeders are now giving egg quality some attention. Random sample tests and past performance of flocks can serve as a guide.

2. Confine the flock at all times. This means fewer soiled eggs, better control over yolk color and fewer off-flavors.

3. Feed well-balanced rations. Deficiencies of calcium, phosphorus, manganese, and vitamin D lead to poor shell quality. Yolk color is almost entirely dependent on the bird's diet. Low vitamin A may increase blood spots.

4. Produce a high percent of nest-clean eggs. This means good flock management. Keep the flock disease-free, through good sanitation and vaccination. Certain diseases, like Newcastle and infectious bronchitis, often cause birds returning to production to lay poor quality eggs.

5. Avoid high laying-house temperatures. When it's above 85 degrees, birds lay eggs with thinner shells and less firm albumen.

6. Replace birds when they are 18 to 20 months old. Pullets lay the best quality eggs.

JAPANESE QUAIL SPEED UP RESEARCH

The Coturnix quail, sometimes called the Japanese quail, is speeding up poultry research at the University of Minnesota.

Major advantages of this new basic research animal are its extremely small size and its exceptional egg-laying rate, reports Elton L. Johnson, poultry department head.

The adult Coturnix quail weighs only 130 grams--less than 5 ounces--compared with 1900 grams for the small, modern type Leghorn hen. It lays the first egg at only 35 to 40 days of age, while the hen takes 160 days to reach this stage of maturity. This makes five generations a year possible instead of two generations under rather expensive conditions with hens.

In addition, the Coturnix quail egg requires 16 to 18 days to hatch, while the chicken egg needs a full three weeks.

Other advantages of this type quail are:

It weighs only 5 grams at hatching time but multiplies its body weight more than six times during the first 10 days of life.

Because it is small, it is easy to handle during experiments. The quail egg is easier to handle, too. The chicken egg weighs approximately seven times as much as the quail egg, and the quail egg takes less laboratory space and involves less production costs per unit.

The approximately 4 cents needed to raise the quail compares with the $1 needed to rear a hen.

Ten times more adult quail can be kept in a given floor area than would be possible with the chicken, and it is easier to stack decks of Coturnix quail because of reduced head room requirements.

The quail's relatively small feed consumption, as well as its other characteristics, makes smaller amounts of labor necessary in its general management.

Rural Sociology ...

AMERICAN MARRIAGES HAPPIER THAN EVER

American marriages today are happier than ever before in history, says Reuben Hill, director of the University's Family Study center. Hill doesn't share the gloom of those who point to the divorce rate, changes in sex morality and juvenile delinquency as indications of a breakdown of the family.

"More people marry and remain married voluntarily today," according to Hill, "because women can support themselves economically outside marriage and men can buy on the market most of the housekeeping services women have traditionally provided.

"It is no longer so shameful to divorce. Therefore, those who remain married do so because they are happier than they would be divorced."

He listed these main reasons why marriages are happier today:

1. Husband and wife are more frequently partners in earning and spending the family income.

2. Authority in decision making is more likely to be shared in all phases of life, including recreation, choice of friends, sex relations and child discipline.

3. There is today a much less pronounced division of labor within the home. Wives do many maintenance tasks with their husbands which men once monopolized, with men crossing ancient boundaries to share in many duties once regarded as exclusively "woman's work." The net effect is greater companionship between husband and wife.

4. Integration of recreation for both sexes has increased the possibilities of companionship in play. The urban husband probably spends more hours per week in the company of his wife than in any decade since industrialism removed production of goods from the home.

5. Trends in the husband-wife relationship have their counterparts in the parent-child relation where increasing sharing of authority and greater companionship between the generations have made parents and children closer friends than their predecessors were.

Hill admits that the present-day family "is not the giant in numbers and functions performed that it was a century ago. The modern family, shorn of kinship attachments, is smaller and more specialized in its functions. Yet society is today more dependent than ever before on the family for the performance of those vital functions of reproduction, infant care, socialization and guidance without which a society would disintegrate.

"In addition," he adds, "the modern family fits well the demands of our new democratic and urban society, something that would have been impossible to the larger, rooted and authoritarian family of the past century."

ATTITUDES OF FARMERS TOWARD SUBURBANITES

Farmers on the big city fringe have mixed feelings toward their new suburban neighbors, a University of Minnesota survey shows.

In general, the home builder seems to get a favorable reception. But tax problems and costs of new public services are often sore spots among farmers.

Rural sociologists George Donohue and Clarice Olien analyzed interviews from 140 farm operators in Anoka, Ramsey, Dakota and Wright counties. All four counties are within the suburban fringe of Minneapolis and St. Paul. Each has seen a rapid expansion recently in rural home building.

About half of the farmers felt the suburban movement didn't break up traditional farm social groups. Not that farmers didn't feel the influence of their new neighbors; they definitely did. About three-fourths, for example, said more people were not attending churches and other social institutions.

When the sociologists asked whether farmers or suburban residents were more neighborly, they got a variety of answers. Three-fifths of the farmers saw no difference. A third felt farmers were more neighborly and only one in twenty thought suburbanites were more neighborly than farmers.

A sizable proportion of the farm operators, however, thought there were still closer ties between farmers and their neighbors than was true of suburbanites.

Most farmers had no objections to their children mingling with suburban youngsters. In fact, three-fourths thought it a good idea. Only one-tenth thought it unwise for the children to mix. The most common reason for that answer was unfavorable attitudes or behaviors farm children might pick up.

Did farmers feel an economic pinch from the rural housing boom? Here, some sharp differences appeared. About two-thirds said their taxes had gone up and they expected a further tax climb. Yet, almost three-fifths felt the cost of schools and facilities was being shared fairly by the suburban residents.

Slightly more than a fourth of the farmers felt suburban home owners weren't holding up their end--particularly in view of the fact that most school costs are financed by property taxes.

Donohue says the tax problem is one of the sorest points in the whole suburban movement. Since farmers have a good deal of property,

they are quite heavily hit by the tax. Even though their land is getting more valuable, their returns from farming aren't increasing much, if any. So in order to get enough money to justify the tax, the farmer has two choices: He can give up farming, or he can pay the tax, figuring he will get a full return from the higher value if and when he sells out.

Another possible area of conflict was changes in the school system, water system and so on. Slightly more than half of the farmers felt suburban residents were in a big hurry to make such changes. About a third didn't want to move too fast on these items and a fifth of the farmers felt very strongly on this point.

Almost half of the farmers were favorable toward selling their land for subdivision and a tenth were very favorable. But about a quarter didn't like the idea and another fifth didn't know whether they wanted to sell.

Most of the farmers thought they would get a good price for their land, but nine out of ten definitely said the community shouldn't be allowed to force farmers to subdivide their property for residential use. Instead, they wanted to continue to make their choices individually.

CHARACTERISTICS OF WELL ADJUSTED RETIRED FOLKS

Meet the retired Minnesotan who's getting the most enjoyment out of his later years.

He's 71 or under, thinks of himself as middle-aged or elderly, rather than "old" and considers himself in good or excellent health.

This well adjusted senior citizen isn't necessarily rich or even well-to-do, but he feels his income is enough to meet his needs. He's more apt to be fully employed than fully retired and likes it that way. He prefers the work or activity in which he is taking part now to switching to something else.

He did some advance thinking about retirement and now has health insurance for himself and his family. He lives in his own home and takes part in community organizations, either as a leader or as a member.

This profile came out of a preliminary report of a study of 300 farm people now receiving social security retirement benefits. The survey was directed by Marvin Taves and Gary Hansen, rural sociologists at the University of Minnesota.

Information received from the 300 persons showed that:

Whether a person is well adjusted in retirement doesn't depend on amount of income, total net worth, financial planning and investing for old age, how much land he owns or where he lives. Nor does it matter whether he's married, single or widowed. And retired women are likely to be just as happy as retired men.

Taves and Hansen also studied 1,400 persons 65 or older living in towns or cities. Six out of ten thought that social security should include hospitalization coverage--even though it would mean higher social security tax.

Fewer than 30 percent of the urban retired citizens had any complaints about their living arrangements. Those who did were concerned about things like stairs or steps, lack of privacy, poor floor plans and poor condition of houses.

Two-thirds of the persons had annual housing costs of under $1,000, and the rest paid up to $2,000.

Most senior citizens were keeping up contacts with other people. Seventy percent reported they had visitors at least once a week but 4 percent said nobody ever stopped by to see them.

Seventeen percent said their income definitely wasn't enough to live on. Another one-third said they had just enough to get by on. Another third reported just enough to meet all needs comfortably. Only a small minority felt they had more than enough.

About 60 percent said they had made no financial plans for after age 65. But of those who did make plans, more than half had been able to carry the plans out completely or almost completely.

The sociologists noted a general lack of preparation for retirement. Nearly two-thirds had no medical or surgical insurance, 49 percent had no hospital insurance and 57 percent had no life insurance.

What community service or activities would the retired people like? Most common answer to this question was free or low-priced health clinics, given by slightly more than half of the retired persons. Nearly as many said "visiting." Other comments, each given by a third or slightly less persons, were card games, social or recreational clubs, homemakers' service, and adult education classes.

Nineteen percent were interested in outdoor sports, 16 percent would like indoor sports and 12 percent listed dances.

RURAL CHURCH FACES MANY PROBLEMS

Rural churches may need to specialize to meet the changing needs of their congregations, Marvin Taves, University of Minnesota rural sociologist says.

Taves believes it may be better for a church "to do a few things well than many things poorly."

He pointed out that today young people look to schools, commercial establishements and other social organizations--rather than churches --for most social and recreational activities. "To compete," he stated, "the rural church may well have to specialize in a limited number of functions and professionalize its personnel."

On the other hand, he warned that churches which narrow their services to spiritual guidance only may lose to others which serve wider diversity of needs--"much as the corner grocery loses to the supermarkets."

Taves noted a number of current changes affecting the rural church, which he defined as any in a community of less than 10,000 population, outside big city areas.

1. Between now and 1965, the church will deal with a society in which marriage and family are more popular than ever. A higher proportion of the population is married, and people are marrying at younger ages--about 20 for women and 22 for men.

2. Rural young people are becoming better educated. This raises the question of whether present educational background of local church leaders (particularly the clergy) is sufficient to provide spiritual and social counsel.

3. Farming and other rural enterprises are becoming strictly businesses; many of the values formerly associated with the family farm and family business are largely "figments of the imagination." By 1965, decisions (on whether to farm) will be based on economic decisions, cultural advantages and social opportunities, all factors on which the urban centers will have the advantage, unless new values are developed for rural living.

4. Rural population beyond the metropolitan fringes is declining, meaning that rural leadership must be improved if these areas are to continue to be given the hearing they formerly had. "The church potentially provides more opportunities for leadership experience than any other single social group in rural America."

"The new patterns of suburban cooperativeness, friendliness and emphasis on quality of facilities and public services may show the way to a renewal of rural living values," he says. "The church should be most competent to foster development of such values."

Farmers who have boosted their own production efficiency will probably expect increased efficiency from their churches. Recent self appraisals by Catholic, Jewish and Protestant groups show that rural churches by 1965 will probably become more efficient.

To better serve rural areas, Taves said churches can, while devising a new system of values, give more meaning to all activities of rural life. Churches can aid in adjustment of rural-urban differences, "especially in the rural-urban fringe, where blue, gray and white collars intermingle."

Taves said churches could strengthen personal guidance activities, as through family and youth counseling. They can help develop effective rural leadership, such as by helping young people choose education and training for adulthood.

"In all of this," he concludes, "it will be essential for the church to go out to the community and to the people, not only physically but spiritually and mentally. This means bringing religion to people in their everyday life, as well as in their devotions and worship. The basic function of the church, of course, is spiritual inspiration and guidance."

RURAL COMMUNITIES NEED SELF-ANALYSIS

What's ahead for the rural community? Will it grow, decline or stay the same? Each village, town or city must answer these questions for itself, according to George Donohue, extension rural sociologist.

He says communities needn't sit back and be run over by the "steam roller of social change." They can determine their own destiny, if they'll make a careful self-analysis of their interests, goals on which local people agree, and steps needed to reach these goals.

However, Donohue has this warning: Communities without carefully defined goals and values may continue, as many have, as loose coalitions of splintered interests, buffeted about by population and economic changes.

The challenge is clear. It's up to citizens and community leaders.

So far, Donohue feels, the challenge hasn't been accepted in enough communities. Too often, they drift along with social change and accept its consequences. More time must be spent by individuals and community groups reflecting on where they want to go and why.

In general, communities of under a thousand people in the past 20 years--except for unique cases--have tended to stand still or decline. Some have disappeared.

Communities with between 1,000 and 2,000 people, however, may expect to grow into more complex centers or go the way of smaller ones. Still larger centers are even more likely to survive.

In spite of the growth in national population, rural communities as a whole in Minnesota, have changed little, with the major population increases occurring around big cities. That pattern of growth will probably continue through 1960.

Therefore, rural communities can't quietly wait for more people. According to current predictions, agriculture is the one industry that will see a decline in employment potential. But Donohue says this decline still doesn't mean a hopeless case for rural centers struggling to keep their people.

Partly offsetting the drop in numbers of full-time farmers is an increase in rural home owners and part-time farmers. Most of the second two groups work in service-type businesses, which will probably grow much faster than agriculture and other production industries.

The U. S. Department of Labor predicts that by 1970, about 10 million persons in the nation will be employed in service occupations, compared to about 5 million in agriculture. Back in 1954, both occupations had about the same number of people--about 7 million each.

This trend is important to rural communities--most of which sell services rather than produce goods. Now, the increased size and efficiency of farms has brought a need for even more services. More people are needed to store, process and distribute farm products.

With fewer people in farm production and more in service employment, rural communities can look forward to more and more differences among their people. Goals and desires of farm, rural non-farm and town people will have to be jointly accommodated.

Such diversity in interests, however, needn't spell weakness and disintegration. In fact, Donohue says diversity may very well contribute to a stronger and more ideal community. It already has in cities. Whether the differences can be accommodated in rural areas depends on the communities themselves. They must assess these interests to find where they conflict with, complement or supplement each other. And they must find the common thread that provides a unifying force.

MINNESOTA RURAL POPULATION DECLINE MAY END

Minnesota could soon see the end of its long decline in farm population.

The prediction that farm population will not go much below that of the late 1950's is made in the book, The Minnesota Community--Country and Town in Transition by the University of Minnesota Press. Lowry Nelson, for many years head of rural sociology on the St. Paul campus of the University, is the author.

Nelson also feels that town and country will continue to be more and more closely integrated and that understanding between the two will continue to grow.

"While the number of large farms may continue to increase, this trend will be largely offset by an increase in small farms for part-time farming," Nelson says.

Some of his prediction is based on the hope that world tension will lessen in the next quarter century and that we will have spent less on defense, he says. This, along with immense number in the labor force, will produce problems of employment which may drive more people to, or keep them in, agriculture.

Factors that may favor a continued decline in farm population include the continued advance in farm technology and the pull of nonfarm employment opportunities.

Factors that favor maintaining present farm populations include the hold of farm life, the growth of part-time farming, the growth of U. S. and world population, the high birth rate of farm people, possible industrial slowdowns and public policies aimed at keeping people on the farm.

ETHNIC COMMUNITY MARRIAGE PATTERNS CHANGE

Marriage patterns in rural Minnesota ethnic communities may be changing, but the change is often a gradual one.

Rural young men from these areas where the old country influence is still strong are going farther from home to find future wives. But few are marrying city girls; the selection still involves mainly girls from other rural places, who have backgrounds similar to the men.

A University rural sociologist, Ronald Klietsch, found these trends in a 1959 study of several communities in central Minnesota. The communities were made up primarily of people with German backgrounds.

He found that in spite of gradual changes, the old "in-group norms" still persist, in these areas of strong ethnic ties, to a much greater extent than where such ties have weakened.

For example, in community "A," records showed that 75 percent of all marriages over a 70-year period had involved couples from within a 10-mile radius. The rest involved mates who had originally been farther apart, but in the same county.

This study didn't account for people who had left the area to be married. It dealt only with couples married in the local area itself.

Klietsch did find gradual change over time. About 48 percent of all community "A" couples married between 1941-50 were from within the 10-mile radius, but the percentage dropped to 31 percent between 1950 and '58.

In community "B," 42 percent of all local marriages from 1941-50 represented couples from within the community itself, compared to only 10.5 percent in the last 8 years. Unlike community "A," marriages within the 10-mile radius around community "B" actually increased --from 35 percent before 1950 to 51 percent since.

Shifts that occurred were due to local conditions--not a trend involving men going to cities for spouses. In community "A," decreasing marriages within the area around the community reflects a drop in farm numbers and availability of prospective marriage partners.

In the second community, more partners are from the open country. Reasons are local improvement in highways--making it easier to court girls from a distance--and a fairly large number of young people starting farming.

Klietsch says the fact that rural young men in these areas prefer mates with the same strong German background stems from the strong influence of religious customs, the role of the family and the ethnic factor itself.

Safety...

READ AND HEED SAFETY TIPS ON CHEMICALS

Chemicals for treating seed are poisonous and must be used right, according to Glenn Prickett, University of Minnesota farm safety specialist.

Here's Prickett's advice:

Keep chemicals and treated grains plainly labeled and stored in cabinets or bins--preferabily locked. Either is sheer poison to children or livestock.

Read every word on the labels--and heed the instructions. Have the granary ventilated when working with seed grains.

Burn paper, cardboard and bag containers only according to label instructions. Smoke and fumes from burning chemicals can also be poisonous.

Apply chemicals as directed. Wear protective clothing and masks to avoid inhaling spray or dust. Keep materials away from the skin. Change and wash your clothing daily while using the chemicals. Wash thoroughly before eating and bathe or shower after work.

There are other dangers with seed treating and cleaning, too. Handling grain requires lifting. Don't lift with your back; squat and use your leg muscles instead.

Check the granary electrical system. Heavy layers of dust and oil around the motor can easily catch fire from an electric spark. Keep the motor and granary clean. Use shields over power take-off shafts, drive belts and "V" belts. And keep your hands away from moving augers and pulleys.

WATER AND CAMP SAFETY TIPS

Safety is your best companion for summer water and camping fun.

Caution while you are vacationing this summer will prevent the injuries which could ruin your boating, swimming or camping fun, according to Glenn Prickett, extension safety specialist at the University of Minnesota.

Here are some tips on camping outlined by Prickett to add safety to your plans for summer fun.

Know the beach where you are swimming. There should be no drop-offs or dangerous boulders and other obstructions in the water. Check the depth before you start swimming. If possible, there should be a lifeguard on duty. When several people are swimming together, use the buddy system and never swim beyond your limit.

When boating, observe the recommended number of passengers for your boat. Don't allow anyone to stand or move around to exchange places while in the boat. Never water ski or speed near swimmers or fishing boats. When wind and waves are high stay off water. Be sure your boat is properly licensed.

Choose a safe campsite where there are no dangerous cliffs or poisonous plants. Be careful when lighting campfires and use water, sand or dirt to put out the fires when you leave camp. Keep your food supply safe from insects and animals. Use a portable cooler for foods which need refrigeration. Take along a first aid kit and care promptly for even minor injuries.

SAFE HUNTING DEPENDS ON YOU

If you'll have anything at all to do with rifles, pistols or shotguns this hunting season, stop right now and review some firearm safety. Your life depends on it.

Glenn Prickett, extension safety specialist at the University of Minnesota, gives these precautions to help you live through the hunting season:

. Never point a gun at anything you don't plan to kill. Teach youngsters this rule and they'll know firearm safety when they're old enough to hunt.

. Always unload your gun before bringing it into a car, camp or home.

. Carry your gun so the muzzle does not cross your companion--and so you can control it in case of a stumble or fall.

. Be sure of your target before you pull the trigger. It's better to lose the game than to kill your friends.

. Unload your gun before crossing or going through a fence, then place the gun through ahead of you and lay it on the ground until you're safely across.

. Make certain you have the right-size cartridge and shell with proper load for your gun. Mixing shells of slightly different sizes is a dangerous practice.

. Always store guns and ammunition separately--under lock and key if possible.

. Remember, gunpowder and alcohol can be a tragic mixture. If you're going to drink, don't hunt. If you're going to hunt, don't drink.

Soils . . .

VALUE OF WHEEL-TRACK CORN PLANTING NOTED

Wheel-track corn planting is a good practice for nearly any type of soil, but it's no panacea for all corn-growing problems.

George Blake said University research and experience of hundreds of farmers around southern Minnesota show wheel-track planting works well on most heavy soils. He refuted the idea that the method is suited only for sandy fields.

The wheel-track method--a form of minimum tillage--means planting corn in tractor tracks on soil which has been plowed but disked and dragged very little or not at all. It saves time and money--reducing costs up to $5 per acre.

Blake listed other advantages, too. In a spring like 1960, he said, it helps get young corn plants up in a hurry. On moist, freshly-plowed soil, a farmer can plant the seed shallow. That makes for ideal germination.

Second, Blake said wheel-track planting reduces erosion. In Illinois research, corn fields plowed, disked and dragged before planting lost 14 times as much soil and five times as much water as fields wheel-track planted.

Farmers using wheel-track planting this year weren't pinched as much by the late, wet spring. Those who did the usual disking and dragging wasted valuable time.

Blake said wheel-track planting can help control weeds, because seeds don't germinate as well in the loose soil between the rows.

The method does have some limitations. Farmers often see individual areas that need extra working. Fields plowed in fall usually need to be disked once before planting. Also, Blake said, in some years good spring plowing is impossible because of the soil condition. If plowing is too rough, disking may again be necessary.

FREE AMINO ACIDS MAY BE RELEASED BY SOIL TREATMENT

Every time you spread manure or plow under a green crop, you may be releasing free amino acids in the soil!

The effect on crops, whatever it may be, is probably all to the good.

Amino acids are components of proteins. And the fact they can occur free in the soil--not as part of a complete protein--has only recently been discovered, according to E. L. Schmidt.

The free amino acids don't last long in the soil, but at times they may total up to 200 pounds per acre.

Why do manure or plowed-under forage release them? This material adds carbohydrates to the soil. The carbohydrates in turn step up activity of certain microorganisms that turn the amino acids free.

While the practical implications of this finding aren't entirely clear yet, the principle is another important finding in this type of research.

Schmidt says it's theoretically possible that certain plants might directly absorb amino acids, if they occur near the roots. In that case, there might be an increase in protein content of the plant.

Other effects, however, are more likely. Certain soil microbes beneficial to plants might be helped along by certain amino acids. Most microbes produce their own but some--like those involved in forming root nodules on legumes --must get some of these growth factors from outside sources.

Schmidt and other researchers made these studies by adding glucose (a natural sugar) to soil. The sugar stepped up activity of soil microorganisms, which in turn released the amino acids in a free state--as any carbohydrate source would.

Schmidt said studies of the synthetic activities of microorganisms as they grow in soil is difficult. But modern research methods help.

Schmidt also pointed to the importance of isolating microorganisms from soil. "Synthetic powers of microorganisms are largely unknow," he said "but of considerable potential significance. Even small amounts of certain biologically active substances produced by a microorganism in the soil could conceivably exert important effects on the soil, on neighboring microorganisms, or even on plant roots in the vicinity."

Microorganisms have been isolated from the soil, he said, for the purpose of producing alcohols, acids, organic solvents, enzymes, antibiotics, and other materials.

WHEEL-TRACK PLANTING SAVES TIME IN BUSY SEASON

Wheel-track planting has taken the place of an extra man on a farm here in Wright county.

Emil Dorf and his son, Emil, Jr., in the summer of 1959 saved nearly 6 weeks in man and machine time on their 500 acres of corn and soybeans. They did it by planting in the tractor wheel-tracks on freshly-plowed but otherwise untilled soil.

The saving--from eliminating one disking, two draggings and one cultivation--meant that father and son could handle this operation alone. Otherwise, an extra hand would have been necessary all spring.

Besides, cutting out those tillage steps saved nearly $1,000 in equipment and operating

costs. And for the soil, less tillage meant better structure, less moisture loss and yields at least as good as under the old method.

The Dorfs used a four-row planter--something many farmers have found difficult for wheel-track planting. They put two extra rear wheels on the tractor, spaced so a planter shoe follows each track.

Wheel-track planting has been strongly promoted by county agents and University of Minnesota soil men in recent years. Research has shown that much of the disking and dragging formerly done to work up a seedbed isn't necessary. It can even cause excess compaction that may actually hurt yields and crop quality.

Emil, Sr. had frequently discussed the practice with J. E. Ellis, Wright county soils agent and Jerry Specht, county agricultural agent.

Dorf got the idea for his equipment from a farm magazine. He picked up two rear tractor wheels and tires from a salvage yard, and had a welder make some braces and an axle extension to hold the wheels in place.

The regular wheels are moved in so that--with smaller spacers between the rim and the wheel--they are just 40 inches apart, the same as planter row width. Each extra wheel is another 40 inches from the closest regular wheel.

Emil, Sr. says the setup works well. And he feels that corn planted in wheel tracks germinates faster. "The soil there is firm and the wheel track holds moisture," he says.

With the soil loose between the wheel tracks, weeds did so poorly that Dorf cultivated only twice--compared to three times in past years.

Disking the 500 acres once would have taken one man 10 days, dragging before and after planting 14 days and one cultivation, 17. All told, the Dorfs saved about 41 days of man and machine time--not to mention the savings in gas and machine wear, which may run $1 or $2 per acre. These estimates are based on a 12-foot disk, a four-section drag and a 10-hour working day.

The Dorfs use their form of minimum tillage on land plowed in spring. However, other farmers have found it can also be done on fall plowing.

University of Minnesota soils men say the idea Carlson used is a good one for farmers to try on fall plowing. Several others have also used it with success.

CONTINUOUS CORN SHOWS FAVORABLE YIELDS

WASECA--A farmer can plant corn 5 or more consecutive years in the same field, without losing a single bushel in yields.

That opinion was stated by University of Minnesota soil scientists A. C. Caldwell and J. R. Kline.

Visitors at the station Thursday saw plots planted to corn every year since 1956. They also saw a rotation of corn for two years followed by a year each of soybeans, oats and alfalfa. So far, continuous corn yields are about equal to corn grown in the rotation.

Despite a drier-than-average season in 1959, continuous corn yields ranged from 91 to 125 bushels per acre.

For farmers thinking of trying continuous corn, Caldwell and Kline gave this advice:

Select fields that are nearly level to avoid soil erosion. Use minimum tillage, as few trips as possible over the field to prepare the seed bed and to cultivate.

Test the soil, then add lime and fertilizer as needed. Continuous corn on the Waseca plots has responded best to phosphorus, paid little attention to nitrogen or potassium application. Experience with plots in other areas shows nitrogen to be an important factor.

Plant a heavy stand, at least 16,000 plants per acre; the plots at the station carry 20,000.

Keep soil insects and weeds under control. Aldrin is an effective soil insect control. Randox applied as a band spray on the row at planting time holds back weeds.

A good stand of continuous corn can yield enough stalks and leaves to return as much organic matter to the soil as a legume.

MINIMUM TILLAGE MOVING AHEAD IN MINNESOTA

Minimum tillage in corn fields is moving ahead in Minnesota.

In general, the idea means working the field less--and saving $2 or more per acre in the process without hurting corn yields. So far, there are two main ways to go about it.

One way is to plant the corn in tractor wheel-tracks on freshly plowed but otherwise undisked and undragged soil.

A second method, if your equipment is hard to rig up for wheel-track planting, is to still plant a few acres on freshly tilled land, but without worrying about putting the corn in the tractor tracks. In fact, this is one good way for a farmer who hasn't tried minimum tillage before to give it a whirl.

Of the two systems, University of Minnesota soils men say wheel-track planting is better--if the farmer has equipment for doing it. It means better soil structure, less undesirable soil compaction, and better weed control. The soil in the wheel tracks is firmed enough for good corn germination.

Between the rows, however, the soil stays so loose annual grass weeds don't grow as well. So if you also band spray the corn row with weed chemicals at planting time, you can eliminate one or more cultivations.

The 2,000 or more Minnesota farmers who have tried wheel-track planting have found it saves $2 or more per acre in equipment and labor costs. University soil physicist George Blake and extension specialist Curtis Overdahl say trials show wheel-track planted corn yields 4 to 5 bushels per acre more.

Some trials show benefits are greater the second or third year after a farmer has started minimum tillage. Soil structure steadily improves.

Biggest block to wheel-track planting so far has been lack of equipment for doing it easily--especially for farmers with 4-row planters. So many of them have planted on fresh plowing, but without putting corn in the tractor tracks.

In this case, there may be some other problems--but not enough to rule out the idea.

The biggest problem is that with corn outside the wheel tracks, the situation may be reversed--with weed seeds germinating better than the corn. This might mean as much cultivation during the growing season as if regular methods had been used.

Blake and Overdahl expect wheel-track planting to be made easier by new equipment now under development. Some tractors with special conversion features are already available. But farmers can also modify their present equipment without much difficulty.

Many farmers feel that wheel-track planting works only on spring plowed land. Yet, soils researchers have shown that it worked well on fall plowing in research at the Morris and Waseca experiment stations. But it is true that fall plowed land needs to be worked once before planting to control weeds.

Here's a tip for fall plowing. Some farmers have simply put the front-mounted cultivator on the tractor at planting time. Then the cultivator digs up the soil ahead of the planter just enough to control weeds and make planting easier. Blake and Overdahl say it's a good idea to try.

Eventually, Blake and Overdahl expect still another corn planting procedure to be prefected for on-the-farm use--the "Plow-plant" system. This involves attaching the planter to the same tractor pulling the plow. Then you plow and plant all in one operation.

Wheel-track planting, then, is probably a method that will later give way to the plow-plant way--which would be easier, more effective, and the ultimate in minimum tillage.

PLANT FOOD USE OUTRUNS REPLACING THROUGH FERTILIZER

Minnesota is far from having a "balanced budget" where plant food use is concerned.

Farmers aren't putting as much fertilizer plant food back in the soil as their crops are taking out.

A pair of extension men at the University of Minnesota estimate that in 1957, for example, 238,000 tons of potash were removed in the harvest of hay and major grain crops. Only a small fraction of this total removed in grain was returned in manure and farmers returned only 52,500 tons of potash in fertilizer form.

That left a "potash deficit" of near 185,500 tons for that year. The deficit was about the same for nitrogen, but only a third as great for phosphate.

Soils specialist Merle Halverson and economist Paul Hasbargen made the estimates. Their "balance sheet," they say, shows room for a good deal more increase in fertilizer use in Minnesota.

Gopher state farmers are stepping up fertilizer use, but not as fast as some other Midwestern states.

Since 1951, total cost per pound of plant nutrients has gone down 8 percent, Halverson and Hasbargen say. At the same time, fertilizer and lime purchases increased from 2.3 percent to almost 5 percent of the total farm operating expenses in Minnesota.

By comparison, fertilizer accounts for 7 percent of farm costs in Wisconsin, 8.7 percent in Illinois and 12.8 percent in Indiana.

State Department of Agriculture figures show that total fertilizer use in Minnesota jumped 120 percent from 1951-58, based on pounds of total material. If you figure actual plant nutrients, the increase was 178 percent.

Farmers are buying more nitrogen and potash, in comparison to phosphate. And well they should, when you look at the "fertilizer deficit" figures, the specialists say. The average ton of actual plant food in 1958 contained 15 percent more nitrogen than in 1951.

PROPER FERTILIZING KEEPS ALFALFA IN LONG STANDS

It's no trick to keep good alfalfa stands on those rolling hills for 8 or 9 years.

In University of Minnesota trials, alfalfa stands 8 or 9 years old are still producing up to 3 and 4 tons of forage per acre--where the right kind of fertilizing and management plan is being followed.

But with haphazard managing, the fields may be taken over by grass, J. M. MacGregor learned in plots at the Rosemount Agricultural Experiment station.

MacGregor found that potash, as well as phosphorus, is a must on long alfalfa stands. The most productive alfalfa plots after the first few years were ones receiving plenty of both nutrients.

Annual topdressing was also important, and better than putting fertilizer on the alfalfa every other year. For the 8-year period, it cost $30 more to apply 200 pounds of 0-20-20

annually than every second year, but the annual topdressing also meant an extra half ton of hay per acre each year.

However, topdressing every second year was much better than not at all.

Starter fertilizer helped too. Where researchers applied a starter like 300 pounds of 0-20-20 the year before seeding and followed up with annual topdressings, alfalfa went 3.5 tons more per acre over the 8 years than with topdressing alone.

Fall topdressing brought results about the same as spring topdressing.

Based on these tests, 300 pounds was a satisfactory application rate for the starter fertilizer.

Applying nitrogen fertilizer was no help. Nor was there any benefit in these tests from trace elements, like copper, boron, zinc, manganese or iron.

SOILS MEN STUDY LIMING RATES

Lime can definitely boost yields of corn, oats and alfalfa.

That was the conclusion from a 1959 study at the University of Minnesota's Rosemount Agricultural Experiment station.

A. C. Caldwell found that with corn, the most practical liming rates were 3 and 6 tons of lime per acre. Higher rates did not bring yields greater than the 6-ton application.

On oats, 6 tons of lime increased yields by 9 bushels per acre. Three tons, however, did not raise oats yields enough to be considered significant.

On alfalfa, 3 tons lime raised forage yields by 1.36 tons per acre, and 6 tons brought a 1.9 ton increase. Again, higher liming rates were no further help.

Soybean yields in 1959 were not improved by lime.

CHELATE COMPOUNDS STILL PROBABLY BEST ANSWER TO IRON DEFICIENCY

Despite their cost, iron chelates (KEYlates) are still probably the best answer to iron-deficiency chlorosis in soybeans.

R. G. Burau said that other cheaper compounds developed from Minnesota peat deposits don't seem to solve the chlorosis problem.

Chlorosis occurs in many high-lime soils of western and northwestern Minnesota. The lime ties up the soil iron, keeping it in a chemical form which plants can't use. As a result, plants turn yellow and may go down in yield or even die.

Chelates are compounds which hold iron in a form available to plants. Minnesota trials in past years have shown that applying a pound of chelated iron per acre would correct the yellowing from chlorosis and therefore prevent the yield loss.

The problem, though, has been cost. Chelate treatments might cost up to $20 per acre.

Burau said he recently compared two different chelates with humates--iron compounds from peat--as treatments for chlorosis. He used soil from areas where chlorosis is a problem and used radioactive "tagged" iron in all compounds so he could check its uptake in soybean plants.

If the humates worked, they would provide a cheaper source of iron. However, the chelates resulted in much more iron uptake by the soybeans than the humates and therefore meant better recovery from chlorosis.

Burau suggested that it might still be possible to develop chelate treatments which would do the job with less expense. For example, further research may show that localized low-rate application of chelates may be enough to carry soybeans through the spring growth period when chlorosis is the greatest problem.

PLOWING MAYBE NOT NEEDED FOR CORN ON STEEP LAND

Plowing may some day be discarded entirely for corn fields on sidehills.

Instead, farmers may save more rainfall and lose less soil to erosion by preparing the corn seedbed with a field cultivator.

University of Minnesota soils researcher J. M. MacGregor says tilling by deep cultivation could be another form of "minimum tillage," an increasingly familiar expression among farmers.

Already, many corn growers have eliminated disking and dragging and instead plant corn in wheel tracks directly on fresh plowing. The next move may be to quit plowing itself--at least on steep land.

MacGregor made some tillage studies last summer on an 8 percent slope at the Rosemount Agricultural Experiment station. One group of plots was plowed the fall before, according to the conventional practice on that particular soil. Other plots were tilled 6 to 7 inches deep with a heavy field cultivator.

The plots were set up with equipment to check accurately on water runoff and soil loss.

The plowed plots lost 19.2 percent of the total precipitation through runoff, compared to 17.2 percent for the tilled plots. Even more important was the difference in soil loss--2.37 tons per acre for plowed fields and only 1.29 tons on fields deep-tilled only.

Yields from the two tillage operations were about the same. The average was about 120 bushels per acre in each case.

The studies will be repeated on continuous corn plots, but MacGregor says deep tillage as

a replacement for plowing is already promising for sidehill fields. His findings are similar to those from studies conducted for several years at the U. S. Department of Agriculture research station at LaCrosse, Wisconsin.

FERTILIZER ADDITIVES SELDOM NEEDED

Can you afford to pay more for fertilizer containing trace minerals, bacteria or organic matter?

Curtis Overdahl, extension soils specialist at the University of Minnesota, has this to say about it.

Except for peat and sandy areas, or a few other isolated areas, soils in Minnesota are seldom short on trace elements such as iron, zinc or copper.

For example, where soil is short on iron, research shows a special kind needs to be added. Most iron-containing compounds won't do the job.

Adding microorganisms to soil isn't necessary, Overdahl says. Few soils are so low in organisms that they can't multiply rapidly when soil conditions favor their growth. And favorable conditions mean high organic matter levels--like you get from turning under sod, crop residue or manure.

Organic fertilizers pay only when price per ton is in line with other means of raising organic matter levels. Many such materials are similar--on a dry matter basis--to manure. Since manure is about 80 percent water, you can figure that 5 tons of wet manure equal a ton of dry organic fertilizer.

Wet manure is worth up to $3 per ton. So 5 tons could be worth around $15, which may be a reasonable value per ton for many organic fertilizers.

Overdahl warns farmers to be wary of striking claims for new materials. If you're in doubt, check with the county agent, vocational agriculture teacher, SCS worker, or other farm leader.

Remember, price per ton isn't always a good comparison. More important is actual nutrient content.

NITROGEN FERTILIZER AFFECTS PHOSPHATE UPTAKE

Corn plants take up fertilizer phosphorus more rapidly when the fertilizer also contains nitrogen in ammonium form.

Soils scientist A. C. Caldwell said the principle holds true both when ammonium compounds and superphosphate are mixed together and when some nitrogen is chemically combined with the phosphorus, as in ammonium phosphate.

He emphasized, however, that applying the two plant nutrients at the same time but separately won't affect phosphate usage.

Caldwell and his co-workers had mixed ammonium nitrate with superphosphate and applied the combined fertilizer as a starter on one set of corn plots at planting time. On another set of plots, they applied the superphosphate and ammonium compounds separately --one on one side of the plant and one on the other.

In every case, the phosphate was radioactive, so the researchers could check uptake in the corn plant with a Geiger counter. In early growth, both where the two compounds were mixed together and where ammonium phosphate was used, about 60 percent of the phosphorus in the plant came from the fertilizer.

Where the two compounds had been applied separately, the fertilizer accounted for less than 25 percent of the phosphorus in the corn plant.

The principle also held true with ammonium sulfate and ammonium chloride, both affected phosphate uptake only when the two compounds were mixed. However, nitrogen in the nitrate form--calcium nitrate and sodium nitrate--did not increase phosphorus absorption even when mixed.

Just what caused the effect on phosphate uptake isn't entirely known. But Caldwell said it was more likely a result of chemical interaction between nitrogen and phosphorus, rather than physiological effects of nitrogen on the plant.

EXCESS COMPACTION LOWERS CROP YIELDS

How overuse of heavy field machinery can pack the soil and lower crop yields was reported by George Blake of the soils department. He said that experimentally packing the soil surface in recent field trials lowered potato yields 54 percent.

Packing reduced wheat and sugar beet yields 13 percent, and corn 7.5 percent.

Where both surface and the plow bottom layer were packed, corn yields went down 14.5 percent.

Also, Blake said, packing tended to harm crop quality. He found twice as many crooked, misshapen beets in fields with a compacted soil surface. Potato tubers had lower specific gravity--and therefore lower cooking quality.

In two years of these tests, Blake packed the soil surface with a heavily loaded truck, and packed in the bottom of the plow furrow a special weighted wheel. The resulting compaction was similar to that which occurs from excessive use of field machinery; compacted soils had less air space and were harder to penetrate.

The results, he said, produce further evidence of the value of minimum tillage--working the soil as little as possible.

Many farmers have already accepted the idea, particularly in corn production. Thousands in Minnesota nowadays plant corn in wheel tracks on soil which has been plowed but tilled very little or not at all otherwise.

CHISEL PLOW REPLACES MOLDBOARD TYPE ON WESTERN MINN. FARM

MADISON, MINN.--Armand Fernholz hasn't turned a furrow with a moldboard plow during his past 18 years of farming.

Yet, his 80 acres of corn produce yields above average for this area and his other crops do equally well.

Fernholz uses a chisel plow, a pull-type unit with nine or ten heavy steel teeth, spaced a foot apart. The teeth dig about 7 inches deep, but do not turn the soil over. The machine closely resembles what many farmers call a field digger.

Chisel plows are widely used by grain farmers farther north, but Fernholz is one of few who uses such an implement for corn and other crops. He is thoroughly pleased with the machine and would like to see other farmers give it a try. He explains why:

"It saves moisture. Instead of turning under all the organic matter, the chisel plow leaves the material on top as a mulch, which helps keep the soil from drying out.

"You don't get as much compaction, the soil stays loose and it soaks up moisture better during a rain." He finds other advantages, too. He no longer has dead furrows or back furrows in his fields. There are no poorly-tilled "headlands" along the edges. Plow scouring problems are over. And he says the "plow sole" --a hardpan that used to exist 7-10 inches under the soil surface--has disappeared.

Yields haven't suffered. Fernholz says that last year--a severe drouth season in this area--his corn averaged around 70 bushels per acre. On an Extra Yield fertilizer demonstration plot, set up in cooperation with county agent George Gehant and assistant agent Bob Leary, the corn yielded 109 bushels per acre.

Wheat on the Fernholz farm went 47 bushels per acre in 1958. Alfalfa does well, too. And in a new venture this year, the family is raising a fine potato crop--also on land tilled with the chisel plow.

In effect, Fernholz use of the chisel plow is a form of minimum tillage. To many farmers, minimum tillage means plowing the usual way, but doing less disking and dragging.

Fernholz eliminates the moldboard plow entirely. He prefers to chisel plow the field once or twice in the fall. Then in spring he hitches a drag behind the disk, goes over the field once again and plants the crop.

Normally, corn on this farm follows alfalfa. But is there a problem from stalks where corn follows corn? Not at all. Fernholz uses a chopper on the stalks and the result is a nice, moisture-saving mulch which he feels is better left on top than turned under.

He first used the chisel plow on a trial basis in 1943; a local dealer had one and "doubted if anyone would want to buy it." But Ferhnholz found it worked so well on 43 acres that he's used it on all 219 acres of his cropland since.

Based on this experience, Armand's brother Pete started using a chisel plow 11 years ago and a third brother, Jerry, started in 1957. Now the three brothers own two chisel plows jointly, in addition to a corn picker, field chopper and blower, a combine and other machinery.

Each chisel plow requires at least a 3-plow tractor. "It really pulled hard the first few years until we got the ground loosened up," Fernholz says. "But now it goes much easier."

FERTILIZER AFFECTS CORN ROOT GROWTH

How you fertilized your corn--in kind and amount of fertilizer and where you placed it--will have a lot to do with how the roots grew.

And how good a root system the corn has may determine whether the corn lodges or is able to seek out nutrients and moisture in a dry year.

Paul Burson, University of Minnesota soils researcher, last year tried different fertilizer treatments on corn before or at planting time, then checked the root development in August.

If the roots grew a heavy mass of fibers in a banded area, he called it an "intensive" system. If the roots spread out over a wide area, he called the system "extensive." Some root systems were both, depending on how fertilizer was applied.

The first thing he found was that applying up to 600 pounds of 8-24-22 per acre, in a band application 2 inches to the side and 2 inches below the seed as a starter did not injure corn germination and stand.

He also found that using up to 120 pounds nitrogen per acre in the starter stimulated an intensive growth of roots. And root growth was much greater when he applied a high amount of starter nitrogen in relation to phosphate, compared to the other way around.

For example, Burson found an intensive mass of fibrous roots where he applied 3 pounds of nitrogen as starter for every pound of phosphate. In contrast, he found limited root fibers in the fertilizer band, but extensive growth farther away when the starter ratio was reversed and the nitrogen was applied later as sidedressing.

Where the roots showed extensive growth, corn lodging was never above 26 percent of all

plants. Those which were intensive had as much as 52 percent lodging.

This was probably due to a lack of proper fertilizer balance in the starter band, because no potash was included in the starter. Nitrogen and phosphate tend to control corn root development more than any other combination of fertilizer nutrients.

College of Veterinary Medicine...

"DISEASE-FREE" BABY PIG TECHNIQUE

Minnesota hog producers will probably hear more and more about SPF (specific pathogen-free) hogs in the future.

SPF pigs are the result of a new technique in swine disease control. The pigs are taken from their dams a couple of days before normal farrowing time by hysterectomy, and are raised under disease-free conditions for the first month.

The idea is to then put them on farms which have been cleared of all hogs for at least a month, and thereby "break the chain" in either or both of two serious diseases--virus pneumonia and atrophic rhinitis. It's possible other diseases may be affected, too.

According to Raymond B. Solac, extension veterinarian at the University of Minnesota, infection from both pneumonia and rhinitis apparently is passed from the mother pig to the young through her breath shortly after birth. Under normal farrowing conditions, a sow infected with rhinitis is almost certain to infect the baby pigs.

However, when pigs are removed by hysterectomy, infection is eliminated, since the young are kept free from the air the sow exhales.

SPF hogs are sometimes called "disease free." That term is a bit misleading, Solac says, since many ailments are not affected and evidence is unclear on many, except for pneumonia and rhinitis.

Here's how a hog producer might use the SPF technique. Suppose his herd has a long history of atrophic rhinitis, he wants to get rid of it, but doesn't want to lose the benefit of his breeding stock. First, he selects his best sows, has them bred, and about 2-4 days before farrowing time sends them to the laboratory which performs the hysterectomy. Five laboratories have already been established in the state.

The laboratory men take the sows to a local slaughter house, and surgically remove the complete uterus. The sow is slaughtered for food.

The baby pigs are taken from the uterus and are raised in incubators for a month, receiving a sterile ration. At about a week of age, they start getting regular feed and are adapted to ordinary outside conditions.

At four weeks of age, the pigs are vaccinated against cholera and are taken by the farmer to a place which has been cleared of all hogs for at least a month. The pigs are then raised as breeding stock, and are kept entirely free from pigs not born by this method. All replacements, gilts or boars must also come from pig laboratories or other SPF herds, to avoid re-introducing virus pneumonia or atrophic rhinitis.

The hysterectomy technique was developed by George Young, formerly a veterinary physiologist at the University's Hormel Institute and now veterinary division head at the University of Nebraska. The technique is controlled by a University of Minnesota patent, and all laboratories performing it are licensed.

Research already conducted shows that SPF swine herds can be kept free of pneumonia or rhinitis for at least three years--and possibly indefinitely.

However, Solac points out some limitations. SPF hogs are no better than their inherited characteristics. The hysterectomy technique can't replace a good breeding program. Daily gains, feed efficiency, and carcass quality depend primarily on inheritance and general management during the growing period.

Naturally, SPF hog production will face some problems. One will be in developing and maintaining SPF breeding herds of superior performance. Another will be setting up a system for health and performance certification of SPF swine.

Currently, representatives of at least five hog breeds are taking part in the SPF program, along with commercial cross-bred herds.

Solac advises producers considering SPF hogs to get advice from their veterinarians before starting the program. And if they choose the program, they will need continuing advice on keeping the herd free from disease.

EFFECTS OF GAMMA RADIATION ON BURROS

The effect of gamma radiation on the central nervous system of burros is being studied by researchers in the University of Minnesota's College of Veterinary Medicine.

Burros are used in this research because their total mass is about the same as a man. "Mass" refers to the total amount of body material. These burros average about 250-300 pounds each, which is similar in general size to humans.

Mass is important in determining radiation effects. Whether radiation will affect structures deep within the body often depends to a great extent on the animal's size. In larger animals, surface mass absorbs many types of radiation.

Also, the anatomical arrangement of the central nervous system and brain of the burro makes it possible to study local irradiation of these tissues.

Five burros were subjected to 1,000 roentgens and six were irradiated at the 400-roentgen level in the study. In each case, the radiation was aimed at the brain region.

The 1,000-roentgen level killed all five burros, within 4 and 24 1/2 hours after irradiation.

This dosage of radiation had several effects. The burros before death all showed a change in rate of heart beat. Circulating blood showed a drop in white blood cells.

However, the radiation damage was apparently confined to the brain area itself. The researchers found no serious lesions in tissue sections from parts of the body not in the radiation field.

All burros receiving the 400-roentgen dose survived. They showed the same type of neurological damage as animals receiving the heavier dose, but the damage wasn't as pronounced. Similarly, those irradiated with 400 roentgens also showed a drop in white blood cells, although the drop again wasn't as pronounced as in those getting the higher level.

When the scientists compared the burros irradiated at the lower level with burros receiving no radiation, they found psychological differences. The radiated burros reacted differently to tinkling bells and other stimuli.

The tests conducted so far are only preliminary. Further research will be aimed at determining effect of several different levels of radiation and what other effects each level will have on the animal.

The studies are conducted jointly by the College of Veterinary Medicine and the College of Medical Sciences, using the gamma irradiation facility on the Minneapolis campus. The burros are housed in accordance with rules for experimental animal care established by the American Medical association.

CAUTION URGED ON CHEMICALS FOR MILK COWS

If you're using antibiotic treatment for mastitis follow the label instructions to the letter. Same thing applies to any other drugs, or for feed from fields sprayed with insecticides.

It's a matter of protecting milk quality, according to Raymond B. Solac, extension veterinarian at the University of Minnesota

Chemicals are helpful if used properly, he points out. But if misused, some of the chemicals can show up in milk. For example, milk from a cow whose udder was treated the same day with antibiotics will contain some of the antibiotic.

Chemicals in milk are "adulterants" and pose a serious public health problem. State and federal laws do not allow milk containing adulterants to be sold. Inspectors for the U. S. Food and Drug Administration and for the state and certain local governments are testing for adulterants in milk.

Milk containing adulterants--no matter how little--is subject to seizure. Offenders may face legal action.

Solac urges farmers to do everything possible to produce high quality milk. Concentrate on good management. For antibiotics, he gives this advice:

. Treat cows only when a diagnosis shows antibiotics are needed. They should be used only as part of a preventive program set up on advice from your veterinarian.

. Do not market milk from cows for the first 72 hours or 6 milkings after giving the last dose of antibiotics for mastitis control. Follow all instructions and warnings on labels of these materials.

Also, use only insecticides approved for use on milk cows to control flies, lice and other pests. Do not use any systemic insecticides on milk cows, such as those for grub control. Systemics are only for beef cattle and young heifers--and even then the labels give you some precautions to follow.

Also, don't give cattle hay or feed that was sprayed or dusted with the incorrect insecticide or at the wrong time.

VETERINARY EXPERT LISTS HINTS ON TURKEY VACCINATION

Vaccination is one of the major guardians of the $70 million turkey industry in Minnesota.

But vaccination at best is a supplement for good management and sanitation, says University of Minnesota veterinary scientist, Dr. C. T. Larsen.

The first step is to keep facilities and buildings clean and free from contagion. Next Larsen advises tailoring the vaccination program to the area. In Minnesota, the three worst diseases that we should vaccinate for are Erysipelas, Fowl pox and Newcastle disease. All can be real troublemakers.

Erysipelas--the same organism which is involved in swine and sheep--usually hits turkeys between 4 and 7 months old, often in the fall. As the disease-causing organism commonly enters through breaks in the skin, males are more prone to become infected, due to fighting. The material used for immunizing turkeys against this disease is a killed product and won't spread the malady.

On farms with a history of erysipelas, breeder flocks should be vaccinated before the birds begin laying. Males may need revaccination during the breeding season if erysipelas seems to be developing. One vaccination usually carries hens through a laying period.

Fowl pox calls for a live virus vaccine, which could be a source of infection to other birds near by. Therefore, it should be used

only where fowl pox is definitely a problem. Vaccination is usually done twice, once when turkeys go to range and once before production.

Two cautions with fowl pox vaccine: Birds should be vaccinated at least 8 weeks before marketing, because it usually takes 4 to 6 weeks for the reaction to disappear. Also, the disease may be transmitted during the reaction period.

For Newcastle, several vaccines may be used. The disease isn't too common in Minnesota, so Dr. Larsen says the killed product is best in this state. It can be used on poults of any age and won't spread the disease. Broiler-type birds should be vaccinated at 2-3 weeks of age and heavier types at 6-8 weeks.