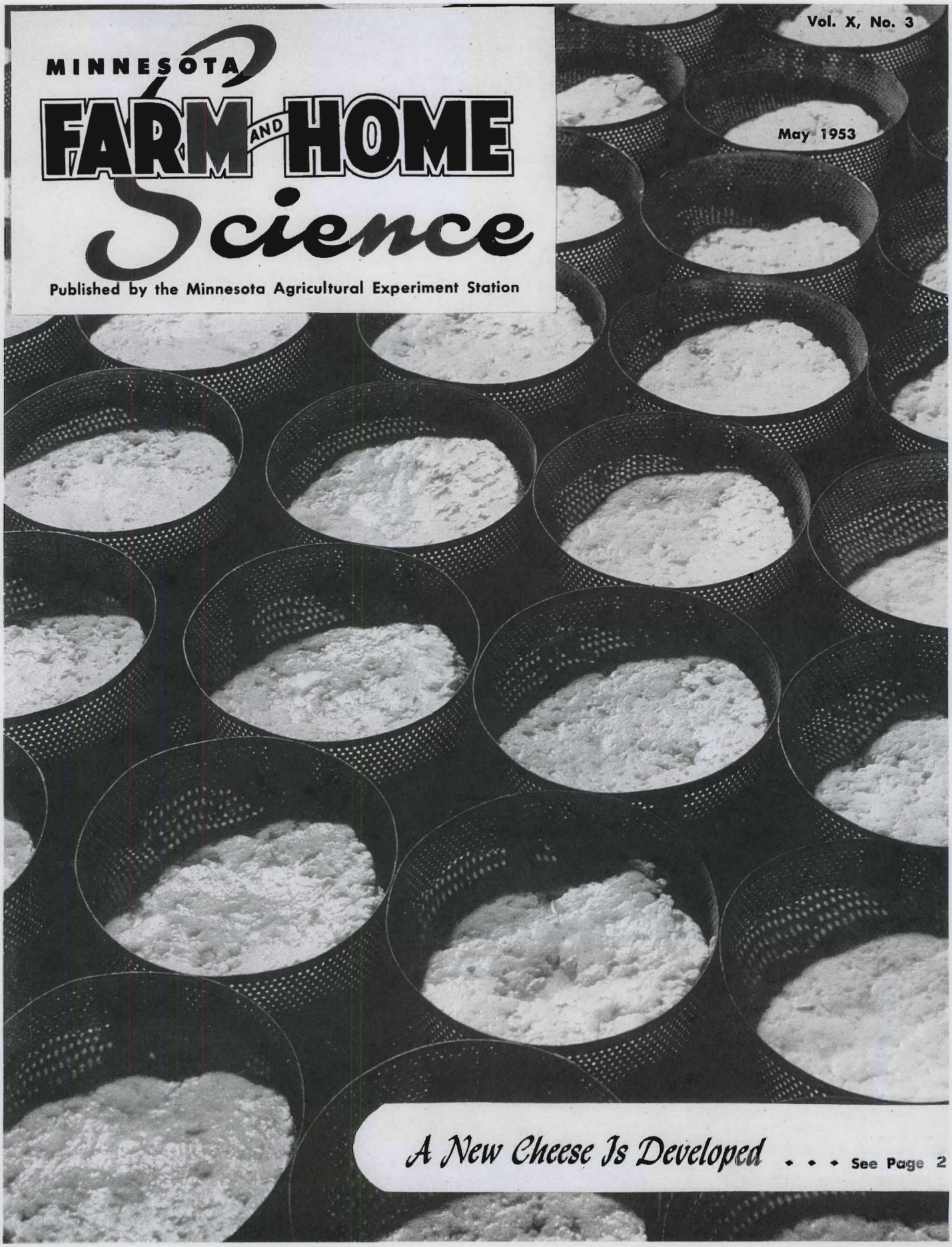
Vol. X, No. 3

May 1953

MINNESOTA FARM AND HOME Science

Published by the Minnesota Agricultural Experiment Station



A New Cheese Is Developed

• • • See Page 2

MINNESOTA FARM AND HOME Science

Published by the University of Minnesota Agricultural Experiment Station, Institute of Agriculture, St. Paul 1, Minnesota

Director—H. J. Sloan

Editor—Harold B. Swanson

Editorial Committee—Harold B. Swanson, chairman; Ralph Wayne, E. Fred Koller, Paul D. Boyer, Emmett L. Pinnell, Louise A. Stedman, and Gwen H. Haws.

Dean of the Institute of Agriculture—H. Macy

May, 1953

A New Cheese . . .

Those rows of cylinders you see on our cover are another example of how our scientists have developed new uses and new markets for farm products.

Here you see hoops of cheese curd that will become a new white cheese soon to be introduced on the market. This new cheese is known as "Nuworld," and many Minnesota families have tested and tried it on an experimental basis. Now at least one large cheese manufacturer is making this new product on a large scale basis.

The flavor of this new white cheese is somewhat similar to that of "blue cheese" which was developed by our scientists here at the University of Minnesota back in the early thirties. Then our scientists demonstrated that blue cheese could be manufactured on a

(Continued on page 15)

Tasting the Nuworld cheese are left to right: Howard A. Morris, W. B. Combs, and J. J. Jezeski. These three scientists were responsible for Minnesota's part in the development of this new dairy product.

Minnesota's Men of Science

Editor's Note—This is the eleventh in a series of articles introducing scientists on the St. Paul Campus of the University of Minnesota. Here we present H. J. Sloan, director of the Agricultural Experiment Station.

H. J. Sloan, director of the University of Minnesota Agricultural Experiment Station, was a prominent figure in the poultry industry in the state and nation before becoming director on January 1, 1953.

H. J. Sloan

He has been in charge of poultry research and teaching at the University of Minnesota since 1936, when he came to this University from the University of Illinois. From 1936 to 1948 he was head of the poultry section of the Division of Animal and Poultry Husbandry. When Poultry Husbandry become a separate division he became chief of that division.

Dr. Sloan was born in Nauvoo, Illinois, May 28, 1903. He received his Bachelor and Master of Science degrees from the University of Illinois in 1926 and 1927, respectively. In 1929 he received the Doctor of Philosophy degree from Cornell Unversity. In 1944 he engaged in a period of postdoctorate studies at the University of Chicago in certain fields of biochemistry and physiology related to his research projects at the University of Minnesota.

Dr. Sloan has been nationally recognized for his work in poultry husbandry. He is president of the Poultry Science Association. This association is an organization of instructors and research and extension workers in poultry science. He served as first vice president of the association in 1951-52.

Under his direction much outstanding poultry research has been conducted at the University of Minnesota. This includes experiments in the use of distillery by-products for poultry rations, in free-choice feeding, and in hybrid breeding.

Besides being a leader in poultry research Sloan has been active in the promotion of the poultry industry in the state and nation. He served as chairman of the Minnesota Poultry Industry Council since it was started in 1939.

He was president of the Poultry Improvement Board which supervises the national poultry improvement plan in Minnesota. He is a member of the poultry advisory committee of the PMA and has been chairman of the Technical Committee of the Poultry and Egg National Board. This board promotes the consumption of poultry products.

Dr. Sloan is a member of Alpha Zeta, Gamma Sigma Delta, Gamma Alpha, Sigma Xi, Phi Sigma, and Alpha Gamma Rho. He is a member of the American Association for the Advancement of Science, the Poultry Science Association, and the World's Poultry Science Association. He has served as associate editor of the journal *Poultry Science.*

Dr. Sloan has served as collaborator with the United States Regional Poultry Laboratory in East Lansing, Michigan.

In recognition of his services to the turkey industry he was awarded the Ranelius trophy by the Minnesota Turkey Growers Association in 1950.

Popularly known as "Tod," H. J. Sloan is a recognized leader in scientific and poultry circles.

What's Happening to BUTTER AND MARGARINE?

REX W. COX

IS BUTTER losing ground to margarine even in the heart of America's dairyland—Minneapolis and St. Paul?

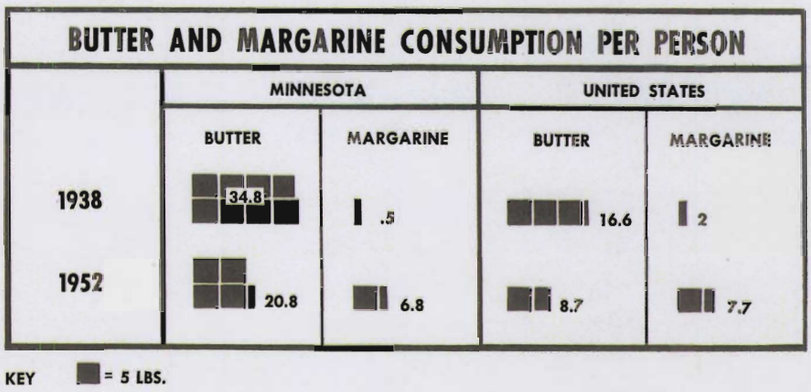
The answer is, yes, for consumption figures in Minneapolis during the past 15 years show a marked decline in the use of butter and a marked increase in the use of margarine.

That shift started during the war. Increased demand for fluid milk and expansion of cheese production for use at home and abroad reduced butter production. Supplies of other fats and oils were short, and rationing limited consumption.

When supplies of fats and oils became ample, housewives shifted to margarine instead of returning to butter. The big spread between the price of margarine and butter encouraged this shift.

As a result many consumers are now unwilling to pay the prices they formerly did for a given amount of butter.

Let's now look at what happened in this shift in Minneapolis.



Families Using Butter and Margarine

Before World War II, consumers greatly preferred butter and strongly resisted margarine. Our studies show practically all Minneapolis families used some butter in 1938; in 1952 90 per cent used some butter. During that time the proportion of families using margarine increased from 4 to 39 per cent.

The changes in the proportions of families using butter only and margarine only are even more striking. For example, in 1938 96 per cent of the families used butter only, while in 1952 only 61 per cent used butter exclusively. The proportion using margarine only increased from one-half of 1 per cent to almost 10 per cent.

A study of 780 families starting housekeeping before World War II provides us additional information. Ninety per cent of these families consumed butter only before the war. About 75 per cent of this latter group continued to use butter only during the war; most of the remaining families shifted to the use of both butter and margarine. Also, about 75 per cent of the families which had continued to use butter only during the war were using butter only in 1952.

Of the families which shifted to the use of both butter and margarine during the war, almost one-half were using both in 1952. However, 40 per cent had shifted back to the use of butter only.

About 71 per cent of the families which started housekeeping during World War II used butter only at that time, and one-half of these were using butter only in 1952. Of the families which used both butter and margarine at the start of housekeeping, almost two-thirds were using both or margarine only in 1952.

Effect of Family Income

More than anything else, family income accounts for the variation in butter and margarine purchases between families. Our 1952 study showed that as income rose the proportion of families using butter increased markedly and those using margarine declined greatly. The proportion of families using both products was about the same for all income groups.

On each income level the consumption of butter per person in families using butter alone was about the same as the consumption of margarine per person in families using margarine alone. Furthermore, the consumption of butter by families using butter only and the consumption of margarine by families using margarine only varied only slightly among income groups.

In families using both butter and margarine, the consumption of butter exceeded that of margarine on each income level. The amount of butter consumed per person did not vary significantly among income groups. However, the amount of margarine consumed by these families decreased sharply from the lowest to the next highest income level but remained practically the same for the upper three income groups.

Considering all groups, families in the upper income averaged 17 per cent more butter and 60 per cent less margarine per consuming unit than families in the lower income group. This variation, however, is in the main due to the variation in the proportion of families using the two products.

Effect of Price

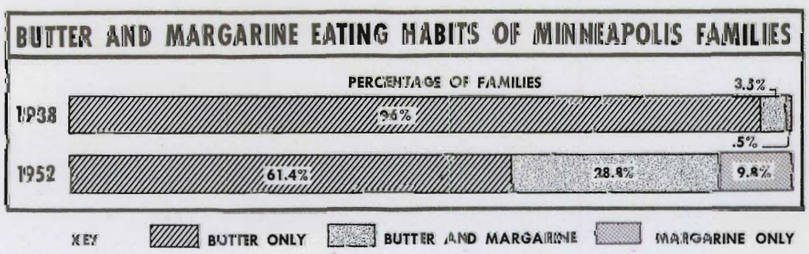
The decision to buy butter only, or both, or margarine only depends in part on family tradition, psychological influences, price differentials, and the price level of butter.

It appears that consumers probably are more aware of the price level of butter than the price differential between butter and margarine.

Families Using Butter Only—Butter prices averaged about 82 cents per

(Continued on page 7)

Rex W. Cox is associate professor of agricultural economics.



Feed Your Corn For Higher Yields . . .

PAUL M. BURSON and C. O. ROST

ARE YOU LOOKING for 100-bushel corn yields? If you are, remember growing corn is a hungry crop. It needs plenty of the right plant food for best growth. If you're hungry and undernourished you cannot work at top efficiency. In the same way your corn cannot produce top yields if it doesn't get plenty of food. Today on many farms yields are low because of low soil fertility and inadequate fertilization.

Soil Fertility Levels Vary

First, let's group Minnesota soils in three productivity classes—high, medium, and low.

High productivity soils now produce 80 to 100 bushels of corn per acre. They do not need a special fertilization program immediately. The soil management and fertilizer program now being followed will take care of them. They are usually well-drained soils of medium to heavy texture, with good tilth.

Medium productivity soils make up the largest acreage in Minnesota. They are now producing 50 to 75 bushels per acre and with proper management and fertilization will give the greatest increase in corn production. These soils are of all textures, poor to fair in structure, but are gradually losing the available and essential plant foods.

Low productivity soils make up a limited acreage in Minnesota. With adequate fertilization they will give large increases, sometimes even doubling yields. This class of soils includes the sandy soils with limited capacity to produce high yields, compared to medium and heavy-textured soils, because of small moisture and natural plant food reserves. These soils need careful attention to management practices, number of plants per acre, and kind and rate of fertilizers used.

Not only do soil conditions vary from farm to farm and from field to field, but also there is a great variation in levels and proportions of different plant nutrients. Corn fields may need one, two, or all three of the basic plant food elements — nitrogen, phosphate, and potash. The proportion in which they are needed will vary, but fertilizer grades are now available to meet most situations.

Paul M. Burson is professor of soils; C. O. Rost is head of the Department of Soils.

Your Prescription for 100-Bushel Corn Crops

Kind of soil	Present productivity	Recommended fertilizer grades based on soil tests		Nitrogen sidedressed according to the number years away from a good legume crop and/or manure	
		Basic soil building treatment	Starter fertilizer	First year away	Second year or more away
		pounds per acre		pounds per acre	
Medium- to heavy-textured soils	High	None	150 to 200	None	150
(Loams, silt loams, silty clay loams)	Medium	300 to 400	150 to 200	100	150 to 200
	Low	400 to 600	200	100 to 150	200
Sandy soils with moisture limitations (Sandy loams, loamy sands, sands)	High	None	150 to 200	None	100
	Medium	300 to 400	150 to 200	100	100 to 150
	Low	300 to 400	200	100	100 to 150

Fertilizer Application Methods Vary

Fertilizer can be applied in many ways, of course. It can be applied:

1. As a **starter fertilizer** in the hill or row with a planter attachment at 150-200 pounds per acre.

2. Broadcast at 300-600 pounds per acre and plowed under or disked into the plowed soil.

In addition, alone or in combination, these two methods may be supplemented by applying a nitrogen fertilizer such as ammonium nitrate at 100 to 200 pounds per acre or the equivalent as a sidedressing to the growing corn around June 20 or at the time of the second cultivation.

You can tell something of the fertility level of your soil in previous years, but a soil test is the best guide as to the kind and amount of fertilizer to use. Your willingness to use enough fertilizer will be one of the determining factors in corn yields—if, of course, there is enough rain during the growing season and other conditions are favorable.

Other Factors Important

Fertilizer alone will not guarantee high yields. A good seedbed, planting on time, using proper planting rate per acre, using an adaptable hybrid, and following proper methods of cultivation are important.

Adaptable hybrids—Use only those hybrids with maturity ratings recommended for your area. It is better to use a hybrid with a shorter maturity rating than one that matures only in the most favorable seasons. There is less difference between yields of short and long maturity hybrids than generally supposed.

Plant population per acre—Adjust the stand to the fertility levels and general condition of your soil.

Fine-textured soils have high water-holding capacities and will support more dense populations. Too few plants per acre will not produce maximum yields. On the other hand, too many plants per acre may lower the yield since moisture supply may become a limiting factor.

Generally stands of 15,000 to 16,000 plants per acre are best for the fine-textured soils such as loams, silt loams, and clay loams. On sandy soils, such as sandy loams and sands, the stand should seldom, if ever, exceed 11,000 plants per acre.

Cultivation's main purpose is to kill weeds. Weeds compete with corn for both plant food and water. But in killing weeds be careful not to damage the corn plants. Corn roots spread rapidly. Anything but shallow cultivation may prune so many roots that corn yields are lowered more than they would be by letting the weeds grow.

Yield and Quality

High yields alone are not the standard for a good corn producer. Big yields of sound, mature corn safe for the crib and for sealing is the goal.

(Continued on page 15)

New Developments in *Oat Diseases*

M. B. MOORE

ALTHOUGH CROWN RUST and stem rust still are the most dangerous diseases of oats, three other diseases have commanded our attention during the past year. The **septoria blight** of oats was probably the most noticeable disease of all among the small grain crops in 1952. At least one of the causes of **red leaf** has been found to be a virus, and an abnormality named **blue dwarf** has been discovered.

Septoria Blight

Septoria blight, which is also known as speckled leaf blotch and black stem, was generally distributed throughout Minnesota in 1952 and much more severe than ever before observed. However, it is not really a new disease since it has been known since 1922 and was quite common in this state in 1947.

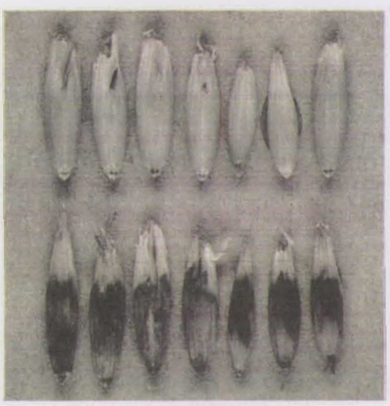
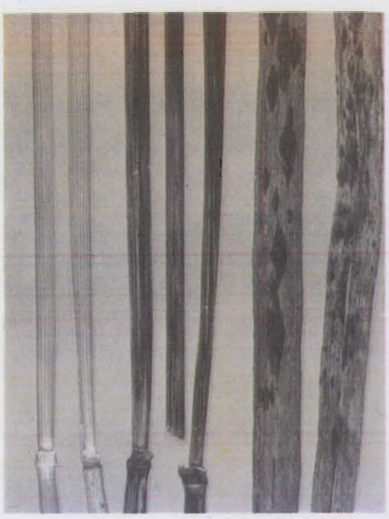


Fig. 1. Septoria blight.
ABOVE—Normal kernels (top row) and blighted kernels.

BELOW—Two normal stems (left) compared with blighted stems (center) and two leaves (right).



It seems probable that the disease is favored by cool moist weather and that the succession of two such seasons in 1951 and 1952 was responsible for its severity in 1952. If 1953 is cool and moist, we can expect this blight again.

Septoria blight attacks first the leaves, causing dirty brown to brownish-black spots with yellowish margins. It later attacks the stems, and finally some of the seeds (figure 1).

Destruction of considerable leaf area is bound to reduce kernel weight and size, and the attack on the stem if severe leads to late lodging at harvest time. Work at Iowa State College indicates that the presence of blackened kernels in the grain probably is no cause for concern whether the crop is to be used for seed or feed.

It appears that the causal fungus overwinters on oat straw, stubble and other debris, and possibly on the seed. Seed treatment with fungicides, while advisable, will not control the blight. Althought none of our present varieties is very resistant, some are more so than others. Limited observations indicate that Clinton, Shelley, Branch, and Clintafe, are somewhat resistant. Bonda, Ajax, James, and Mo. 0-205 are intermediate in reaction, and Mindo, Andrew, and Gopher are susceptible.

Red Leaf

Experiments during the past year and a half at the Minnesota Station have proved that one of the causes of leaf reddening in oats is a virus which is carried from diseased to healthy plants by plant lice. This same virus can also attack barley. Plant lice which had fed on red leaf plants readily transmitted the disease when they were put on healthy plants, while plant lice which had been reared continuously on healthy plants did not transmit the disease.

Plants affected early are usually killed; those attacked later ripen prematurely and produce light seed or only empty hulls. While red leaf has not been of great importance in Minnesota, it has caused considerable concern in states farther south. No practical control is known at this time.

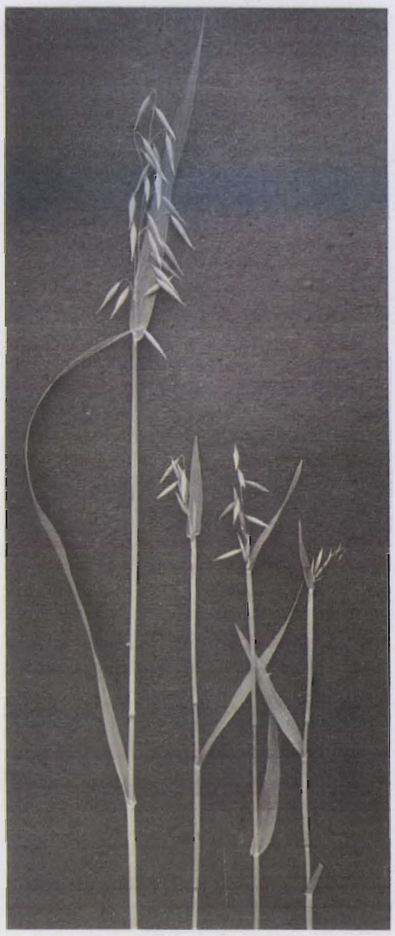


Fig. 2. Blue dwarf. One normal (left) and three dwarfed stems. Note the shortened leaves and blasted heads of the dwarfed plants.

Blue Dwarf

This disease had never been described before 1951 when it was found sparsely distributed over the southern half of Minnesota and in some adjoining states. It was present again in 1952. In the most heavily infected fields up to 2 per cent of the plants has been affected.

Blue dwarfed plants are one-half to two-thirds the height of normal ones, dark blue-green in color, and the leaves, especially the upper ones, are shorter and stiffer than normal giving the whole plant an appearance of unusual sturdiness.

The heads, however, are severely blasted and produce very little seed (figure 2).

The exact cause of blue dwarf is as yet unknown. However there are indications that it is a virus and is transmitted by the feeding of aphids.

M. B. Moore is instructor in plant pathology.

What About *Infectious Bronchitis in Poultry?*

B. S. POMEROY and
REUEL FENSTERMACHER

LAST WINTER, the Minnesota poultry industry suffered one of its worst outbreaks of an acute respiratory infection. Half the state was hard hit and hardly an area completely escaped the effects. In some areas as high as 90 per cent of the farm flocks were reported involved.

Because of the seriousness of the outbreak, the University Animal Diagnostic Laboratory in cooperation with the Minnesota Livestock Sanitary Board, local veterinarians, hatcherymen, and county agricultural agents made a thorough study of the outbreak.

The infection was confined to the counties in the south and central section of the state. More than one third of the poultry in Minnesota or approximately nine million chicks, broilers, and adult layers were involved. Many birds died and egg production fell.

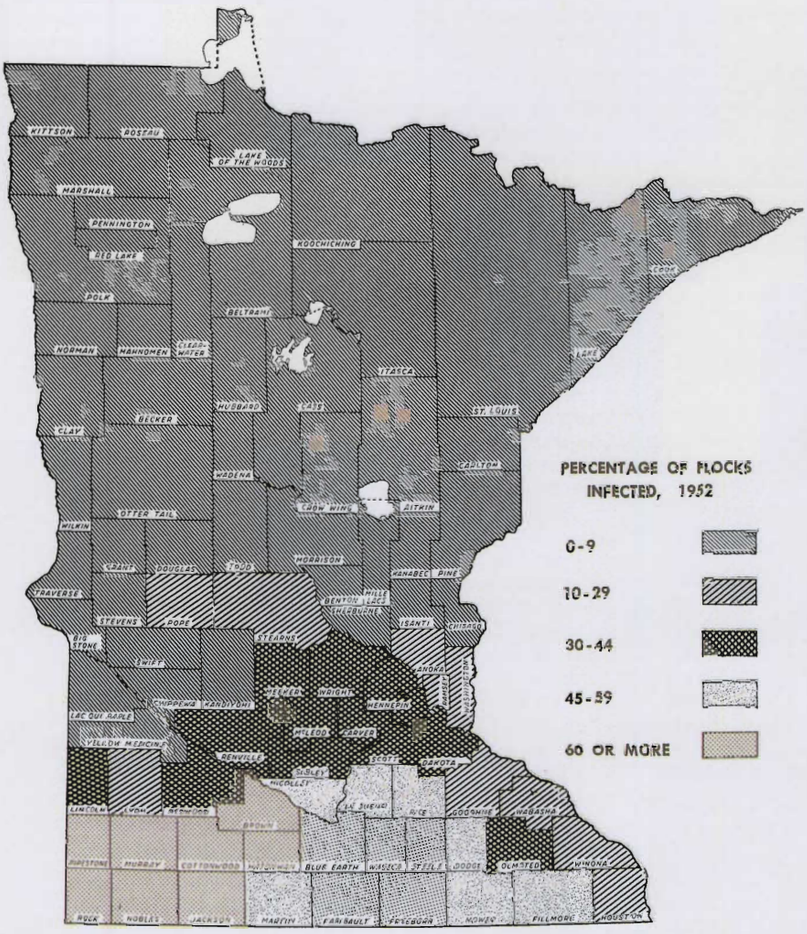
It costs the poultryman $1.00 per bird when his flock is hit while in production. For the state this is a loss of $9,000,000. The effects of this outbreak are still felt because of the permanent damage to egg quality, lowered egg production, hatchability, and curtailed chick replacement purchases this spring.

Cause of Outbreak

Our survey indicated that three diseases—infectious bronchitis, Newcastle disease, and fowl pox—were widespread last fall. Infectious bronchitis was responsible for 90 per cent of the outbreaks and Newcastle disease and fowl pox for the other 10 per cent in areas where a complete study was made.

Infectious bronchitis is not a new disease in Minnesota or the United States. Every year there are scattered outbreaks in young chicks and adult layers, but it never has hit as hard as last fall.

A virus causes infectious bronchitis. It brings about an acute infection of the respiratory system of chickens. The disease spreads rapidly in a flock because of the short incubation period of 18 to 36 hours. Probably no disease of chickens spreads more rapidly.



Is It Newcastle or Infectious Bronchitis?

In Young Chicks—The characteristic symptoms are nasal discharge, gasping, coughing, and depressed appetite. In the respiratory phase, Newcastle disease and infectious bronchitis cannot be told apart either by symptoms or post mortem examination. It can only be determined by laboratory procedures.

After the acute respiratory phase, nervous symptoms usually follow in Newcastle disease but are completely absent in infectious bronchitis. Chicks that recover may be further tested by laboratory procedures to differentiate the two diseases.

In Older Birds—Both infectious bronchitis and Newcastle disease may also strike growing as well as adult chickens. Differentiating between the two on the basis of symptoms becomes even more difficult because in many outbreaks of Newcastle disease in range and adult birds, nervous symptoms may be completely absent. Here's an example of the problem of telling the two apart.

Two well-qualified poultrymen in the same town, but unknown to each other, submitted replies to our survey. Both estimated that 70 per cent of the farm flocks were affected. One felt the entire outbreak was due to Newcastle disease. The other indicated that 90 per cent of the flocks were affected by infectious bronchitis and 10 per cent by Newcastle disease. Our extensive laboratory tests indicated about 95 per cent of the flocks were affected with infectious bronchitis and 5 per cent with Newcastle. Egg production in adult flocks infected with infectious bronchitis and vaccinated for Newcastle disease fell as much as in flocks not vaccinated.

B. S. Pomeroy and Reuel Fenstermacher are professors of veterinary medicine.

Why Is It So Costly?

Death loss from infectious bronchitis in adult birds is not great. The effect on egg production may be moderate to severe, reducing the egg production to 10 or 20 per cent or even to zero within a few days. Hens often lay shell-less, soft-shelled or thin-shelled eggs or rough and mishapen eggs during and for weeks and months after the outbreak. Few flocks ever regain normal production.

In addition, the interior quality of eggs is also permanently damaged. The white of the egg or albumen becomes very thin and watery. The egg buyer may unjustly complain of improper egg handling by the producer.

Ten to 50 per cent of the flock never produce eggs again, and it is almost impossible to cull out the nonlayers by ordinary culling methods. The comb remains large, normal depigmentation of the beak and shank occurs, the pubic bones are widely spread, and the vent appears large, moist, and flaccid as if the bird were laying. Birds may even go on the nest each day as if to lay. The only way to cull the nonlayers is to use trap nests for two to three weeks and cull out all nonlayers. If a nonlayer is autopsied usually the ovary is active, egg yolks are being formed but because of impairment of the oviduct the egg yolk never or rarely ever passes through the oviduct to emerge as an egg.

Preventing Future Mass Outbreaks

★ **Fowl Pox**—In areas that have a problem with fowl pox, follow a yearly vaccination program.

★ **Newcastle Disease**—In areas where Newcastle disease has been a problem, consider a vaccination program. There are three types of Newcastle disease vaccines available; each has certain advantages and disadvantages. See your local veterinarian, hatcheryman, and county agricultural agent for specific information.

★ **Infectious Bronchitis**—Killed infectious bronchitis vaccines have no value and there is no commercial live virus vaccine available at present. There are one or more modified live virus vaccines under field test now. If and how soon these vaccines will be released by the United States government is not known. This leaves these three alternative procedures:

1. Avoid the introduction of living bronchitis vaccines in an area and hope sanitation practices and environmental conditions prevent a reoccurrence of of what happened in 1952.

2. Poultrymen who had trouble with infectious bronchitis may introduce a few recovered adult birds into the pullet replacement flock while they are on range and before they are in production. Here they attempt to introduce the disease when it would not affect egg production. However, adult birds may not be carriers and nothing happens. Then unless the flock is tested following this exposure by laboratory procedures the immunity status of the flock is unknown.

What's more the adult birds may be carriers of other diseases such as fowl cholera, coryza, "air sac infection," and leukosis and thus cause more harm than good in introducing serious infections into the pullet flock.

3. In New England mass vaccination of replacement flocks with virulent infectious bronchitis virus has been followed for several years. The cooperation of 75 per cent or more of the poultrymen is necessary in an area.

The infectious bronchitis virus is introduced into the replacement flocks between 8 to 14 weeks of age while the birds are on range. The flock goes through a natural outbreak with very little loss and no effect on future egg production.

The development of this program will require the approval of the Minnesota Livestock Sanitary Board. It would involve thousands of flocks and millions of birds in the south and central Minnesota counties. The Minnesota Livestock Sanitary Board plans to develop a definite policy concerning infectious bronchitis within the near future so that definite action can be taken before fall by poultrymen.

More About Butter and Margarine . . .

(Continued from page 3)

pound at the time of our study. Thirty per cent of the housewives of families using butter only said they would start buying some margarine if butter rose to $1.00 a pound; 61 per cent said they would never buy margarine.

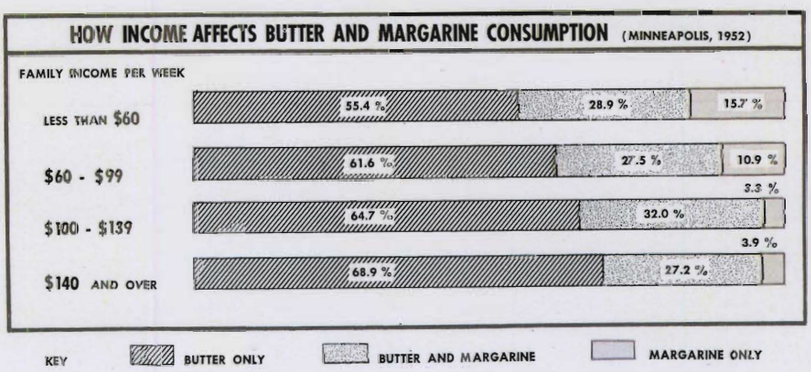
In this same group using butter only now, 10 per cent said they would shift over to margarine completely if butter rose to $1.00 per pound while 80 per cent said they would never shift completely to margarine.

Families Using Both—Almost 50 per cent of the housewives of families using both butter and margarine said that they would purchase butter **only** if the price fell to 60 cents, but 20 per cent said they never would buy butter only. Less than one-half indicated they would buy margarine only if the price of butter advanced to $1.00. About 41 per cent said they never would buy margarine only.

Families Using Margarine Only—Forty per cent of the users of margarine only declared they would buy some butter if the price fell to 60 cents; more than one-third, however, replied they never would buy butter. Only 16 per cent of the housewives in this group said they would change solely to butter if the price declined to 60 cents. Almost 60 per cent declared they never would confine their purchases to butter only.

The resistance to the use of margarine has become less and less. Once margarine has been fitted into the consumption pattern, the chances are about even that its use will continue if butter and margarine price relationships remain about the same.

There are some families, however, whose preference for butter is such that they will continue to buy butter only even though the price of butter is relatively high. There are also families who would not shift back completely from margarine to butter even though the price of butter were to drop sharply. In the case of many families, the decision to buy one or the other product rests largely upon the price level of butter—or the price differential between butter and margarine.



Natural Control of the

Forest Tent Caterpillar

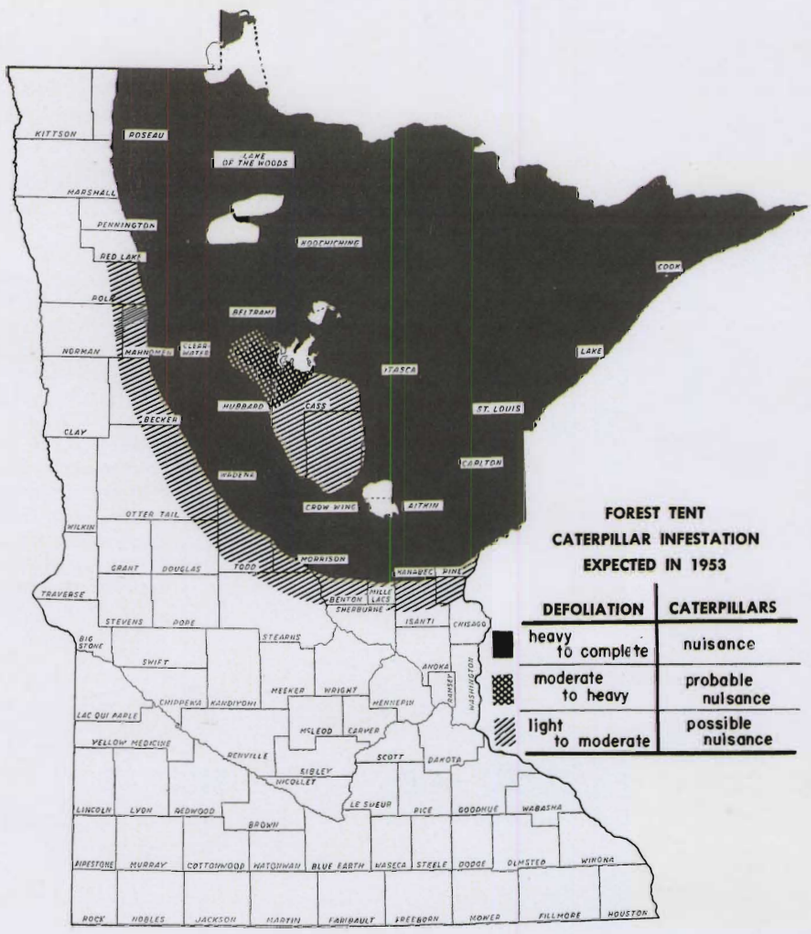
A. C. HODSON

AGAIN IN 1953, Minnesota faces a serious outbreak of the forest tent caterpillar. Chemical control by spraying will protect small resort areas but offers little in control in large areas where spraying would be too expensive. What then is the answer? Is it natural control? Let's look back and see how natural control handled the situation in the past.

In 1938 Minnesota's worst outbreak in history ended abruptly. The summer before hordes of caterpillars swarmed over 3 million acres of our northern forests, completely defoliating most broadleaf trees and shrubs and greatly annoying residents and summer visitors.

The contrast in most of the area in 1938 and over the entire area in 1939 was remarkable. Where caterpillars literally had blackened the trees in 1937, none was seen two years later. This population "crash" left few survivors. For instance, we searched in vain for forest tent caterpillars each year following the "crash" without seeing or receiving a report of a single individual until 1947. However, the current outbreak raging since 1949 shows that there must have been some present during the 10 years between outbreaks.

What stopped the mid-thirties' outbreak? Field records from 1935-1938 show that several natural control agencies—especially unfavorable weather, starvation, and parasitic flies and wasps—were responsible. How they worked will give us a cue of what we can expect now.



Full-grown forest tent caterpillar.

The first wedge was driven into the outbreak in 1936 in the Detroit Lakes region. Daily temperatures over 100° F. during the first week in July wiped out the heavy infestation. The forest tent caterpillar moths were emerging then, and many were killed by the heat without being able to escape from their cocoons. Survivors laid fewer eggs than had been expected, and more than 90 per cent of the eggs laid on the trees were killed.

To the east there was considerable mortality also, but not enough to prevent the infestation from expanding. Along the north shore of Lake Superior there was scarcely any effect because that area escaped the worst of the heat wave.

During 1937, when the greatest amount of damage was done, starvation and heavy parasitism became more common. However, these two natural controls reduced the caterpillar population effectively in only a few local areas where the first signs of heavy defoliation had been discovered early in the outbreak.

Here's What Happened in 1938

Thus, the forecast made in the early spring of 1938 was a gloomy one. Throughout most of northern Minnesota there were more than enough egg masses in trees to justify the prediction of widespread, complete defoliation. Fortunately this dire prediction came true only in the northeastern part of the state, near Lake Superior. Weather and parasites provided effective control over the large central portion of the infested area.

Some of the eggs that had overwintered on the trees were killed during March of 1938 when hatching started prematurely after several days of unseasonably warm weather. Tem-

A. C. Hodson is professor of entomology and economic zoology.

peratures about 70° F. were followed rapidly by a drop to near 0° F. with the result that about one-third of the population was eliminated before the normal hatching period was reached.

Much heavier mortality occurred among young caterpillars during early May after the remaining eggs had hatched. The caterpillars were exposed to rain and freezing weather for about three weeks. More than 80 per cent of the larvae were killed either by direct injury or by starvation after the expanding leaves were frozen. Even though the caterpillar population was severely reduced, this reduction alone would not have been sufficient to end the outbreak.

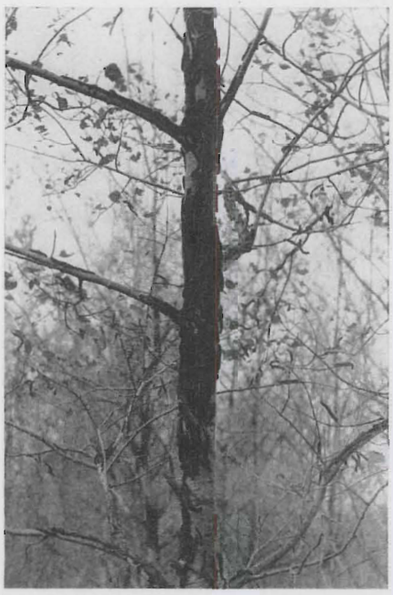
As it happened, parasites attacked the remaining larvae after they had spun their cocoons to such an extent that few were left unaffected. Thus a combination of frost and parasitism struck a blow from which there was no obvious recovery for about 10 years.

Late spring frost did not affect the population significantly along the shore of Lake Superior. In this area insect parasites were principally responsible for terminating the outbreak. Thus, different natural control factors were operating with different degrees of effectiveness at different times and in different places.

What Can We Expect?

Predicting when and how the current outbreak will come to an end is not easy. For instance, a heat wave and late spring frosts, so effective in 1936 and 1938, respectively, are unpredictable far enough in advance. Starvation, which results wherever the number of caterpillars exceeds the food supply, already has been chiefly responsible for local drops in the infestation.

Masses of caterpillars blacken tree trunk.



Our map shows a large "hole" extending from Hubbard County to the southern part of Crow Wing County. Here a high percentage of the caterpillars starved to death in 1952. This map was prepared by the State Entomologist's Office in cooperation with the University of Minnesota, the State Division of Forestry, and the U. S. Forest Service.

Starvation will undoubtedly reduce the immediate threat of damage in other areas in 1953. Unfortunately, population seems to recover rapidly from depletion by starvation. The area designated as "moderate to heavy" on the map is one in which there was heavy mortality from starvation in 1951 followed by light defoliation in 1952. However, the number of egg masses found in the fall of 1952 indicates that a significant increase in the number of caterpillars can be expected in 1953. Apparently, parasite numbers also were reduced in those areas where heavy starvation of caterpillars occurred.

At present, a forecast can be made only with many "ifs and buts." A timely late spring frost could change the entire picture very quickly. In many areas the egg mass survey conducted last fall showed enough egg masses to foretell complete defoliation and extensive mortality among the caterpillars due to starvation. The parasite population is building up in most areas enough to be considered a promising factor of control in 1953, but its actual significance cannot be determined until after moth emergence next July.

Natural control will end this outbreak as it has other similar outbreaks.

Natural control will likely take place before serious or irreparable damage to forests takes place. But can we all wait until it becomes effective? In the meantime, it will be necessary for local residents, resort managers, and summer visitors who own lakeshore property to get immediate relief by spraying with insecticides.

Index Is Now Available

An index for the first nine volumes of *Farm and Home Science* has been compiled and multilithed. It covers the period from October 1943 to May 1952.

If you would like a copy of this index, send your request to the Bulletin Room, University of Minnesota, Institute of Agriculture, St. Paul 1.

Corn Breeders Cooperate

E. L. PINNELL AND E. H. RINKE

If you have been offered seed of a corn hybrid named A.E.S. 610 you probably wondered what the name meant. Both the name A.E.S. and the number 610 mean something. A.E.S. (literally, Agricultural Experiment Station) means that state and USDA corn breeders from the twelve North Central States have cooperated in breeding the hybrid and testing it in several states. The "600 series" number means it is adapted to the general area of southern Minnesota and northern Iowa.

Trials of cooperatively developed corn hybrids are conducted each year in nine maturity zones numbered 100, 200, etc. up through 900. The 100 zone is the short season hybrid area stretching across North Dakota; northern Minnesota; Manitoba, Canada; Wisconsin; and northern Michigan. The 900 zone extends east-west through southern Illinois. Two years of these regional trials are made before a particular hybrid can be approved for an A.E.S. number.

The corn breeders of the North Central Corn Improvement Conference who meet annually to discuss current problems and plan cooperative work devised this plan in 1951 for the following reasons. A regional name for a hybrid (that is, A.E.S.) indicates its wide adaptation better than a state designation such as "Minhybrid" or "Wisconsin" hybrid.

A good share of the hybrids now being developed result from exchange of breeding material and thus a regional name more appropriately indicates the cooperative effort involved. Sometimes two or more breeders in different states came up with the same hybrid combination for release to farmers. Under the cooperative system the combination can be given an A.E.S. designation and thus avoid the former difficulties brought about by the same hybrid being sold under two or more state hybrid names.

The corn breeders in Northeastern and Southern United States have similar plans. Hybrids developed cooperatively in the Northeastern section are given the designation "Eastland" while those hybrids developed in Southern United States by workers in the Southern Corn Conference Group are called "Dixie" hybrids.

These procedures are a natural development of the system of free exchange of ideas and breeding material which has existed among the corn breeding scientists of the United States for many years. They should assure continued success in the development of better hybrids.

THIS NEW PLANT Applies Wood Preservative At Relatively Low Cost . . .

FRANK H. KAUFERT, JOHN R. NEETZEL, and RALPH HOSSFELD

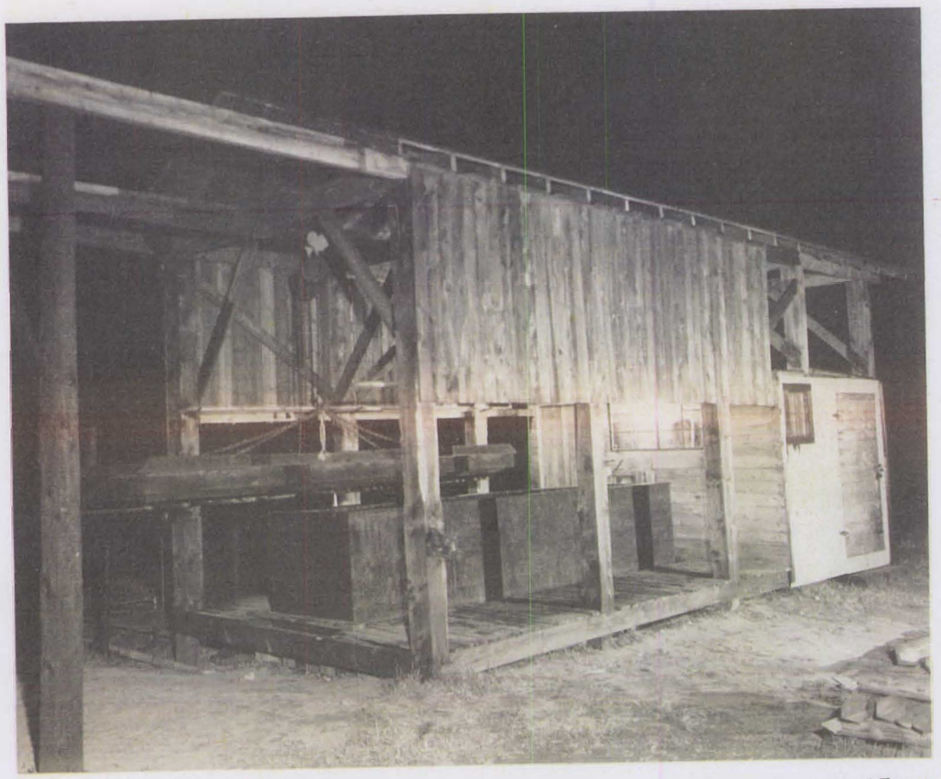


Fig. 1. General view of the vacuum treating plant constructed at the Cloquet Experimental Forest.

A NEW TYPE of plant for applying wood preservatives has been developed which provides a relatively good treatment at a low plant investment.

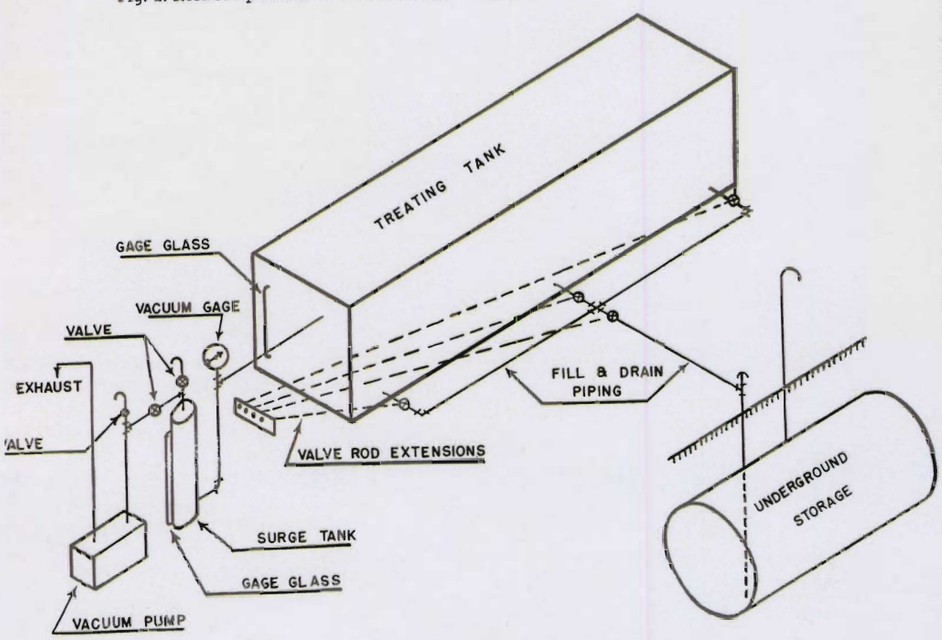
This new type of plant fills a long-felt need for a process that would be less expensive than the processes used by large commercial treating plants and do a better job than the cold-soak process used by some manufacturers of wood products.

The University of Minnesota School of Forestry has been working on this new process since 1947 and now has a pilot plant in operation at the School's Cloquet Experimental Forest. This newly developed plant incorporates the principles of a vacuum process in a relatively inexpensive unit.

A general plan of the plant is shown in accompanying drawings and pictures. The treating tank and cover are of arc-welded 12-gauge steel with interior wood framing. The outside dimensions are 4 feet x 4 feet x 18 feet. The tank will hold 100 3-inch fence posts or 1,000 board feet of lumber. The cover is sealed to the tank by a sponge rubber gasket attached to the contacting flange. Although limited by engineering considerations, change in design and construction would permit some increase in tank size. The electrically driven vacuum pump and the hoist are the only pieces of mechanical operating equipment. The cost of a plant similar to the installation described should not exceed $6,000 at present prices.

For best results wood to be treated should have a moisture content of not over 25 per cent. Operation of the treating plant is simple. A treating cycle consists of: (1) loading the tank and lowering the cover with an overhead chain hoist; (2) drawing the desired vacuum (up to 25 inches of mercury) and holding it for the period necessary to remove air from the wood; (3) while still maintaining the vacuum, allowing the preservation solution to be drawn into the tank from underground storage tanks; (4) releasing the vacuum and if necessary allowing a

Fig. 2. Relative position of different units and piping plan.



Frank H. Kaufert is director, John R. Neetzel is research associate, and Ralph Hossfeld is associate professor of the School of Forestry. Mr. Neetzel is also a forester on the staff of the Lake States Forest Experiment Station, U.S. Forest Service.

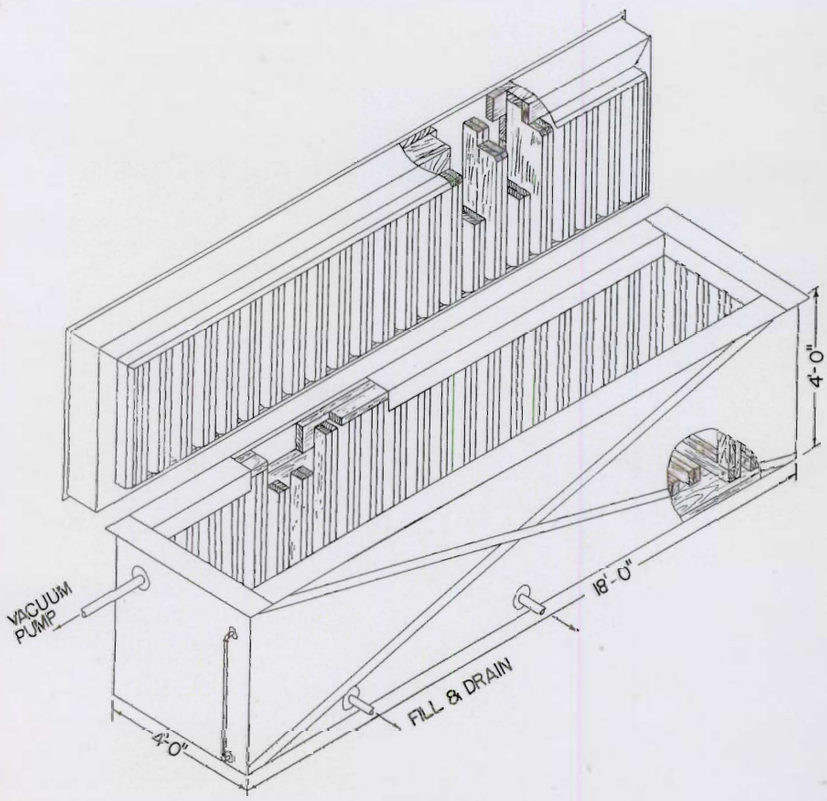


Fig. 3. (above) Drawing of treating tank and cover showing method of framing for interior support.

Fig. 4. (right) Interior of treating tank showing method of hoisting lid.

soaking period; (5) draining the preservative by gravity back to storage; and (6) drawing a final vacuum to remove excess preservative from the treated material. Full sapwood penetration of dry jack pine fence posts has been obtained (figure 5) using a 5 per cent solution of pentachlorophenol in No. 2 fuel oil in less than one hour.

We plan to do more research on this vacuum treating plant, especially in preservation of difficult-to-treat woods, such as tamarack and Douglas fir. However, results obtained to date with pine have far exceeded expectations. Small, low-cost plants of this type should prove of real value in providing preservative treatment for many wood products now used untreated or inadequately treated.

The advantages of a treating plant of this type are: simplicity of construction and operation, low cost, treating plant can be built locally, relatively low fire hazard, and better quality of treatment than obtained by soak and dip treatments.

The most obvious limitations are: the relatively small size of units that can be constructed, quality of treatment that may be obtained with hard-to-treat woods, and the necessity of having material to be treated surface dry and below 25 per cent moisture content.

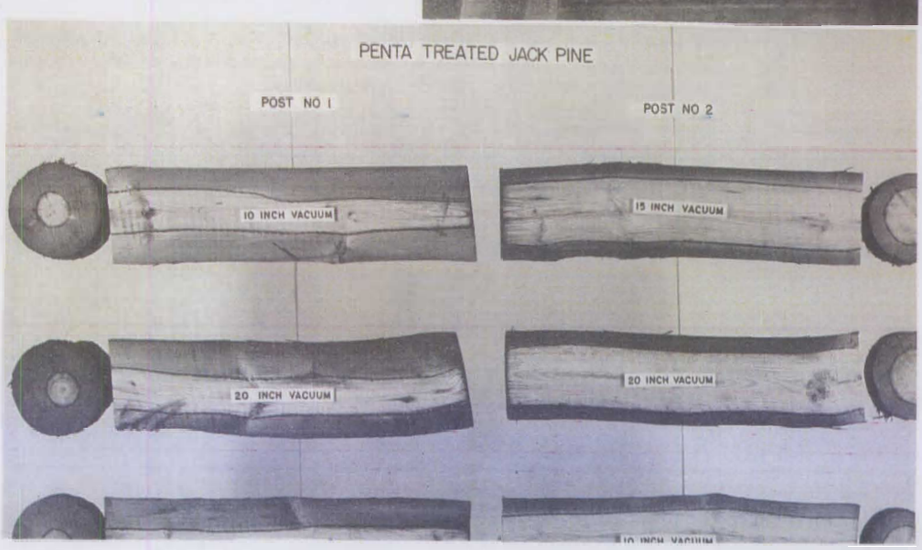


Fig. 5. Sections of two jack pine posts treated with different vacuum combinations.

Prices of Minnesota Farms Reached New High in '52

L. ORLO SORENSON and AUSTIN A. DOWELL

PRICES of farm real estate in Minnesota reached a new high early in 1952. Reports from about 400 Minnesota real estate brokers indicate that the state average in June 1952 was $107 per acre compared with the previous high of $104 per acre in 1920-21.

Only in the southeastern, east central, and west central districts did values in June 1952 fail to top the 1920-21 peak, and in the west central district the difference was negligible.

The violent fluctuations in land prices from before World War I to June 1952 are shown in table 1. Per acre prices for the state more than doubled between 1910-11 and 1920-21, then declined to below the 1910-11 average during the great depression of the 1930's.

With the coming of World War II, land values began to move upward, haltingly, at first, but more rapidly as inflation spread. The rise continued until late 1948 and 1949 when the inflationary forces started to weaken.

Then with the outbreak of war in Korea in June 1950, land prices moved upward rapidly. The increase from March 1950 to March 1951 was twice as large as any year for a decade prior to 1951 and almost twice as large as during the year following.

The increase in land prices from the depression lows to June 1952 varied considerably in different parts of the state. The increase was relatively much greater in the three western districts than in the corresponding three eastern districts. The greatest relative increase occurred in the northwestern district and the least relative increase in the east central district.

L. Orlo Sorenson is research assistant in agricultural economics; Austin A. Dowell is professor of agricultural economics and director of resident instruction and assistant dean, College of Agriculture, Forestry, and Home Economics.

Table 2. Minnesota Farm Real Estate Market: Type of Buyer in 1952 and Number of Sales and Number of Listings by Districts in 1952 Compared with 1951, as Reported by Farm Brokers, June 1, 1952

District	Decline in number of farms sold January 1 to June 1, 1952 compared with same period in 1951	Proportion of brokers reporting indicated change in number of farms listed for sale June 1, 1952, compared with June 1, 1951			Type of buyer of farms sold January 1 to June 1, 1952	
		Increase	No change	Decrease	Farmer	Other
	per cent					
Southeast	38	37	46	17	80	20
Southwest	40	25	47	28	76	24
West central	46	22	56	22	80	20
East central	18	37	41	22	82	18
Northwest	42	18	52	30	86	14
Northeast	9	46	50	4	76	24
State	34	31	48	21	81	19

The Land Market in 1952

Fewer Farms Sold—Minnesota farm real estate brokers reported 34 per cent fewer farms sold in Minnesota during the first five months of 1952 than during the same period in 1951 (table 2). This decrease was fairly uniform in all parts of the state except in the east central and northeastern districts where it amounted to only 18 per cent and 9 per cent, respectively.

More Farms for Sale—More brokers reported an increase in the number of farms listed for sale on June 1, 1952 compared with the same date in 1951 than reported a decrease. About 31 per cent of the brokers reported an increase in listings, 48 per cent no change, and 21 per cent a decrease. However, the actual increase in number of listings on June 1, 1952 over June 1, 1951 may have resulted from fewer sales during the first five months of 1952 rather than from an increased desire by owners to dispose of their properties.

Farmers Doing the Buying—Reports on 1,063 voluntary transfers of Minnesota farms from January 1 to June 1, 1952 indicate that 81 per cent of the buyers were active farmers. Only 19 per cent bought for speculative or other purposes. Although comparable figures are not available for earlier years, the brokers believed that this did not represent an unusual amount of buying by nonfarmers.

Table 1. Average Value per Acre of Farm Real Estate in Minnesota by Districts, for Specified Periods

District	1910-11	1920-21	1934-35	1940	1945	1950	1951	1952*
	dollars per acre							
Southeastern	$58	$141	$52	$59	$79	$109	$125	$131
Southwestern	57	152	58	68	92	141	166	175
West central	39	98	38	36	49	76	89	96
East central	24	68	26	26	35	50	59	58
Northwestern	24	57	22	22	29	46	54	68
Northeastern	11	24	15	24	29	40	46	42
Minnesota	41	104	40	43	58	85	99	107

* June 1952.

What Affected Sales

The cooperating farm real estate brokers suggested several reasons for the decline in activity in the farm land market. The most important factors affecting prospective buyers appeared to be: (1) the poor 1951 corn crop in many areas, (2) an increasing number of prospective buyers who lacked the required down payment, and (3) greater difficulty in getting farm mortgage credit.

Factors tending to hold down sales included: (1) the relatively high returns over a period of years from farm real estate compared with returns from alternative investments, (2) the expectation or fear of continued inflation, and (3) income tax considerations.

Inflationary Pressures Subsiding

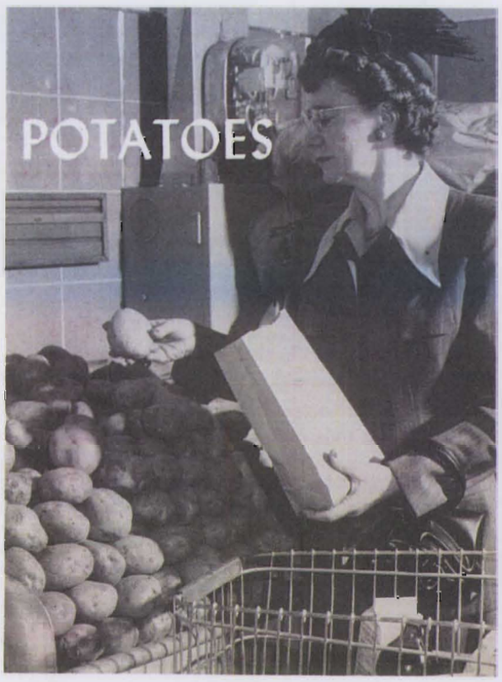
Inflationary pressures arising first out of World War II and then out of the outbreak of war in Korea and the rearmament program appear to be subsiding. Wholesale prices on the average have been relatively stable since January 1, 1951. Prices of many farm commodities have declined, while many farm production expenses, including farm real estate taxes, mortgage credit, and wages to farm labor have increased.

The ratio of prices received to prices paid by farmers declined to 94 in February 1953, after having been above parity most of the time for the past decade.

Farm mortgage credit has tightened up somewhat, as indicated by a gradual rise in the mortgage rate of interest. Brokers report that lenders have become a little more selective in their loans and usually require a larger down payment than formerly. They find that an increasing number of prospective

(Continued on page 15)

What Housewives Want in POTATOES



F. A. KRANTZ

MADAM HOUSEWIFE is the boss when it comes to selling your potatoes. Her likes and dislikes will determine how well your potatoes do on the market.

To discover what she wants in potatoes, we (North Central Region Potato Marketing Technical Committee) made consumer acceptance studies in retail stores in Chicago, St. Louis, and the Twin Cities.

Here's what Madam Housewife showed us:

She wants few defects (less than 5 per cent), an even surface, and reasonable attractiveness in her potatoes.

On the other hand, she isn't too concerned about color (red or white) or shape or whether the potatoes are smooth or russeted.

Acceptance of Defects

Potatoes with no defects and 2 and 5 per cent defects were offered at the same price in each of six retail food stores in the Twin Cities. Sales in per cent of total sales were as follows:

Percentage of defects	Store					
	A	B	C	D	E	F
	percentage of total sales					
0	32.8	33.8	41.0	38.5	32.4	43.3
2	33.2	33.5	39.3	28.0	31.0	35.6
5	34.0	32.7	19.7	33.5	36.3	21.1

Sales in stores *A*, *B*, *D*, and *E* indicate nonselective buying. Apparently in these stores all three lots were equally acceptable to the customers. In stores *C* and *F* housewives apparently were more discriminating and bought more of the lots with the least defects. However, we retested these stores and this time there was no great difference. This led us to conclude that housewives accept some but not too many defects.

When the potatoes with practically no defects were priced four cents per ten pounds higher than the others with minor defects, sales for the no-defect potatoes dropped 10.3 per cent.

Acceptance of Color

We also made three tests in six retail stores in St. Paul on sales of red and white potatoes of equal grade and condition. The results were as follows:

Test number	Color of potatoes			
	Red	Red	White	White
	pounds sold			
1	.....	380	360	.....
2	275	218	255	.....
3	.....	600	780	850

Sales of reds and whites were about equal in test 1. This could mean either that there was about an equal demand for reds and whites or that there was no color preference and buying was nonselective. Sales in tests 2 and 3 indicate that the latter is true. Sales were directly proportional to the number of offerings. This would not have been the case if there had been any selective buying for color.

Surface Appearance

Potatoes rated as having (1) very good appearance and (2) good appearance were sold in three stores in St. Paul in three tests. Customers in test 1 had a choice of very good and good potatoes; in test 2 of one lot of very good and two good; and in test 3 of two lots of very good and one of good. Here's the percentage of each kind customers bought:

Test number	Very good appearance	Very good appearance	Good appearance	Good appearance
	A	A	B	B
	per cent			
1	.....	54.8	45.2	.....
2	.....	38.9	29.2	31.9
3	34.1	37.9	28.0	.....

Test 1 indicates that there was 9.6 per cent of selective buying in favor of the potatoes having the more attractive appearance. If the remaining 90.4 per cent was nonselective buying, then we would expect in tests 2 and 3 the following sales of the lots offered:

Test number	A	A	B	B
	per cent			
2	.....	39.7	30.1	30.1
3	34.9	34.9	30.1	.....

This agrees with the sales actually obtained in tests 2 and 3.

Acceptance of Russeting

To test the acceptance of russeting, we made a two-week test of four different potatoes in four St. Louis retail stores. Three of the potatoes were russets; the other was smooth. Here's what homemakers bought:

Variety	Source	Percentage of sales
Russet Burbank	Idaho	39
Russet Burbank	Wisconsin	23
Russet Sebago	Wisconsin	20
Sebago (smooth)	Wisconsin	18

This study showed 18.7 per cent purposely selected the Russet Burbank from Idaho. The remaining 81.3 per cent appears to be nonselective buying. However, further tests would be necessary to establish this point. The small differences between the three lots from Wisconsin are not significant. This suggests that surface texture (russet or smooth) had little if any influence on sales.

Acceptance of Size

Average sales of small (1⅞"-2¼"), medium (2¼"-3"), and large (3"-4") were respectively 20, 44, and 36 per cent of total sales in the more than 20 retail stores studied in Chicago. These stores gave equal display to the three sizes. Forty per cent of the purchases were by buyers who selected medium and large potatoes in preference to the small size. The remaining 60 per cent may represent sales to buyers who considered small, medium, and large sizes equally acceptable.

Eight per cent of the total sales were to buyers who selected medium over large, and 72 per cent of total sales may represent buyers who considered the medium and large sizes equally acceptable. Tests separating the selective from the nonselective buying for size are needed before an accurate picture of size acceptance can be obtained.

F. A. Krantz is professor of horticulture.

SUNFLOWERS FOR MINNESOTA?

R. G. ROBINSON and O. C. SOINE

FOR MANY YEARS, Mammoth Russian sunflowers in Minnesota gardens have turned their heads and greeted the rising sun. The Northeast Experiment Station at Duluth conducted sunflower trials during the "twenties and thirties" and found them to compare favorably with corn or root crops for silage. However, as early-maturing corn hybrids pushed profitable corn production northward, interest in the "Russian peanut" dwindled.

Recently sunflowers made another bid for favor, this time as an oil seed crop that could be harvested with a combine. Commercial production of seed for edible oil was started in Canada during World War II and in Minnesota in 1947. The acreage in Minnesota has varied from 300 to several thousand acres per year.

Many Potential Uses

Food—Sunflower oil, like soybean oil, is edible and can be used in margarine, cooking oil, salad oil, and other food products. North Dakota Agricultural College found that sunflower oil did not become rancid after long-time storage at room temperatures and also showed no precipitation after long-time refrigeration. These characteristics make it an especially outstanding vegetable oil.

The meal or flour remaining after oil extraction can be added to wheat flour and improves the quality and nutritional value of cakes and other bakery products, according to University of Illinois experiments. Chemical analyses showed that sunflower meal or flour is especially high in the vitamins, niacin and thiamine.

Sunflower seeds can be prepared in various ways as a confection for human consumption.

Livestock Feed—The sunflower meal or flour is a valuable protein supplement for livestock. University of Illinois experiments show that sunflower oil meal compares favorably with soybean oil meal and other protein supplements for poultry and swine.

Bird Feed—Most of Minnesota's 1952 production was sold for bird feed at about six cents per pound, somewhat more than prices received for the 1949-51 crops.

Fuel—Sunflower seed hulls contain practically no oil and are separated from the meats before oil extraction is started. A Canadian cooperative presses these hulls into fuel logs. Other uses for this by-product could no doubt be developed.

R. G. Robinson is assistant professor of agronomy and plant genetics and O. C. Soine is associate professor at the Northwest School and Experiment Station, Crookston.

Comparative Average Seed Yields, Oil Content, and Oil Yields of Sunflowers and Soybeans Grown at Crookston 1948-52, Morris 1948-50, and Southwestern Minnesota, 1948-52

Location	Seed yield		Oil content		Oil yield	
	Sunflower	Soybean	Sunflower	Soybean	Sunflower	Soybean
	pounds per acre		per cent		pounds per acre	
Crookston	1,100	912	30.3	17.9	333	163
Morris	1,252	878	31.0	18.8	400	164
Southwestern Minnesota	1,302	1,485	31.1	18.6	405	276
Average	1,218	1,092	30.8	18.4	379	201

Adapted for Minnesota

Sunflowers performed well in all of our trials in western Minnesota. The seed germinates well and the seedlings grow vigorously. The crop is quite resistant to spring drouth but the leaves wilt badly if drouth occurs in late July or early August when the plants have their full growth.

In order to compare sunflowers and soybeans in oil production per acre, we planted adapted varieties of the two crops side-by-side for five years at Crookston and on farms in southwestern Minnesota and for three years at Morris.

In each of the 13 comparisons, sunflowers produced more oil per acre than did soybeans. In our trials, sunflowers generally ripened earlier than recommended soybean varieties. This is because sunflowers can be planted earlier than soybeans and not because they have a shorter growth period than early soybeans.

Growing the Crop

Sunflowers are usually planted about the same time as corn with a corn planter in rows 40 inches apart. Trials at Crookston and Morris for three years show that Advance sunflowers spaced 6 inches apart in the row yielded a little more than those spaced 12 inches apart. These trials and others conducted by E. D. Putt in Canada suggest that in these widely spaced rows, you should plant seeds from 3 to 6 inches apart to get the best stand of 6 inches or slightly more between plants. About 5 pounds of seed per acre is required. You can reduce an excessively thick

Sunflowers are a prospective new crop for Minnesota.

stand by wise use of the spike tooth harrow.

Data from Crookston indicate that Advance in rows 21 inches apart yielded more than Advance in rows 42 inches apart. For these narrow rows, you should plant seeds from 6 to 9 inches apart in the row.

Some Minnesota growers are using commercial fertilizer on sunflowers and report good results. Two trials at Crookston show that phosphate alone or phosphate-potash fertilizer increased yields. Send soil samples to the University Soil Testing Laboratory and follow their recommendations.

Commercial fields in Minnesota have frequently been weedy. Pre- and post-emergence use of the spike tooth harrow or weeder when weeds are emerging and still "white" may be a good practice if the same precautions are used as in harrowing soybeans. Sunflowers are susceptible to post-emergence applications of MCP, 2,4-D, or TCA, but in experimental plots have shown promising resistance to some of the new grass weed killers.

Sunflowers should be harvested by combining the standing crop. You can use your grain combine by making a few alterations, or you can purchase a sunflower attachment for your combine.

Advance Variety Is Recommended

Advance and Arrowhead were the best of the seven combine-type varieties we have tested.

Advance is a hybrid produced in a crossing field similar to hybrid corn so you should buy new, certified seed every year. Our trials show that second generation Advance yielded 24 per cent less than certified Advance. Advance contained more oil and yielded much more seed than Arrowhead in southwestern Minnesota and yielded about the same as Arrowhead at Morris and Crookston. It has a thicker, slightly shorter, and stronger stalk than Arrowhead.

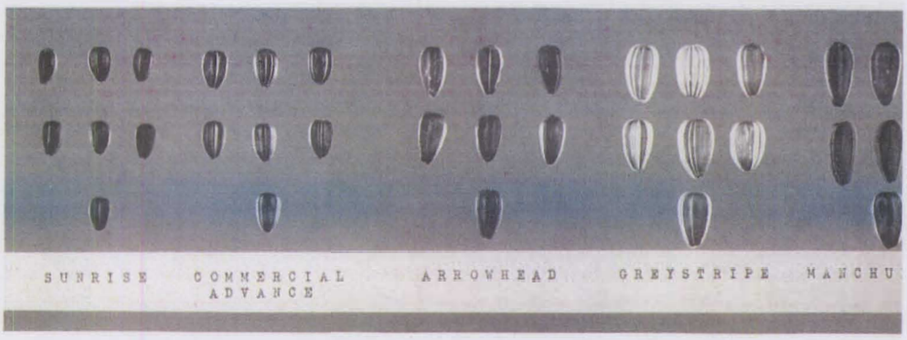
Arrowhead is earlier-maturing and larger-seeded than Advance. Arrowhead may be a useful variety for feed and confections where its early maturity is needed.

Markets, Rust, and Other Problems

This crop does not have a stable and sure market, so you are taking more risk with it than with some other field crops which not only have a sure market but price supports as well.

Sunflower rust is a constant threat wherever sunflowers are grown for more than one year since its spores live over winter on old sunflower stalks and trash. Resistant varieties are needed, but there is little or no research on this problem in the United States.

Marketing promotion and research are urgent needs. Crop sequence, seedbed preparation, planting, fertilizing, weed control, harvesting, and processing methods in use today are probably not best for sunflowers, since they are makeshift applications of machinery and techniques used for other crops. Many of these other crops have had years of research, promotion, and government subsidies while sunflowers have had very little help. Yet this well adapted, native American plant has a foot in the door of Minnesota agriculture. Can it get in?



Varieties differ in height and seed size. The three at left generally grow about five feet tall. The two on the right are giant varieties grown mostly in California.

Feed Your Corn . . .

(Continued from page 4)

Don't be satisfied with bushels per acre rather than quality, grade, and high feeding value for market and livestock needs or government loan.

High Yields in 1952

All of these factors will have a bearing on the yield obtained but remember that corn is a hungry plant and a good supply of plant nutrients is a "must" if high yields are to be obtained.

Many Minnesota farmers applied above normal rates of fertilization in 1952 using a "prescription" given them by the University of Minnesota Department of Soils. The prescription was based on a study of past management practices, yields, soil tests, and other soil conditions. Yields varied from 100 bushels to 160 bushels per acre. Farmers on the medium and low fertility fields spent $25 to $35 per acre for fertilizer and made $30 to $35 per acre over fertilizer costs.

Farm Real Estate . . .

(Continued from page 12)

buyers are unable to meet down payment requirements. These and other factors have brought about some reduction in activity in the farm real estate market.

Results of farm real estate price studies conducted in other states show a leveling off or slight decline in land prices in the latter part of 1952. It will be interesting to see what has happened in Minnesota when land prices are surveyed again in June 1953.

The need for caution on the part of prospective buyers with limited funds appears to be in order. A farm is worth what it will earn over a considerable period of time, not what it will earn in one or a few especially favorable or unfavorable years.

More About Nuworld Cheese

(Continued from page 2)

large scale basis and fit American standards. Up to that time it was thought that Roquefort or blue cheese could be made only from small lots of milk because that had been the practice in Europe.

Since that time the blue cheese industry has become an important one in Minnesota.

And now another new cheese has been developed. Compared to blue cheese Nuworld has a light cream color, a softer and more buttery body, and a mild blue-cheese flavor.

The new cheese is the result of combined efforts of scientists at the University of Minnesota and the University of Wisconsin.

The new white cheese will have many uses. It can be used in cheese cookery, in salads, and as dessert. Moreover, it has many manufacturing possibilities. For example, it can be used in process cheese blends to give them a sharp, aged cheese flavor without the green or grey color of blue cheese.

How Many People Leave Farming or Move to New Farms?

EDWARD W. HASSINGER

THE FARM has long been regarded as a cornerstone of social stability. And it is. But there is more movement off farms and between farm communities than most of us realize perhaps. That movement varies greatly too between communities. Recently we made a study of mobility among rural people in five Minnesota communities (table 1). The results and data will help answer such questions as:

What proportion of the children leave the community?

How do the communities differ in their "holding power" over young people?

What occupations do the boys from these communities enter?

How many of the family heads were born in the locality in which they now live?

What proportion of present owners are related to the former owners?

How long have these Minnesota farms been in the family?

Rate of Migration

In all five communities, more girls left the farm than boys (column 1, table 2). However, communities differed widely.

In communities A and B nearly nine-tenths of the girls and three-fifths of the boys had left, while in D only about one-sixth of the boys and fewer than half the girls had left.

Communities D and E show a remarkable power to retain boys and to a lesser degree the power to retain girls, while in A and B more boys leave than stay and almost all of the girls leave. Community C ranks near the middle in holding power but appears to be more like communities D and E.

Occupations Followed

What proportion of the boys in the five communities were engaged in farming? As with the rate of migration, the differences among communities is great (column 2, table 2). Only 25 per cent of the male children of families living in community A were engaged in farming compared with almost 90 per cent in communities D and E.

Undoubtedly an important factor in the high proportion of boys remaining in farming in communities C, D, and E is that these communities are located in areas of from good to excellent productivity (table 1). In these areas young people have a better chance to make a satisfactory living in farming than in communities A and B.

This factor does not necessarily account for the entire difference among the communities. Values associated with the religious and nationality composition of the communities probably play an important part.

Place of Birth of Family Heads

A great majority of the male heads of families were born in the community in which they lived at the time of our survey (table 2, column 3). Again communities D and E show the greatest stability; 90 per cent of the family heads were born in the same community in which they are living. Community C also shows a very high stability in this respect. Community A is the only community in which a sizeable proportion of the family heads were born in a foreign country—in this case 57 per cent were born in Finland.

Relation of Present Owner to Former Owner

Keeping the farm in the family becomes an important goal for many farm families. Some communities have a higher per cent of transfers of the farming operation within the family than do others (table 2, column 4).

Many of the younger farmers, especially in communities C, D, and E, do not actually own their farms but rent them from a relative, often the father. This type of tenancy is greatly different from renting from a nonrelative, and in many cases the son who rents from his father has every expectation of taking over the farm and is actually in the process of doing so.

Community D shows the highest retention of the farm within the family—and it is remarkably high. Communities A and B which have shown the highest mobility on other indices have the lowest per cent of present owners who are related to former owner.

Time Farm Is in Family

Minnesota is a fairly new area of settlement being less than a hundred years old as a state or about three generations. In considering the length of time the farm has been in the family it should be remembered that communities C, D, and E, are in areas of the state which were settled earlier than those in which communities A and B are located (table 2, column 5). Community C has the greatest per cent of its farms in the same family for over 50 years. Communities D and E also have a large proportion of their farms in the same family for over 50 years. Community A has a small proportion over 50 years but 66 per cent of the farms have been in the family more than 25 years.

In summary, the data presented show that there is great variation among the five communities regarding mobility. Communities A and B consistently show greater mobility than communities D and E with community C generally having a middle position.

Table 2. Mobility of the Population of Five Rural Minnesota Communities

Community	Column 1: Per cent children away from home community, Boys	Column 1: Per cent children away from home community, Girls	Column 2: Per cent of male children engaged in farming	Column 3: Per cent family heads born in home county	Column 4: Per cent operators related to landlord or previous owner	Column 5: Per cent of farms in the family over 50 years
	per cent					
All	41.0	63.1	65.1	76.9	63.2	36.7
A	62.5	89.4	25.0	36.8	40.0	12.8
B	61.8	89.7	40.4	58.5	32.2	14.3
C	33.3	68.4	65.7	84.7	75.0	58.5
D	15.8	47.8	89.5	93.9	95.6	51.2
E	27.4	41.9	86.2	91.4	85.5	39.3

Table 1. What the Communities Studied Were Like

Community	Dominant nationality	Dominant religion	Productiveness of farm area	Section of the state	Time of survey	No. of families	No. of children out of school
A	Finnish	Lutheran	Poor	North Central	1951	42	95
B	Scandinavian	Lutheran	Fair	Northwest	1950	71	126
C	German	Lutheran	Very Good	Southwest	1951-52	60	74
D	German	Catholic	Very Good	Southwest	1952	95	92
E	German	Catholic	Good	Central	1950	105	141

Edward W. Hassinger is a graduate research assistant in rural sociology.

LOOSE HOUSING *Saves Labor...*

S. A. ENGENE and J. A. SHUTE

LOOSE HOUSING has saved 10 to 24 per cent of the labor of dairy chores. That has been shown by farmers using the system. New methods and new equipment will probably increase this saving.

Information obtained from 21 farmers using stall barns and 33 using loose housing is shown in table 1. The farmers using loose housing spent 17 per cent less time on their cows. They saved time on practically every job in chore work. They also did less walking—20 miles a year per cow compared with 27 miles for the farmers using the conventional stall barns.

Table 1. Man Hours Spent per Cow per Year, 1949-1950

Job	Stall barns, 21	Loose housing, 33
Milk*	58.2	53.3
Feed grain	4.2	3.0
Feed hay	4.1	3.2
Feed silage	3.7	3.7
Haul manure	8.1	4.9
Bed cows	3.6	3.1
Other chores†	5.0	.8
Total hours	86.9	72.0
Total miles walked	27	20

* Milk; care for milk; clean equipment, milking room, milk room.
† Cows in and out, curry, breed, care for sick animals, etc.

The chore time shown in table 1 is probably a little low. These farmers gave much of this information from memory and probably underestimated many items. We can check this against information from 22 farmers who kept daily records of their dairy chores in 1952 (see table 2). Apparently the data in table 1 are underestimated by almost 20 hours, mostly on jobs other than milking. The underestimate, however, probably is equally great for loose housing and stall barns. We can then use those figures to estimate the difference between the two systems of housing.

The farmers with loose housing barns have bigger opportunities for improvement than do the men with stall barns. They have had less experience with their system. One man had used loose housing for 10 years; most men had used it for only 2 or 3 years; and a few were using the system for the first year. Most of them developed their barn plans themselves. There were few experienced people they could go to for advice. Naturally, some barns were inconvenient. With experience these men are making improvements. Farmers building or remodeling now are profiting by those men's mistakes.

S. A. Engene is associate professor of agricultural economics; J. A. Shute was formerly research assistant in agricultural economics.

Table 2. Man Hours Spent per Cow per Year in Stall Barns

Job	21 farmers interviewed	22 farmers with records
Milk	58.2	59.1
Feed	12.0	18.5
Bed and haul manure	11.7	18.8
Other	5.0	8.9
Total hours	86.9	105.3

Let us now go back to the averages for these two groups of farmers and take a closer look at the individual jobs.

Milking in Loose Housing Barn

Loose housing provides a different system for milking. In the stall barn the farmer takes the milker to the cow and carries the milk to the milk house. In the loose housing barn the cow comes to the farmer. Most of the farmers we studied used four milking stalls. These usually were raised about 30 inches so that the worker could stand up to do his work. By standing he can work more easily, and do a better job. The milk room was only a few steps away, saving considerable walking. Cleaning the milking room adds extra time, however.

Milking and handling milk can be speeded on many of these farms. A pipe line milker fits very well in this system. It eliminates carrying milk. With bulk tanks, the milk is handled automatically. Large capacity water hoses speed up floor cleaning. With a three- or four-stall milking room one man using two milking units can do a fast job.

Feeding

Most farmers with loose housing fed grain in the milk room, using a scoop to fill the feed box. Since these boxes were used for grain only, the farmer saved the work of cleaning mangers at each feeding. By using an overhead feed bin with chutes leading to each feed box one farmer cut grain feeding to less than 4 seconds per cow at each feeding. This is about one-fifth of the average.

About half of the farmers using loose housing took the hay from the mow

(Continued on page 19)

Fig. 1. With a well-bedded loafing area, daily cleaning is reduced.

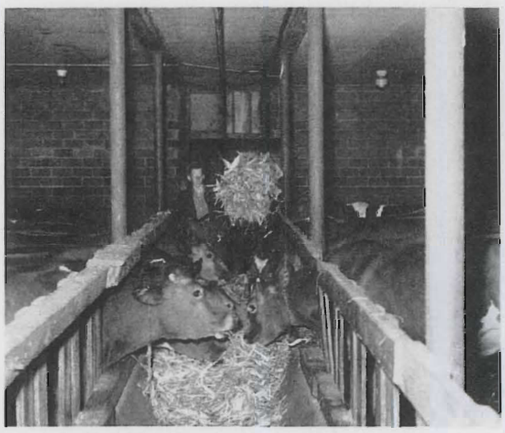
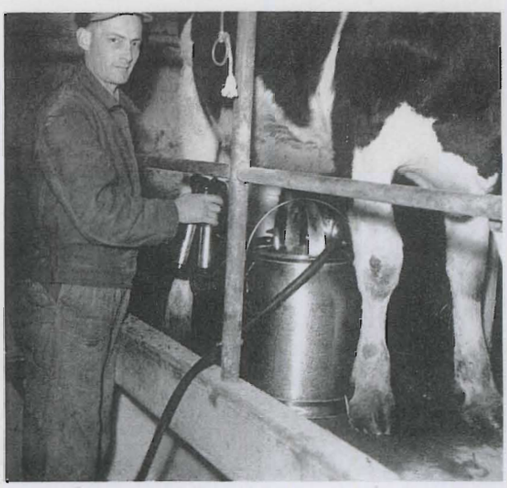


Fig. 2. With loose housing the cows come to the feed.

Fig. 3. Milking is easier when the worker can stand erect.



MINNESOTA SWINE BREEDERS Anticipated the Present Demand for Leaner Pork

L. M. WINTERS

THE PRESENT DEMAND by consumers for leaner pork was anticipated by the University of Minnesota when swine breeding projects were begun 16 years ago.

The major objective of the project was to learn what more effective use could be made of inbreeding, crossbreeding, and selection on the basis of performance for the improvement of swine by breeding. As a part of the project, plans were made to attempt a reduction of fat on the pigs bred in this project.

The project was initiated in 1937 with a concentration of effort on the improvement of the Poland China breed. It was believed by those of us in charge of the work that it was better to concentrate our work on one breed than to disperse it over a number of breeds. We already had underway a small project of inbreeding Poland China swine, so it appeared logical to expand that project. As a result, 13 lines or families of Poland China swine were established at the outset.

Stock was selected carefully on the basis of the records then available. Stock was obtained from Minnesota, Wisconsin, and Iowa breeders. Poland China lines were established at the Southeast, West Central, Northwest, and Central Stations.

One foundation of crossbred swine, a cross of the Tamworth and Danish Landrace was established at the North Central Station. We reasoned that a suitable crossbred foundation should make a superior base from which to initiate an inbred line. Since lard was in 1937 as acute an economic problem as it is today, the crossbred foundation was laid with two breeds that produced superior lean carcasses. The entire project has been conducted in cooperation with the USDA Regional Swine Breeding Laboratory.

In all lines, selection was centered on five economic characteristics: fertility, survival, rate of gain, economy of gain, and a type that would yield high carcass quality. These characteristics are the basic factors that make for profit or loss in swine production.

Since our markets have not been especially appreciative of differences in quality of carcass, there might be some question as to the economic importance of carcass quality to the producer. There certainly is no question of its importance to the consumer. That, in turn, reflects an advantage to the industry as a while, which, in turn, affects the producer. A high-quality product tends to keep that product in public favor. No industry can afford to ignore public favor.

L. M. Winters is professor of animal husbandry.

Minnesota C Line

At the present time, the original 13 Poland China lines have been reduced to one. This one rests on a background of seven lines that came through the initial tests satisfactorily. This line is known as the Minnesota C line. The line is especially good in rate of growth, in ability to make gains economically, and in carcass quality. It is, however, to be criticized as to fertility and milking ability. The line does do an excellent job when crossed with other lines.

Minnesota No. 1 and No. 2 Lines

The cross of the Danish Landrace and Tamworth laid the foundation for the Minnesota No. 1 line. This line looked so promising at the end of five years, that another crossbred foundation, namely, two of our inbred Poland China lines x Yorkshire, was used as a foundation for still another line which eventually developed into the Minnesota No. 2 line.

The No. 2 line was developed so as to have a second line high in carcass quality to cross with the Minnesota No. 1. It should be borne in mind that all inbred lines are developed to be used in crossbreeding programs, and the Minnesota No. 2 was developed especially to complement the Minnesota No. 1 in a crossing program.

Since the matings made in the fall of 1937 at the North Central Station, no outside breeding has been introduced into the Minnesota No. 1 foundation herd. The result is that the amount of inbreeding has become about four times as high as that of the average pedigreed swine.

It has been our contention from the outset that as a rule the best crosses are made from the best performing inbred or outbred stock. In other words, we must have good performing inbred lines in order that they be of the most use in a crossing program. And all the inbred lines have been developed toward the ultimate end of being used in a systematic crossing program.

The following table shows the performance of the Minnesota No. 1 herd and the crossbreds raised at the North Central Station in 1952-53. The crossbreds were, however, fall farrowed pigs, hence, they were reared in dry lot with a resulting increased feed require-

	Pure Minn. No. 1	Minn. No. 1 crossbreds
Number born alive per litter	10.2	11.2
Average birth weight	3.06	3.24
Number raised per litter	8.84	9.64
Average weight at 154 days	198.1	221.7
Feed per 100 pounds gain	316	337
Total average litter weight at 154 days	1,751	2,137

A crossbred hog of Minnesota C, No. 1 and No. 2 lines. This kind of crossbreed will weigh 200 pounds in 140 days and produce bacon like that shown at right.

ment. It should be added, however, that the summer lots provided very poor pasture for the 1952 crop at the North Central Station.

Crosses Between No. 1 and No. 2

Despite the fact that the Minnesota No. 1 herd, as a straight herd, had a very fine production record as shown above, when these hogs were crossed to Minnesota No. 2 boars or to boars of other breeds that were being tested as a source of future breeding stock for another line, the crossbreds outperformed the straight Minnesota No. 1's. The amount of increased performance ranged from a 6 per cent advantage in average birth weight to a 21 per cent advantage in total average litter weight at 154 days.

The feed required per 100 pounds of gain is somewhat difficult to evaluate since the purebreds were raised on poor pasture and the crossbreds were raised entirely in dry lot. A 10 per cent saving feed is usually credited to good pasture. If we assume a 50 per cent satisfactory pasture to the purebreds and a 10 per cent benefit of a good pasture, that would then bring the purebreds and crosses to essentially an equal feed requirement of about 300 pounds of feed per 100 pounds of gain on good pasture.

This is in keeping with previous data which have ranged from the feed requirement of somewhat less than 300 pounds feed per 100 pounds of gain to about 310 or even 315 when the pigs were on good pasture. It is also in keeping with other data in the project in that the crossbreds seldom show any marked benefit over the pure strains in efficiency of feed conversion.

A further fact of major importance in this day of lard surpluses is the fact that the Minnesota No. 1-2 crosses, when slaughtered at around 200 pounds, yielded as high quality carcasses as are demanded by the most discriminating world markets for pork.

The carcasses sampled at that weight averaged slightly under 31 inches in length (31 inches is considered best) and had a backfat thickness of 1.3 to 1.4 inches, which also conforms to a high standard of carcass quality. What is more, the basal ration for the swine was corn. It was, of course, properly supplemented with protein, minerals, and vitamins.

Other Crossing Combinations

An important phase of the Minnesota Swine Breeding Research is being conducted at the Southeast Station. Here, different lines produced in the Minnesota Swine Breeding Project and some lines that have been produced outside are being tested in various crossing combinations. Several continuous crosses have now been carried on for eight consecutive generations. In not a single case has the so-called "running out" resulted. When all things are taken into account, the best rotational cross, to date, has been:

★ **To start with, use the Minnesota No. 1 boar on whatever females are available.**

★ **Follow the Minnesota No. 1 cross with a Minnesota No. 2 boar.**

★ **Follow this with the Minnesota C-line boar.**

★ **Back to the Minnesota No. 1, and so around.**

Better lines are still being sought. At the West Central Station, the Beltsville No. 1 line is being tested, and a herd of San Pierres is being developed and tested. At the Rosemount Station, a new line to be known as the Minnesota No. 3 is in the process of being developed.

Loose Housing Saves Labor . . .

(Continued from page 17)

to the barn floor, then to the feed alley, and then to the manger. They used as much time as the farmers with stall barns. The other half threw the hay directly into hay bunks and saved about one-half of the time. Many farmers now self-feed hay out of stacks or hay barns.

All except one of the farmers using loose housing fed silage inside, using a tub or a cart. They spent about as much time as the men with stall barns. One farmer fed outside, with the bunk next to the silo. He threw the silage directly into the bunk, and then spread it. He saved about half of the time. Many farmers now feed this way.

Cleaning the Barn

Time spent in hauling manure depended upon the method used. In the stall barns, about half of the farmers drove through the barn with the spreader; they spent 6.5 hours per cow. Most of the others used a litter carrier, dumping into the spreader. They spent 9.6 hours per cow. A few piled the manure outside, and then used a power loader and spreader; they spent 9.1 hours. None of these farmers used mechanical gutter cleaners; however, studies made elsewhere show about 5 hours per cow.

Some of the men with loose housing fed the cows in one area, and had a separate, bedded resting area. The feeding area was cleaned frequently, every day on some farms. The resting area was cleaned once or twice a year. These men spent 5.3 hours per cow. The farmers who fed in the bedded area cleaned once or a few times a year; they spent 4.6 hours.

Savings with Best Methods

The figures in table 1 show the average time for these farmers we studied. Some used more efficient methods than others. By using the fastest methods we found on these farms, the men with stall barns could have saved about 10 hours a year for each cow; the men with loose housing could have saved about 16 hours. More recent developments in loose housing would save still more.

As stated earlier, the estimates of chore time as shown made by the farmers are low. According to the more detailed labor records obtained in 1952, a reasonable average for stall barns would be 105 hours per cow. For loose housing it would be 85 to 90 hours. With the best methods this could be cut to about 90 hours for stall barns and about 70 to 75 hours for loose housing.

Taking the average figure of 105 hours for stall barns, 25 cows would take 2,625 hours a year. With loose housing the farmer could take care of 30 cows with the same labor.

Labor saving is an important advantage of loose housing, with labor scarce and expensive. It is not important enough, however, to overshadow other factors. Cost studies show that labor is about 30 per cent of the cost of keeping a cow. Saving 20 per cent on labor cuts total costs by only 6 per cent.

You will not always save labor by shifting from a stall barn to loose housing. If you have a well arranged stall barn, a reasonable average time for chores is 90 hours a cow. If your setup with loose housing would be no better than average, you would save no time. With a poor arrangement you might use more labor.

This means that if your present barn is convenient and big enough you cannot afford to change to loose housing just to save labor. If you must rebuild or remodel, however, it will pay you to look into loose housing.

How to Control PERENNIAL WEEDS

H. G. HEGGENESS and A. H. LARSON

MANY PERENNIAL WEEDS are widespread in Minnesota and are becoming more prevalent each year. These pests decrease land values besides interfering with agricultural and recreational activities.

Formerly, the only method of control in nontillable regions was to use soil sterilizing chemicals, such as sodium chlorate, the thiocyanates, and the arsenicals. This never became a popular practice because some chemical treatments were hazardous to man and animals. Also, the sterilized soil could not be used for agricultural purposes for a period of several years.

Recent studies with the newer herbicides have shown that there are no general control practices for all perennial weeds. Some of the weeds require special herbicides which must be applied at a particular time, while others have shown the need for repeated treatments.

Furthermore, modern weed control chemicals should be used with due regard for certain principles: 1. Treatments should prevent seed formation. 2. The herbicide should be applied when it will seriously interfere with the accumulation of food reserves and the formation of stem buds.

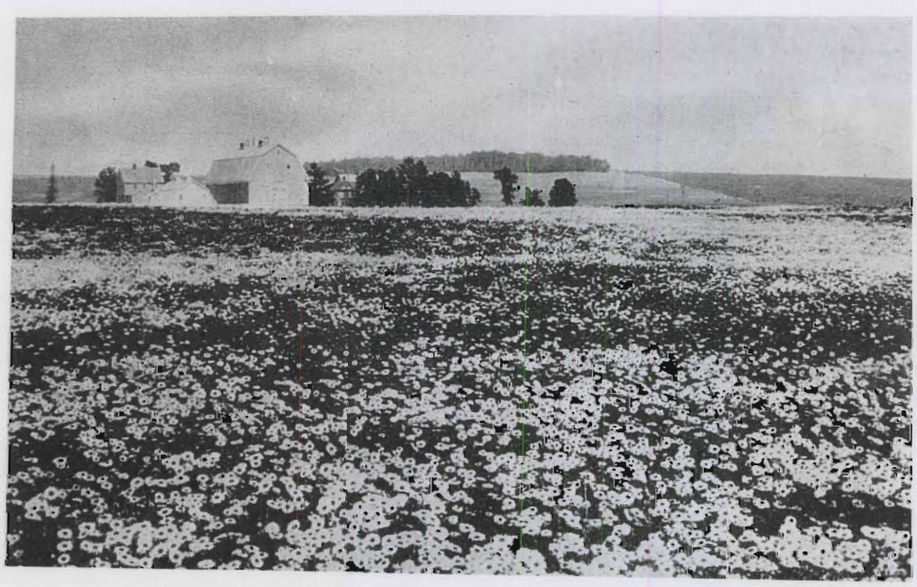
Perennial weeds are sometimes susceptible to herbicides in late summer or early fall. Some weeds form one type of root system in a sandy soil and another type in a heavier soil. The roots in heavy soil are frequently harder to kill.

During the summer the University of Minnesota makes many field tests to work out control practices for these noxious plants. One phase of this control work has been extensive in northeastern Minnesota where certain weeds have become well established. Although the experiments have not been concluded, the results to date demonstrate that some of these weeds can be effectively controlled.

Meadow buttercup (*Ranunculus acris*) often occupies entire pastures and constitutes a major weed problem north and east of Todd County. Three pounds (acid equivalent) of an amine formulation of MCP per acre will practically eradicate buttercup if applied as the plants are coming into full bloom in the spring. One treatment appeared to be adequate in our experiments. However, if seedlings or regrowth appear in late summer, make a second application.

Orange hawkweed (*Hieracium aurantiacum*) is widespread in Pine, Carlton, St. Louis, and Lake Counties. It spreads rapidly because each plant produces hundreds of parachute-equipped seeds which may be blown considerable distances. Either the isopropyl ester of 2,4-D or an amine of MCP, each at three pounds per acre, effectively kill both the tops and roots of this pest. Two applications each season are neecssary—one in early June and another in late summer. Either herbicide may be used, but 2,4-D is cheaper.

Ox-eye daisies in a clover meadow. Many folks confuse them with Shasta daisies.



Tansy (*Tanacetum vulgare*) is very well established and has taken over hundreds of acres of nontillable land in St. Louis, Carlton, and Morrison Counties. Tansy is susceptible to early applications of the isopropyl ester of 2,4-D. Apply the herbicide at the rate of three pounds per acre when the plants are about six inches high. Make a second application in late summer when regrowth from the root crown and stem is likely to occur.

Ox-eye daisy (*Chrysanthemum leucanthemum*) occupies extensive areas in St. Louis, Lake, and Cook Counties as well as other areas throughout the state. Spray these weeds with an isopropyl ester of 2,4-D (three pounds per acre) as they come into flower in June. A second application is necessary in early fall to prevent some of the old roots from forming new shoots for the next year. In experimental plots this killed most of the daisies, and the grasses produced about 100 per cent more foliage the same season.

H. G. Heggeness is instructor in agricultural botany and A. H. Larson is assistant botanist.

In This Issue