

MINNESOTA  
**FARM AND HOME**  
*Science*  
Published by the Minnesota Agricultural Experiment Station



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

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October, 1949

### A New Dress

Were you surprised when you received this issue of our magazine? Perhaps you didn't even recognize it with its new cover and features. It's the same magazine you have been receiving in the past. We hope that its "New Dress," or layout, as printers call it, will make it more interesting and readable.

### The Cover

With Thanksgiving just around the corner, it's no more than right that we allow the turkey to step into the limelight, especially since Minnesota now ranks third in the nation in turkey production. The picture was taken at our Rosemount Research center.

### Our Authors

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# Minnesota's Men of Science

**Editor's Note**—This was to have been the first in a series of articles introducing the University's leading agricultural scientists. Among the first we had hoped to introduce was Professor W. H. Peters, chief of the Animal Husbandry Division. But Professor Peters passed away on August 8, at the age of 64, after an illness of several months. Now, our introduction must be, in a small and inadequate way, a tribute to a good friend.



Professor W. H. Peters would have objected to a printed tribute. He was a quiet, modest man who shunned the limelight. His life was devoted to his many friends and to improving the livestock industry of the nation.

The life of Professor Peters is sprinkled with incidents that reveal an understanding and human kindness that distinguish a successful man in the true sense of the word. Hundreds of students came to him for help and left with encouragement and even financial aid. His colleagues found him to be a source of inspiration and a staunch friend and able worker in his field.

During the past year he had been singularly honored. Last winter, at the time of the International Livestock Exposition, his portrait was hung in the world-famous gallery of the Saddle and Sirloin club in Chicago with appropriate ceremonies. This honor is awarded annually to the member of the American Society of Animal Production who has done outstanding work in teaching and research.

Early this year his portrait had been hung in Minnesota's livestock men's hall of fame—the Master Livestock Breeders' Gallery at University Farm.

Professor Peters was born on a farm in southeastern Iowa, near Keokuk on July 9, 1885. He attended a one-room school and Keokuk high school. He was graduated with honors from Iowa State College in 1908, and the next year became head of the Department of Animal Husbandry at Manitoba Agricultural College.

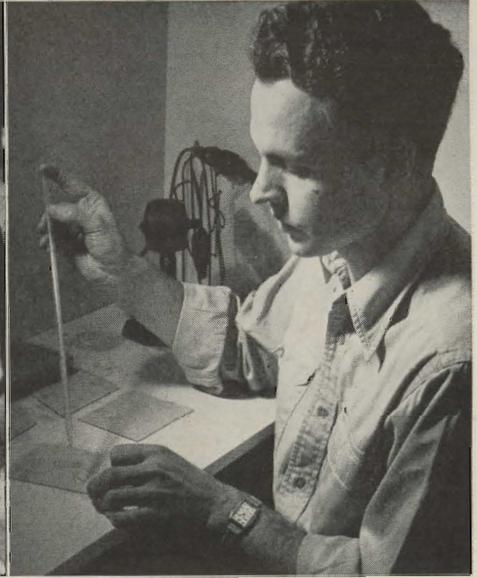
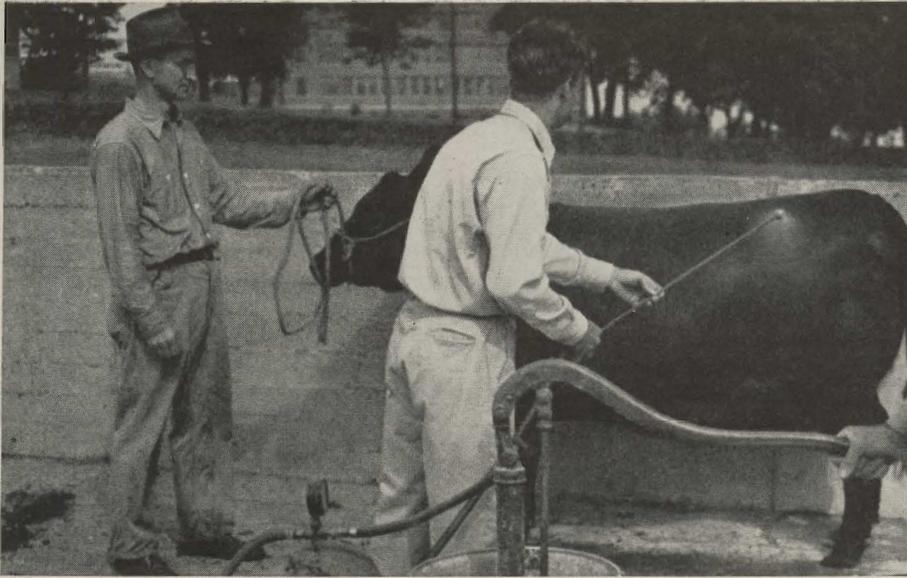
In 1914, Professor Peters was named head of the Animal Husbandry section at North Dakota Agricultural College and in 1918, he came to the University of Minnesota. He was named chief of the Animal Husbandry Division at University Farm in 1921.

During his years as chief, the work of his division increased nearly fourfold and an extensive research program was developed.

Professor Peters also achieved fame as a livestock writer. He was livestock editor of *Farm Stock and Home* from 1916 to 1931 and of the *Farmer* since 1931. His book, *Livestock Production*, is now used widely in colleges throughout the nation and was used as a text by military personnel off-duty after the end of the war. Collaborating with G. P. Deyoe, he wrote another book, *Raising Livestock*, in 1946.

In 1941 Professor Peters served as president of the American Society of Animal Production. The journal, *Animal Science*, was started during his term.

During all his years with the University, Professor Peters remained in close touch with livestock problems. He understood farmers' problems and constantly sought practical answers to their questions. During all this time, he served Minnesota agriculture as a teacher, a leader in research, and a friend.



University scientists test insecticides by spraying (left) and in specially built chamber equipped with ultraviolet (right).

# What's New in Insecticides?

L. K. CUTKOMP

One of the miracles of modern science has been the rapid expansion in the use of insecticides. Even today there are new and better insecticides replacing those that were startling the agricultural world. This article brings up-to-date the results of insecticide research by the University of Minnesota and other agencies.

"**H**OW CAN I get rid of the ants in my kitchen?" "The grasshoppers are eating up my garden. How can I stop them?" "I have some DDT—how careful do I need to be when using it?"

That's a sampling of the questions that pour into the University's Division of Entomology and Economic Zoology all summer long. People are anxious to learn about the new insecticides, their limitations and possible hazards.

Practically all of the synthetically prepared insecticides are available as oil solutions, oil emulsions for use in water, wettable powders which may be stirred into water, or as dusts which do not mix with water.

Dust is usually the safest form for plant and animal use. The wettable powder in water is the safest of the sprays, and in many cases is the only type of spray which can be applied successfully to foliage or to animals.

Oil solutions are commonly limited to applications on inanimate objects on which insects may rest or crawl. Emulsions are coming into greater use

on certain plants, but the danger of plant injury must be carefully evaluated with each spray problem.

## DDT

DDT has been widely used almost anywhere that insects are a problem. In public health work, mosquitoes, flies, bedbugs, and lice are readily controlled, often by contact with a DDT spray or dust applied to a surface. Numerous insects are controlled on field crops, fruits, vegetables, and in forests. In addition to killing power, DDT has a long-lasting quality which has promoted its use. Sometimes the killing action is ascribed to contact alone, but DDT is also effective against an insect which eats and chews a treated leaf.

Any insecticide is, to some degree, poisonous to man and other warm-blooded animals. DDT is no exception, but when used with reasonable care it may be considered quite safe.

The greatest problem with DDT is that it concentrates and accumulates in fatty tissues and butterfat of milk.

This, of itself, does not seem serious, but rapid turnover of DDT-laden fat in the body releases most of the insecticide from the fat and allows it to get into the blood stream.

Although extensive research has been conducted, more study is required to clarify the DDT residue problem. At present the danger of milk contamination with DDT makes it inadvisable to spray or dust DDT on dairy cattle, since small amounts can later be found in the butterfat.

In addition, DDT-treated crops, such as corn and peas, may sometimes endanger the milk supply if they are fed to milking animals. DDT decomposition is much more rapid outdoors than indoors. However, chemical analyses by the Experiment Station indicate that small amounts of DDT may be present on corn plants 30 days after they have been sprayed to control the European corn borer.

Certain insects and related pests appear to be unharmed by DDT. Some of these are grasshoppers, plant and animal-feeding mites, a number of aphids, several different ants, and the German cockroach.

## Chlordane

The widespread use of chlordane has been assured because, unlike DDT, it is highly effective against grasshoppers and all common species of ants and roaches. Its potency against many other insects is rather similar to DDT, but its lasting qualities are less.

It is interesting to know that chlordane also has a fumigating action in

small enclosed areas. For this reason, it is particularly effective against some subsurface insect feeders such as certain cutworms and wireworms, and fabric feeders such as carpet beetles and clothes moths.

Although chlordane is also effective against flies and mosquitoes, it should not be used on dairy animals because it may also accumulate in body fats.

#### Toxaphene

Mild and pleasant in odor, this insecticide deserves its popularity in the Midwest because it is so effective against grasshoppers and crickets. It is also effective against many other insects, but often has not proven more advantageous than DDT. Unlike chlordane, toxaphene has practically no killing action from the vapor, and usually is longer-lasting, although it does not last as long as DDT.

A single dose of toxaphene is about four times as poisonous as DDT to warm-blooded animals and for this reason its use on livestock may not be justified. However, present evidence indicates that destruction of the chemical in the body of a warm-blooded animal is more rapid than DDT, and it does not seem to accumulate as much from repeated doses.

#### Methoxychlor

Because it is safer than most insecticides, methoxychlor can be used in place of DDT on cattle, in dairies, and on edible portions of vegetable crops. It is not quite as generally effective against insects as DDT, but it does the job in many cases. More and more Minnesotans are using methoxychlor, principally because it is not so poisonous to warm-blooded animals and does not accumulate in body tissues.

Experiments at the University Farm during the past summer have been designed to see if weight gains occurred in beef cattle following the use of a methoxychlor spray. This spray reduced annoyance and feeding of stable flies on cattle.

#### Benzene hexachloride

Although this product is very effective against many insects and mites, it has a lingering musty odor and disagreeable taste which is imparted to fruits or vegetables on which it is used. New preparations, however, are now becoming available which will be just as destructive to the insect population, but which are relatively free from the taste-odor problem. They will be known under the name **lindane**, the uses of which may be many except where cost is a limitation.

This product, along with methoxychlor, becomes a possible substitute for DDT in dairies since it does not accumulate in any portion of the body and is comparatively safe at the time of spraying or dusting.

Like chlordane, benzene hexachloride may kill by insect ingestion, contact, or by vapor in enclosed spaces.

#### DDD or TDE

DDD is almost as effective as DDT against many insect pests, but usually has a slightly shorter lasting effect. It has an advantage over DDT in that it kills many pests such as mosquitoes and flies, yet even in overdoses is not likely to be harmful to fish and wildlife.

Unlike methoxychlor, however, repeated doses of DDD have been found to accumulate in fatty tissues. This insecticide is not widely used in the Midwest, but in many eastern areas it has been used for the corn earworm though its actual effectiveness is rather similar to DDT. On the west coast it is used considerably for insect pests of tomatoes. Growing plants in general are not as easily injured by DDD as by DDT.

#### Organic Phosphates

Two highly effective chemicals of a different type are now available for certain insect control problems. Both materials are many times more poisonous than DDT to warm-blooded animals and for this reason must be used carefully.

Fortunately, the hazard is greatly lessened when these chemicals are prepared as dusts or sprays for insecticidal use. In addition, the necessary insect-killing concentration usually is considerably less than that required for DDT.

**TEPP or TEP** (tetraethyl pyrophosphate) commonly used as a water spray for aphids and mites on plants, loses its effectiveness in a matter of hours after being mixed. Therefore, no resi-

due problem exists because the active chemical has broken down. Dusts of this product are in limited use, but must be kept moisture-free before use if they are to remain potent.

**Parathion**, unlike TEPP has a stability sufficient to kill insects for several days after application. The general killing power of parathion appears to outstrip DDT, since mites, scale insects, and aphids are all susceptible.

At present many greenhouse operators have one or the other of these two insecticides doing the major part of the mite and insect control work.

Parathion is not likely to endure as a residue more than a month, and it does not accumulate in warm-blooded animals. Though not widely recommended, parathion's use in the future will be governed by two important facts: the need for an efficient material on a certain insect problem and the ease with which its hazardous nature may be avoided.

#### Ryania

This slow-acting but very effective insecticide is a fairly recent discovery, though it was tested early during World War II. Ryania has compared very favorably with DDT in control of the European corn borer. Tests by the Minnesota Experiment Station and other stations have indicated its effectiveness and hundreds of acres of sweet corn were sprayed this past summer. Because it is safer to use and shows no evidence of accumulation in any body tissues, Ryania is a logical replacement. The chief drawback has been the difficulty of obtaining enough from the West Indies and South America, since it is not prepared synthetically but is a product of plants grown there.

Ryania has good dusting qualities, but difficulties in grinding the plant stems result in a product that gives troublesome clogging in standard spray machines.

Further testing will be necessary to see what other insects may be readily controlled by this material.

### WHAT ABOUT THE FUTURE?

There is considerable uncertainty about specific uses of some of these new insecticides, and rightfully so. Some uncertainty is due to insufficient practical application and incomplete toxicity studies. A certain amount of it is due to other competitive materials which have only been used experimentally thus far, and are not discussed here.

All of the materials mentioned here have had more than two years of extensive testing both against insects and warm-blooded animals. Although further studies are necessary, each insecticide has been tested and handled by hundreds of workers in widespread areas and over extensive acreages.

# New Form of Disease Threatens Poultry

JAMES E. WILLIAMS, B. S. POMEROY, and R. FENSTERMACHER

**P**ULLORUM DISEASE, long one of the most dreaded enemies of poultry, is now being recognized over the United States in a new form, called Canadian, "X," or variant pullorum.

The usual type, so-called "standard" pullorum, is familiar to Minnesota poultrymen, for it not only lowers the livability of young chicks and poults, but may also interfere with the productivity of the adult birds.

Now poultry farmers over the state are faced with this menace in its new form, variant pullorum. This new type of the disease is not easily distinguished from the usual type unless infected birds are examined bacteriologically, using special laboratory tests.

For several years, the Division of Veterinary Medicine, University of Minnesota, has been conducting studies to answer such questions as these:

1. How does the variant type differ from standard pullorum?
2. Do we have much of the new type in Minnesota?
3. How important is variant pullorum in our present pullorum-control program?

Before we can appreciate the answers to these questions, we should consider some of the basic facts about the nature of pullorum disease.

Both the standard and variant types of pullorum seem to lodge in the egg-producing organs, especially the ovary, of the infected hen.

The disease is usually transmitted through the egg, from the infected hen to the chick. Infected chicks may transmit the disease to other chicks which are in direct contact with them in incubators and brooders.

Not all pullorum-infected chicks die; they may grow to maturity and remain life-time carriers, capable of laying pullorum-infected eggs which may then hatch into diseased chicks.

Obviously, then, to control and eradicate pullorum, we must diagnose the disease in adult carriers. To break the infective cycle of the disease, all such infected adults must be eliminated from the breeding flocks.

## Antigen Spots Infection

Since infected birds usually show no outward symptoms of pullorum, carrier birds are detected by a blood test called the "agglutination test." The testing fluid, called an "antigen," is a suspension of killed pullorum bacteria.



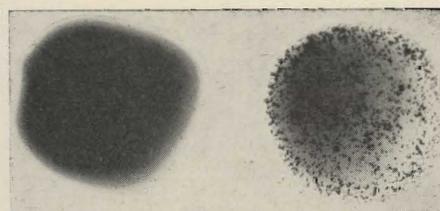
One of the authors, James E. Williams, aided by Miss Florence Jones, laboratory technologist, obtains blood from a wing vein for a whole-blood pullorum test.

The testing fluid is mixed with the blood or the blood serum of each bird to be tested. If the bird is infected with pullorum, the so-called "antibodies" present in the blood will combine with the pullorum bacteria in the testing fluid.

This "clumping" of the antibodies with the bacteria is the sign of a positive reaction to the test. All birds which react positively should then be culled from the flock.

The eradication of pullorum is one of the objectives of the National Poultry Improvement Plan. This plan, which calls for extensive pullorum-testing among both chickens and turkeys, has decreased considerably the number of cases of the standard type of pullorum in tested flocks.

Birds infected with standard or variant pullorum show identical symptoms, pathological changes and death losses. Despite this fact, the standard-type antigen used in blood testing may not detect birds infected with variant pullorum.



Blood from variant-infected bird reacts differently to two tests. (Left) Negative reaction to standard antigen and (right) positive reaction to variant antigen.

Similarly, an antigen prepared from variant pullorum may not be effective in detecting standard-infected birds. In most cases, the antibodies present in the blood of standard-infected birds are very different from those of variant-infected poultry.

For example, periodic blood tests were run on a flock of 60 birds known to be naturally infected with the variant type of pullorum. Both standard and variant antigens were used.

These tests revealed that if standard antigen alone had been used, approximately 85 per cent of the infected birds would have been missed.

Thus, the control of variant pullorum depends upon its detection, and upon the use of special testing agents in flocks where it is known to exist.

## New Antigen Needed

Most official antigens now in use are prepared only from standard pullorum types. A double-testing program employing both standard and variant antigens would be effective in detecting both types, but this would be impractical because of the time, effort, and expense involved.

We need, then, a single antigen that will detect both the standard and variant types of infection. Most of the work of developing such an antigen is still in the experimental stage.

It has been possible to mix standard and variant pullorum types together

(Continued on page 15)



Courtesy Grand Forks Herald

## Low-grade Potatoes as a Feed . . .

O. M. KISER and H. D. FAUSCH

**C**ULL AND LOW-GRADE potatoes can be fed successfully to beef cattle. Recent experiments at the University of Minnesota's Northwest Agricultural Experiment Station at Crookston definitely show this.

In the Red River Valley potato marketing would be simplified and prices increased if these cull and low-grade potatoes could be kept off the market.

These potatoes in the past have been sold for whatever the market would bring. If prices were too low the potatoes were dumped on the fields. Here they had only low fertilizer value.

Seeking new practical ways of using these potatoes, the Station set up a feeding trial with 24 medium-grade yearling feeder steers.

The purpose of the trial was to see how successfully raw potatoes could be fed:

- (1) whole with good quality hay,
- (2) chopped with good quality hay, and
- (3) whole with oat straw.

These steers were divided into four lots of six each. During the 168 days of the feeding trial beginning December 11, 1948, one steer developed bloat and later contracted pneumonia and died. This was the only unhappy experience in the whole experiment.

Now to see how the experiment was conducted, let's look at the rations of each of the four lots.

**Lot 1 (Check lot)**—Each day all the steers were fed three pounds of alfalfa hay and as much brome grass hay as they would clean up. They also received standard Red River Valley cattle fattening grain ration of 60 per cent

ground barley, 30 per cent ground oats, and 10 per cent linseed meal.

**Lot 2**—These steers received *whole potatoes*, alfalfa hay, and brome grass as did Lot 1, plus grain after 84 days. The grain fed was the same as with Lot 1 and was added to get a desirable market finish.

**Lot 3**—These received the same ration as Lot 2 except that the *potatoes were chopped* by a feed cutter.

**Lot 4**—This lot was fed exactly the same as Lot 2 (*whole potatoes*), except that oat straw replaced the hay.

At the beginning of the second 84-day feeding period, the amount of potatoes fed to Lots 2, 3, and 4 was reduced gradually from 60 to 50 pounds per head per day.

The standard grain ration used for Lot 1 was then added to the rations.

beginning with small amounts and increasing gradually up to 17 pounds per steer per day on March 27 in Lots 2 and 4, and up to 11.6 pounds per day in Lot 3 for the last 22 days of the feeding period.

The grain ration to Lot 3 was increased over the amount fed to Lots 2 and 4 because the steers in this lot refused to clean up their quota of sliced potatoes. The amount of sliced potatoes cleaned up by Lot 3 per day was reduced from 300 pounds to 200 pounds.

At the end of the feeding period, the steers in Lot 1 had more condition and better finish than the potato-fed lots. These steers were appraised at the highest market value.

### Comparative Feeding Value of Potatoes

To compare the feeding value of potatoes in different forms and rations, the method illustrated for Lot 2 was used.

**Lot 2**—Subtracting \$12.06 (the cost of hay and grain in producing 100 pounds of gain by the steers in this lot) from \$22.17 (the feed cost of 100 pounds gain for Lot 1 steers), leaves \$10.11 as the feed replacement value of 2,566.04 pounds of potatoes, the additional feed required by steers in Lot 2 to produce 100 pounds gain. Dividing \$10.11 by 2,566.04 pounds gives \$.00393 as the value of a pound of potatoes fed in Lot 2.

This gives a value of 39.3 cents per 100 pounds.

**Lot 3**—Using the same method, the feeding value of sliced potatoes used with alfalfa and brome hay and grain was 24.5 cents.

**Lot 4**—Where oat straw was substituted for hay, potatoes had a feeding value of 55.8 cents per 100 pounds.

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Table 1. Daily Gains, Daily Feed Consumption, Feed per 100 Pounds Gain, Selling Price, Dressing Percentages, and Carcass Grades of the Four Lots of Steers in Potato Feeding Experiment

	Lot 1	Lot 2	Lot 3	Lot 4
Average Daily Gain	2.12	2.05	1.71	1.99
Average Daily Feed, Pounds				
Alfalfa hay	3.0	3.0	3.3	
Brome grass hay	6.53	8.34	9.37	
Oat straw				10.70
Potatoes		51.49	49.28	52.97
Grain*	13.11	8.32	9.18	8.68
Feed per 100 lbs. gain				
Alfalfa hay	141.60	148.18	153.66	
Brome grass hay	307.21	405.77	546.40	
Oat straw				561.15
Potatoes		2,566.04	2,785.17	2,753.04
Grain	767.38	216.43	268.83	217.36
Cost per 100 lbs. gain	\$22.17	\$16.48	\$22.21	\$23.27
Net selling price, cwt.	\$24.36	\$24.27	\$24.15	\$24.56
Margin per head over feed cost	\$17.09	\$27.20	\$19.18	\$24.17

Feed prices charged: Barley, \$1.90 per bushel; Oats, \$.65 per bushel; Linseed meal, \$80.00 per ton; Alfalfa hay, \$30.00 per ton; Brome grass hay, \$25.00 per ton; Oat straw, \$10.00 per ton; Potatoes, \$.25 per cwt. No charge was made for grinding of grain, slicing potatoes, salt or mineral.  
\* Grain was fed Lot 1 during the entire 168 days and to Lots 2, 3, and 4 during the last 51 days only.

# Purebred Livestock Prices Fluctuate Violently

AUSTIN A. DOWELL

**V**IOLENT FLUCTUATIONS have characterized the prices of purebred beef and dairy cattle in the nearly four decades since 1910 (figure 1). In some respects, prices of each class of cattle behaved much the same throughout this period.

In each case, prices advanced sharply during the World War I boom, declined greatly in the early 1920's and again in the early 1930's, and then moved upward at a rapid rate during World War II.

For each class of cattle, the price rise took place more rapidly and the boom ended sooner during the first and shorter inflationary period than it has recently.

Some significant differences, however, will be observed. Purebred beef cattle prices fluctuated more violently than purebred dairy cattle prices, rising higher in periods of inflation and falling farther during low price periods.

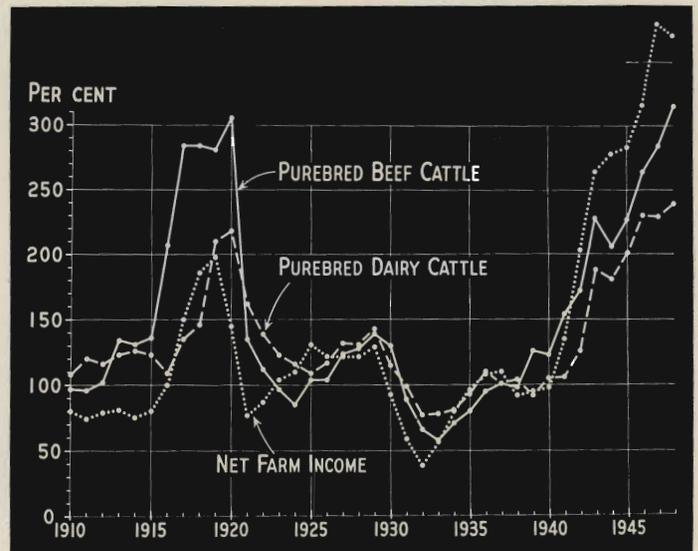
Purebred dairy cattle prices rose above the 1920 peak in 1946, while purebred beef cattle prices did not rise above the 1920 high until 1948.

Purebred dairy cattle prices were compared with prices of 92-score butter at New York, (figure 2) and purebred beef cattle prices with prices of beef steers at Chicago, (figure 3).

## Prices Rise and Fall Together

In the figures, you can see a broad general tendency for beef steer and butter prices to rise and fall together, and for purebred beef and dairy cattle

Fig. 1. Index of prices received for purebred beef and dairy cattle sold at auction and of net income of farm operators in U.S., 1910-1948 (1935-39 = 100).



prices to rise and fall along with beef steer and butter prices.

Forces which tend to cause rise and fall in beef and butter prices also tend to cause fluctuation in prices of many other farm products at about the same time. This affects the gross income of farmers.

Because changes in farm expenses tend to lag behind changes in gross income, net farm income fluctuates more violently than gross income. Net income rather than gross income determines the relative prosperity of farmers and this, in turn, has an important bearing on the prices which farmers can offer for purebred cattle.

Throughout the period, net farm income (figure 1) fluctuated much more violently than prices of purebred dairy cattle, and somewhat more violently

than prices of purebred beef cattle, especially after 1920.

Purebred cattle prices were high as compared with net farm income during the first World War, while net farm income has been high relative to purebred cattle prices during the recent boom. This suggests that farmers have been more conservative during this inflationary period than during the first boom.

Changes in the trend of purebred cattle prices tend to lag behind changes in net farm income, which suggests that net farm income exerts strong pressure on purebred cattle prices, tending to force purebred cattle prices up or down as net farm income rises and declines.

The slight downturn in net farm income in 1948 was not accompanied by a downturn in the average price of

(Continued on page 9)

Fig. 2. Index of prices received for purebred dairy cattle sold at auction and wholesale prices of 92-score butter at New York, 1910-48 (1935-39 = 100). Butter prices were adjusted for subsidy payments from 1943 to 1946.

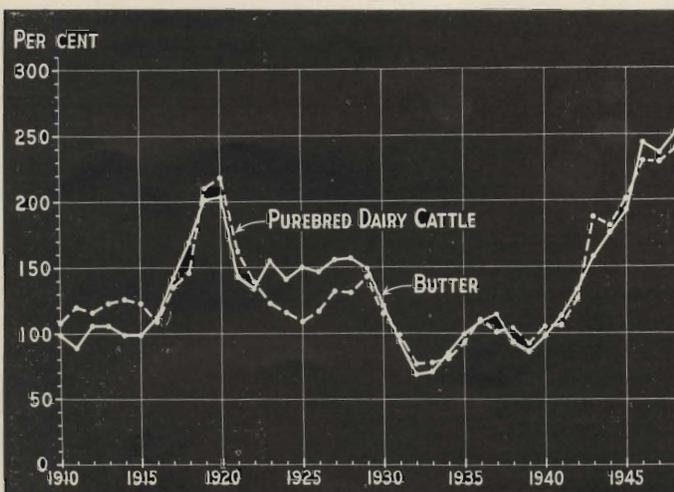
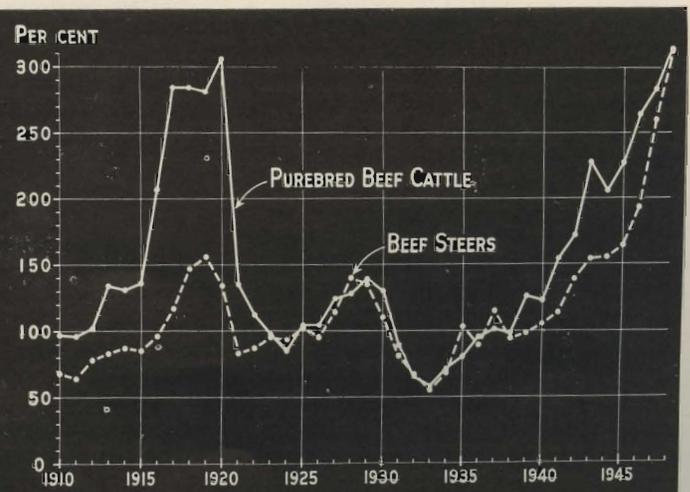


Fig. 3. Index of prices received for purebred beef cattle sold at auction and prices of beef steers at Chicago, 1910-48 (1935-39 = 100).



# New Agricultural Experiment Station Branch at Rosemount Sets Stage for Expanded Research

T. H. FENSKE

"THEY SHALL BEAT their swords into plowshares, and their spears into pruninghooks," says a verse in the Song of Solomon. The Agricultural Experiment Station Branch at Rosemount had no swords or spears to begin with, but a transformation has taken place at the site of the Gopher Ordnance Works at Rosemount which very well demonstrates the idea expressed by Solomon.

A part of the former war plant has been transformed into a branch of the Minnesota Agricultural Experiment Station and plows and other agricultural equipment are very much in evidence there.

One of the limiting factors in agricultural experiment station work on the St. Paul campus and in the Twin City area has been a lack of land. A solution to this problem was offered when the University obtained the former Gopher Ordnance Works, with accompanying land.



T. H. Fenske

The part of the Experiment Station land which is not used on definite experimental projects is utilized to produce feed for livestock on the farm. As needs develop, additional land from the general tract can be made available for use by the Station.

## Extension of University Farm

The Rosemount Station is really an extension of the University Farm, St. Paul. The research projects are planned and carried out by research workers who may have their offices at University Farm and who divide their time between University Farm and Rosemount. In that respect this Station differs from the other branch stations in the state where work is carried on cooperatively between division and branch station personnel.

Actual work at Rosemount got under way in October of 1947. While the Station has been operating only a short while, it is evident that it will play an important role in Minnesota agricultural experimental work in the future.

## Nine Divisions Use Facilities

There isn't space here to describe in detail the interesting and significant work that is now under way. A brief summary shows that up to the present time nine divisions of the Minnesota Agricultural Experiment Station are using facilities at Rosemount.

Animal Husbandry has established there a unit of the Regional Swine-breeding Laboratory operated in cooperation with the U. S. Department of Agriculture. Inbred Poland Chinas, Minnesota No. 1 and Minnesota No. 2 hogs are included in the initial herd.

Sheep breeding is also being studied under the general heading of "Breeding Sheep for Efficiency of Production." One flock being used in the sheep-breeding experiment was formerly owned by a farmer in southwestern Minnesota who introduced no new blood to the flock for 50 years. Another flock is of open-faced Hampshires.

A beef cattle herd will be established on the area when barns or shedroom become available.

Poultry research, especially turkey breeding, received a great impetus when the Poultry Division was allotted facilities at Rosemount. Work with chickens and geese will be expanded when suitable buildings and other facilities are obtained.

## Pen-Type Dairy Barn Tried

One of the barns that is attracting a great deal of attention at Rosemount is the loose-housing or pen-type dairy barn being used by the Dairy Division. Three divisions—Dairy, Agricultural Engineering, and Agricultural Economics—are cooperating in a study of this type of shelter for dairy cattle.

A pole-type barn, designed to eliminate certain expensive construction

costs, is also being built and will be used by the Dairy Division as soon as it is completed.

Dairy research workers are also studying dairy cattle breeding methods, pasture rotations, and feeding tests, including the use of grass silage.

The Agronomy, Plant Pathology, and Soils Divisions can now expand their work in testing varieties, study of disease resistance, and investigations of fertilizer and soil management problems.

Several hundred experimental plots—small grains, corn, soybeans, forage and grass varieties, and potatoes—have been seeded in the past two years. The Plant Pathology Division is cooperating with the Horticulture Division in studying wilt-resistance in melons.

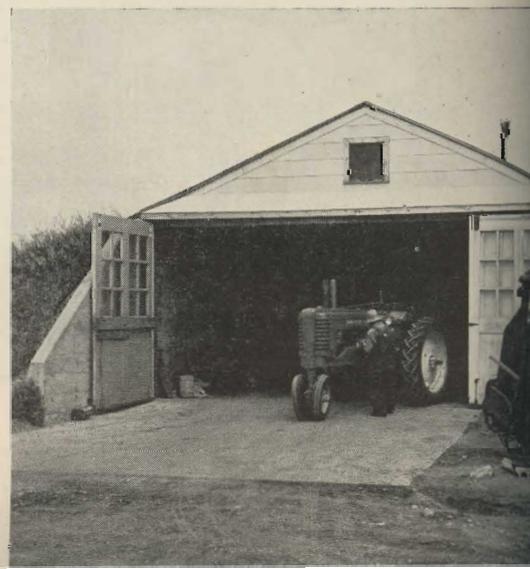
As weed-free land becomes available, it will be possible to speed up the increase of new varieties of grains and other crops which are being developed or tested by the Minnesota Agricultural Experiment Station.

## Soil Conservation Studied

The Soils Division has made a soils survey of the Rosemount tract. The information from this survey will enable each division to operate in its own particular land area, using soil-building and soil-conservation practices to the best advantage. The Soils Division plans a long-time program, testing fertilizers, and soil erosion control practices.

The Agricultural Engineering Division is working on the development of new types of farm machinery which will be adaptable to Minnesota. This division is also testing new machines, such as flame cultivators. A field shop

Old ammunition dumps at Rosemount are now made



has been established and will be used primarily by the Agricultural Engineering Division in its work at Rosemount.

Shelter belts, windbreaks, and the establishment of Christmas tree plantations are the special concern of the Forestry Division. Spacing of trees, varietal tests, and methods of handling are being studied in a long-range program instituted by the forestry staff.

### Rosemount Only Beginning

The Rosemount Branch is really only in the beginning stage so far as buildings and equipment are concerned. Several old buildings have been repaired or remodeled. Three have been moved to the agricultural area for use as barns, and a machine shed and several smaller structures have been built.

Additional buildings are to be constructed when funds are available. Perhaps it will be several years before there will be enough buildings for the work of the various divisions.

For the first two years, the administration of the branch was directed from the University Farm. As plans developed, however, and expansion took place, a resident superintendent was needed at Rosemount. Professor A. C. Heine became the superintendent on July 16, 1949. He was formerly assistant superintendent at the West Central School and Station at Morris.

### More Than Land Alone

In an editorial in *Minnesota Farm and Home Science* for May, 1948, the writer stated, "Land alone does not make an experiment station. Persons who have faced material and machinery shortages know the problems that have had to be solved in starting a new unit. The first machine was a hired tractor and the first tool a borrowed wrench.

"The Experiment Station now has some equipment of its own, and some building has been done but there is still much to do. The year 1948 is the



William Bester, foreman at Rosemount, Otto Swenson, farm superintendent at University Farm, and A. C. Heine, superintendent of the Rosemount Station, discuss combining operations.

beginning, but it is just a beginning. Given the necessary things with which to work, the Experiment Station staff can reasonably be expected to develop at Rosemount the best station of its kind anywhere in the country. We need the cooperation and interest of every citizen of the state toward making that dream come true."

That statement is still true—land alone does not make an experiment station. The Legislature has provided a reasonable amount of money for the operation of the Rosemount Branch. Over a period of years, more money will be needed for building purposes.

The Station staff wants to develop the best station in the country, but now and in the future, we do need the cooperation and interest of every citizen of the state.

\*\*\*\*\*

The Rosemount agricultural branch is one of many the University maintains throughout the state in order to conduct research under widely different conditions.

## Purebred Prices . . .

(Continued from page 7)

purebred beef or dairy cattle during that year. This may have been because slaughter steer prices advanced sharply to an all-time high during the late summer, while butter prices also were relatively high during the winter, spring, and summer. Sharp declines in prices both of beef steers and butter did not occur until late in the year.

On the other hand, it may have been caused by net farm income remaining high compared with purebred cattle, even after the slight decline in net farm income in 1948. In the past we have found that a severe or prolonged decline in net farm income is likely to be followed by a decline in purebred cattle prices.

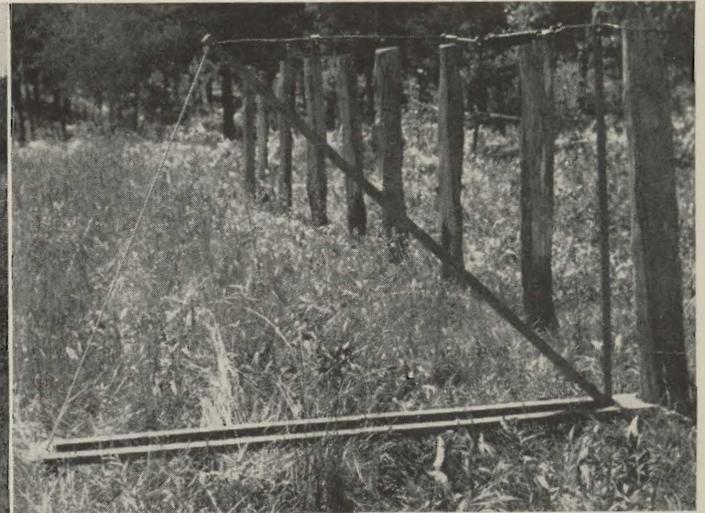
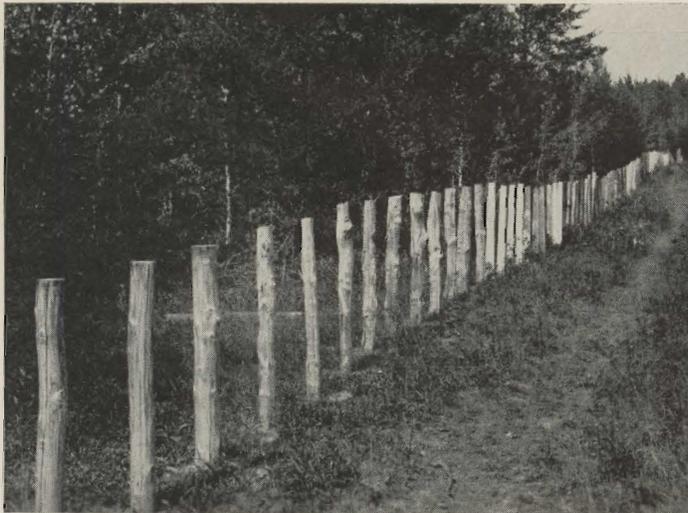
Farmers should remember that a purebred beef or dairy animal is worth what it will earn during its useful life plus its slaughter value at time of disposal. Its true value is likely to differ greatly from its sale price either during a boom or depression.

Milking parlor plan being tested.



University hog breeding work will center at Rosemount.





Fence post grave yards (left) and strength-testing devices (right) are important "tools" in the University fence post research program.

# How Long Will Your Fence Posts Last?

C. H. CHRISTOPHERSON and  
F. H. KAUFERT

**D**URABILITY TESTS of fence posts are usually made in what we call "fence-post grave yards." Here, posts of different types are tested annually or periodically to determine their strength or serviceability. Closer comparisons can be made during tests than when posts actually are set in fences.

University test plots have been established at the Cloquet Experimental Forest, University Farm, Zumbra Heights, and the Southeast Experiment Station at Waseca. These test plots offer soil and moisture conditions which vary from a very light, sandy soil at Cloquet to a black loam with clay subsoil at Waseca. Thus, they afford a range of exposures so necessary in correctly judging the durability or serviceability of posts for use in Minnesota.

We are now testing more than 5,000 posts including:

*Untreated posts of 21 species native to or at present growing in Minnesota.*

*Posts of eight of the more abundant and available species treated with a number of different preservatives applied by different treating procedures.*

*Steel posts.*

*Concrete posts.*

The strength of the posts is tested annually or periodically by exerting a 100-pound horizontal pull on each post 4 feet from the ground.

If the post does not break when tested, it should be strong enough to withstand the average load in a fence line and is considered to be serviceable for an added period.

Strength failures in untreated posts of such nondurable species as aspen or basswood are high, and few posts may remain in tests after a few years. On

the other hand, posts of such durable species as northern white cedar and white oak may still be serviceable after 12 to 15 years, and preserved wood posts as well as steel and concrete posts are expected to withstand the test loads for 25 years or more.

### Natural Durability

We have always recognized that the heartwood of such native species as northern white cedar, white oak, bur oak, and eastern red cedar is very durable. Consequently, these common trees meet with favor when available.

An actual comparison of the durability of fence posts of these and other Minnesota woods, however, was not made until 1934, when a study was begun by the Division of Agricultural Engineering.

These tests will not be completed for several years. However, their results (table 1) when combined with the information available from individuals, railroads, and other states will tell us what woods are best for posts.

Our native woods can be classified as having durable, medium durable, and nondurable heartwood.

Within each group, especially in durable heartwoods, larger posts usually last longer because they contain more heartwood. This difference in size and amount of heartwood accounts for most of the difference in durability or serviceable life of such posts as cedar. Small cedar posts with top diameters of 3 inches may last only 5 to 8 years, while large cedar posts with top diameters of 6 inches may last 25 years.

The species of trees in each durability group are as follows:

**Durable (15 to 25 years)**—large northern white cedar; large split white and bur oak; and black locust.

**Medium durable (7 to 15 years)**—medium-sized and small northern white cedar; small and round white and bur oak; large tamarack; large split red oak and red elm; rock or cork elm; large jack and red pine; butternut; Kentucky coffee tree; and honey locust.

Table 1. Serviceable Life of Untreated Fence Posts

Year Set	Kind	No. Set	No. Left	Life in Years		Remarks
				Average	Range	
1934	Aspen	30	0	4.2	2 to 7	All posts gone in 10 years except one.
1934	Jack pine	30	1	4.4*	2 to 15*	
1934	Red pine	30	0	4.2	1 to 10	All posts gone in 13 years except one.
1934	Tamarack	30	1	8.5*	4 to 16*	
1934	Red elm	30	2	10.7*	5 to 16*	All posts gone in 13 years except one.
1934	Red oak	30	9	?	7 to ?	
1934	Bur oak	30	22	?	5 to ?	No failure in 10 years.
1934	White oak	30	23	?	9 to ?	
1934	White cedar	30	19	?	10 to ?	
1939	Black locust	30	30	?	?	
1939	Butternut	20	18	?	7 to ?	
1939	Green ash	20	0	6.6	3 to 10	
1943	Kentucky coffee	20	18	?	5 to ?	
1943	Honey locust	20	20	?	?	No failure in 6 years.

\* Estimated life, assuming one additional year for remaining posts.

Table 2. Service Life of Posts Treated with Creosote

Species	Treatment	Average service life (years)
Basswood	Creosote—cold soaking	21
Basswood	Creosote—hot-cold bath	32
Cottonwood	Creosote—hot-cold bath	30
American elm	Creosote—cold soaking	11
American elm	Creosote—hot-cold bath	32
Silver maple	Creosote—hot-cold bath	28
Red oak	Creosote—hot-cold bath	33

**Nondurable** (1 to 7 years)—aspen and cottonwood; small jack pine, red pine, and tamarack; small red oak, red and rock elm; green and black ash; basswood; paper birch; American and Siberian elm; hard, red, and soft maple; ironwood; hickory; and box elder.

It may seem strange that untreated posts of a single species, such as northern white cedar, can vary in durability from 5 to 25 years. However, it is only the heartwood or dark inner wood of cedar that has natural durability. The outer, light-colored wood or sapwood is no more durable than the sapwood of basswood. Consequently, the larger the post and the higher the heartwood content, the longer the post will last.

#### Durability of Treated Wood Posts

As early as 1909, tests were made to determine the serviceable life of treated fence posts. Most of these posts were of our nondurable species and were treated with creosote by cold-soaking and by the then newly-developed hot-cold bath process. These service tests were continued until 1937.

How effective these preservative treatments were in increasing the service life of nondurable species (table 2) is evident when one considers that without preservative treatment, such posts rarely last longer than five years.

The high cost and difficulty of treating with creosote stimulated additional work when a promising new chemical, pentachlorophenol, became available around 1940. In 1942, the Division of Forestry treated 100 posts each of jack pine, aspen, cottonwood, black ash, paper birch, red oak, and bur oak with a 5 per cent fuel oil solution of pentachlorophenol by cold soaking for 24 or 48 hours and then installed these posts in service tests. Since 1945, another 1,000 posts have been placed in service tests after being treated with this preservative, with chromated zinc chloride, and with several other promising preservatives.

Although it is too early to draw conclusions on these newer tests, the results to date do indicate that a 5 per cent solution of pentachlorophenol in fuel oil or other solvents is about as

(Continued on page 16)

# Minnesota Farmers Spend One Week Each Year Fencing

S. A. ENGENE  
and J. R. NEETZEL

**S**EVENTY-TWO HOURS—one work week out of every year—is what the average Minnesota farmer spends in building and repairing his fences.

He will have about 720 rods of fencing and about 720 posts on a quarter-section farm. He replaces from 50 to 75 posts each year, as well as a considerable amount of wire fencing and materials.

#### Fencing Big Business

On a statewide basis, fencing is big business. Minnesota farmers have about 150 million fence posts standing on their farms. They probably replace at least 10 million of these each year.

These same farmers spend about 15 million man hours to build, repair, and replace their fences—it's enough work to keep at least 5,000 men busy throughout the year.

Information about fencing is relatively meager. These figures are only approximations. In 1936, the Forest Survey estimated that about 150 million posts were in use on Minnesota's farms. This estimate was based upon sample areas measured in various parts of the state by the Lake States Forest Experiment Station at University Farm.

#### 4.5 Rods Per Acre

A similar estimate was obtained from farm management research studies conducted in the state. Data obtained on farms in three sections of the state are summarized in the following table.

The number of rods of fencing was similar for all three areas—about 4.5 rods per acre. With about 33 million acres in farms in Minnesota, that means

about 150 million rods of fencing and about 150 million posts.

The farmers who supplied these data also kept records of the time spent in building and repairing fences. They averaged an hour a year for every 10 rods of fencing. One-quarter to one-third of this time was spent in building or rebuilding fencing, and the rest was used for repairing.

Rotting posts account for much of the time spent in repairing and rebuilding fences and much of the cost of fencing material.

#### Wood Posts Last 10-15 Years

The average life of wooden posts is probably between 10 and 15 years. Many last only a few years. Since the wire wears for a considerably longer time, the rotten posts are replaced without tearing down the fence, and this is time-consuming work.

The repaired fence is frequently not as tight nor as solid as the farmer wants, and often the wires are broken in the process of replacing the posts.

Many farmers use steel posts to prolong the life of their fences. Although only a few Minnesota farms are fenced by treated wood posts, farmers in other states have used them successfully.

#### Wood Posts Could Last 25 Years

With modern methods of treatment, wood posts can be made to last for 25 years or more. The original cost of the treated post is higher than the untreated, but the life is longer and much repair work is avoided.

Treated posts of small diameter can be used successfully, and these simplify the problem of setting the posts. Three-inch posts will serve for many needs, making it possible to use small timber that might otherwise be worthless.

Rods of Fencing per Farm and per Acre

	Stevens County	Winona County	Nicollet County
Year .....	1932	1935	1941
Number of farms .....	22	21	26
Acres per farm .....	348	322	210
Rods of fence per farm			
Barbed wire .....	754	856	652
Woven wire .....	720	746	202
Electric .....	0	0	100
Total .....	1,474	1,602	954
Rods of Fence per acre .....	4.24	4.98	4.54

# Is Our Ground-Water Supply Vanishing?

P. W. MANSON

**D**ON'T BE ALARMED by those stories that farm drainage is using up our ground-water supply or changing the pattern of our rain and snowfall. There is no scientific evidence to prove this.

Whenever there is a dry spell—whether it be for weeks or for years—the same old stories arise. Farm drainage is accused of lowering the ground-water table to exaggerated depths. Going even further, some of these critics claim that drainage causes drouth. During wet years these charges are temporarily forgotten.

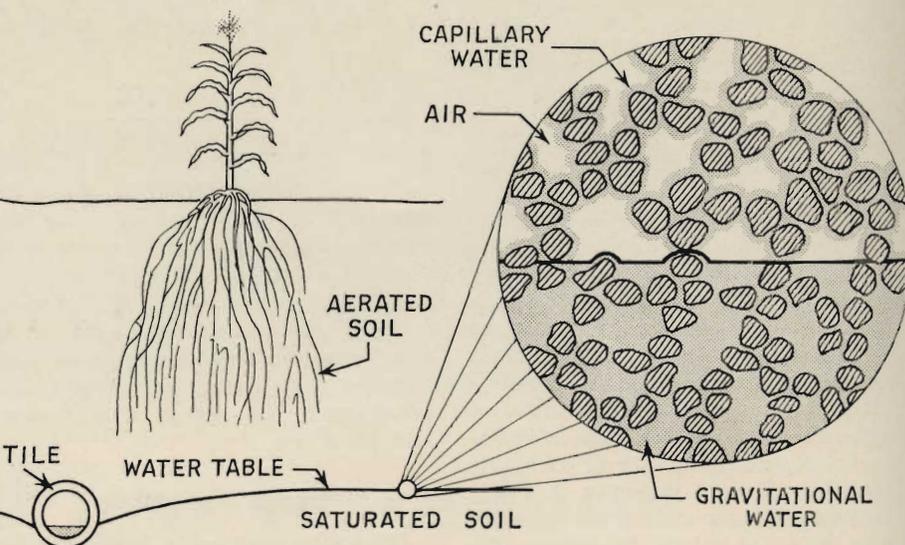
If we follow well-established water conservation practices, there is no need for alarm. Geologists report that for the country as a whole there is no progressive decline of the water table.

## Our Water Problem

Precipitation (rain and snowfall), climate, and topography combine to make Minnesota a state of not too plentiful water. In addition, little water flows into our state from outside.

However, our average precipitation, if it comes when and where it is needed, is enough to bring top crop yields and to maintain our lakes.

Minnesota averages 25.4 inches of rain and snow each year. About 21 inches of this will be lost by evaporation and transpiration (water the plant uses). The disposition of the remaining 4 inches is through runoff and deep seepage, thus serving to replenish our ground water and lake levels. Successive dry years inevitably reduce ground water and lake levels, and cut crop yields. Likewise, normal precipitation soon recharges soils and raises lake levels.



This enlarged section of soil shows the difference between capillary and gravitational water discussed below.

## Drainage Does Not Cause Drouths

First, let's answer the charge that drainage causes drouths.

The annual precipitation chart for the Twin Cities, covering 112 years, shows no connection between drainage and precipitation. Many of our severest drouths occurred where drainage has not been widespread or before drainage was common.

There is further evidence, too, that dry weather is not new. Records from the nation's oldest weather stations and precipitation records based on tree-ring charts dating back over 500 years definitely prove this.

Long-time precipitation records also indicate that there are certain sections of the country where dry and wet years tend to run in series, not cycles. Such series, however, are so unpredictable that we cannot forecast dry or wet periods.

## Theory of Farm Drainage

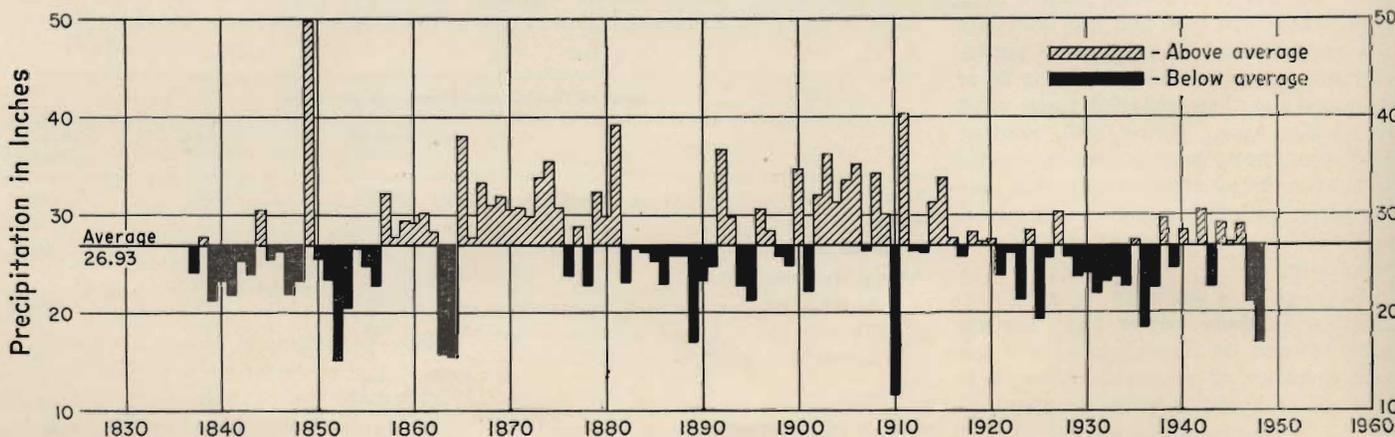
The purpose of drainage is to control soil moisture to increase yields and to improve crop quality by removing harmful water from the upper 3 to 4 feet of the soil as quickly as is economically possible.

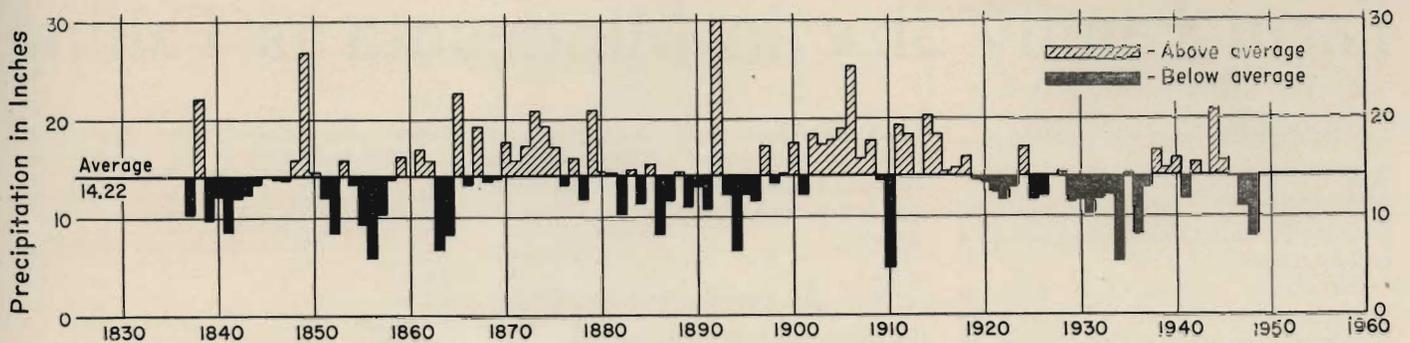
To make this clear, we must explain our three types of soil water:

1. Hygroscopic—the water held so tightly by the soil that plants can't use it.
2. Capillary—the water that forms a thin film around each soil particle. This film of water carries the plant nutrients and is available to the plant when there is no gravitational water present.
3. Gravitational or free—the water in excess of the capillary water. It is harmful to plant growth and will collect as free water in an open hole.

Ground-water levels are measured by the distance from the ground sur-

Annual precipitation, 1837-1948, at U. S. Weather Bureau Station, Minneapolis.





Crop season precipitation, May-August, 1837-1948, at U. S. Weather Bureau Station, Minneapolis.

face to the water surface in a hole. Ground-water levels in Minnesota generally range from the ground to a depth of about 10 feet.

#### Drainage Removes Harmful Water

Artificial drainage does not disturb the useful (capillary) water so essential to plants. It only removes the harmful (gravitational) water.

Therefore, mineral soil suited to farming cannot be overdrained. In fact, during a drouth, a properly tile-drained soil will generally produce better crops than a similar soil not drained.

A completely saturated, heavy loam soil may contain the equivalent of 6 or more inches of water per foot of soil. Of this, only ½ to 1 inch is free water that can be removed by drainage. Saying this another way, a ½-inch rain, falling on a heavy soil loaded with capillary water, may cause the water table to rise about 1 foot.

Another point to remember is that the beneficial effect of a tile line or an open ditch on a saturated soil will seldom exceed 50 to 100 feet on either side of the drain.

#### Drainage Important to Conservation

Besides improving the soil-moisture condition in the root-zone area, farm drainage today is an important part of our soil and water conservation program.

By improving the yields from flat, wet acres, the slopes where erosion is serious can be planted to soil-saving and water-conserving cover crops.

#### Effect of Drainage on Ground Water

Most drainage systems are in the low and flat part of fields. Very little of the water standing in these low areas seeps through the tight subsoils to become deep soil water. Most of the water for our deep wells (several hundred feet or more) comes through lighter and more porous upland soil or through the porous layers that outcrop at the ground surface and are not sealed by a water-tight layer of fine soil.

Actually, only a small part of these upland soils are drained. Only about 5 per cent of the whole Mississippi River basin is in drainage enterprises.

The University of Minnesota Division of Agricultural Engineering has studied ground-water elevations relative to farm drainage in Minnesota for more than 30 years.

These investigations show that the ground water does not drop rapidly below the tile level. Below tile depths, there is no difference in the rate of drop for drained or undrained plots.

For example, water-table readings were taken last June on a Webster soil in south-central Minnesota. These show that the water table during a dry period, at a depth just below the tile (3.5 feet), was dropping about 1 inch per week both on the drained and undrained plots. This is equivalent to a layer of water 1/25-inch thick.

At greater depths, the water-table recedes very slowly because of low evaporation and transpiration. Most subsoils are tight and do not allow much water through. The water movement is rapid enough to provide deep soil water only in open, porous soils where drainage is not needed.

Rain and snow are disposed of by surface runoff, sub-surface runoff, evaporation, transpiration, and deep seepage. If artificial drainage appreciably decreased deep seepage, then runoff from drained areas would be greater than before drainage.

#### Iowa Studies Cited

However, a thorough study by Sherman M. Woodward and Floyd A. Nagler of the University of Iowa indicated otherwise. The study included 10,000,000 acres in the Des Moines River watershed (takes in part of southwest Minnesota) and 2,000,000 acres in the Iowa River watershed. The drainage operations on these watersheds included building tile drains and open ditches and some straightening of stream channels.

One-third of the total area was drained. In the Des Moines watershed, 4,000,000 acres received 67 per cent of

complete drainage, and 2,700,000 acres were completely drained. The monthly precipitation for this study ranged from 0.88 inches to 9.95 inches.

The authors concluded that during flood periods there has been no significant change in the behavior of these two streams which may be attributed to drainage.

**The total runoff from storms of like precipitation, the maximum rates of discharge, and the rain-water storage conditions within the basins seem to have been unaltered by extensive drainage.**

This research definitely indicates that the drainage of large areas of farm land similar to southern Minnesota or northern Iowa does not materially affect the water storage rate of the area.

There are a few exceptions such as isolated swamps, ponds, or small lakes, which are so perched on, or near, porous soils that they may have appreciable effect on the surrounding ground water. Likewise, drainage ways installed near open bodies of water can lower the level of the water if the surrounding soil is porous.

In addition to ground-water investigations in the farming areas of Minnesota, automatic water-stage recorders were installed in the peat areas of Aitkin, Beltrami, and Roseau counties.

These studies, like others, indicate a close connection between the height of the ground-water table and precipitation. Except under unusual conditions, low or high ground-water levels fluctuate with the amount of rain and snow. Lake levels and ground-water table levels in northern Minnesota have been high this past season. We have had normal to heavy precipitation.

Since Minnesota does not have too much rain and snow, we must observe water-conserving practices that will tide us over water shortages during dry spells.

Much deep-well water is now pumped for cooling purposes in large cities. This water is then discharged as surface

(Continued on page 15)

# Farm Family Size in Minnesota is Falling

DOUGLAS G. MARSHALL

**M**INNESOTA farm families are having only half as many children now as they did back in 1875.

The size of families of all religious groups and nationalities is actually declining in Minnesota, some much more than others.

German-Catholic farm families have been the largest in Minnesota during most of our history. Religion, probably more than nationality, explains this fact.

We reached these conclusions as a result of studying the changes in the size of farm families in five selected townships in Minnesota from 1875 to 1940. Actually this was a part of a broader study on farm population in which we hope to find the answers to such questions as major causes of death and who migrates from rural Minnesota.

The purpose of the investigation was to find out what part religious and nationality background have in the size of the farm family. To make the study, we selected five townships with definite religious and nationality backgrounds. These were:

**Clearwater** in Wright County, predominately Anglo-American. In fact, this township is the most nearly Anglo-American area we could find in Minnesota.

**Norway** in Fillmore County, obviously Norwegian.

**St. Martin** in Stearns County, German Catholic.

**Vasa** in Goodhue County, Swedish.

**Young America** in Carver County, German Lutheran. This township was selected to compare the size of German Lutheran families with those of German Catholics.

To measure the size of farm families, we used what sociologists call "effective fertility ratio." This simply is the number of children under five years of age, per thousand rural-farm females aged 15 to 49—the child-bearing age

group. Fertility ratio here does not refer to the actual ability of farm families to have children but rather to the actual number of children they do have.

## All Families Smaller

Comparing 1875 with 1940, we found a decline in the "effective fertility ratio" in all five townships. However, in some it has been much greater than in others.

The German-Lutheran township declined the most, nearly 65 per cent since 1875, followed by the Norwegian, 58 per cent; German-Catholic, 40 per cent; Swedish, 35 per cent; and Anglo-American, 22 per cent.

Very clearly, then, the farm family size in these areas has fallen in widely differing amounts. The drawing below shows how it dropped steadily from 1875 to 1940.

## Catholics Dropped Less

If we compare the two German townships, with religion as the varying factor, we also find a different decline. Apparently, religion is a factor when nationality is the same. The size of Catholic families fell only half as much as that of the Lutherans.

In 1875 the German-Lutheran group rate was nearly as high as that of the German-Catholic group, but it has dropped more rapidly than the German Catholic since then.

It should also be pointed out that even though the Anglo-Americans declined the least, their rate in 1875 was relatively low. In other words, the German Lutherans and the German Catholics began with larger families than the others.

## How They Ranked

The German-Catholic township, St. Martin, has held a relatively high rank all the time (table 1), even though it has dropped 40 per cent.

Table 1. How Different Groups Ranked, from Largest to Smallest, in Size of Families in Selected Townships, 1875-1940.

Areas	Years							
	1875	1885	1895	1905	1910	1920	1930	1940
Anglo-American	5	5	4	4	5	5	2	3
Norwegian	3	4	2	3	3	2	5	5
German								
Catholic	1	1	1	2	2	1	1	1
Swedish	4	3	5	5	4	4	3	2
Lutheran	2	2	3	1	1	3	4	4

The German-Lutheran group held a persistently high rank until about 1910 and then started to drop off very rapidly to fourth place in both 1930 and 1940. This group fell the greatest amount over the whole period.

The Swedish group in Vasa Township has moved slightly upward during the period covered. It was in fourth place in 1920, third in 1930, and second in 1940.

The Norwegians reached their peak about 1920, and then declined rapidly to fifth place in 1930 and 1940.

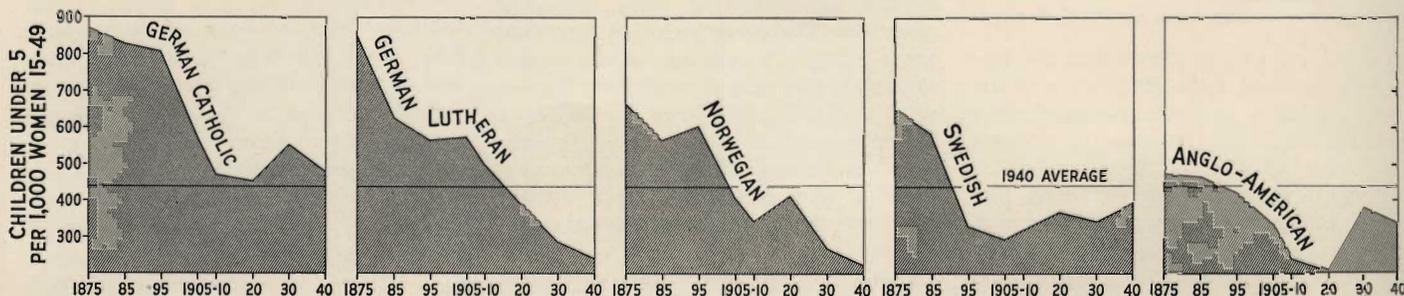
The Anglo-Americans in Clearwater township were in fifth place until about 1920. By 1930 they had jumped to second place and in 1940 dropped to third place.

It is well to point out here that the predominantly Anglo-American population shifted decidedly between 1925 and 1930 when many German Catholics from Stearns County moved into Clearwater Township.

This may partially account for the sudden increase in the ratio in the township between 1920 and 1930, and so we cannot generalize too broadly from the figures for Clearwater Township as a distinct nationality group after 1920.

You may ask, "How do the ratios in these townships compare with other farm and city areas?" Table 2 gives the exact figures for 1940.

The average ratio for the five townships is just about the same as that of the total Minnesota farm population. This should be true because we picked



"Effective Fertility Ratio" in five Minnesota communities, 1875-1940. The black line indicates the 1940 average for all communities.

Table 2. "Effective Fertility Ratio"  
Five Townships and Selected Areas, 1940

Average five townships	437.8
Clearwater Township	446.6
Norway Township	325.9
St. Martin Township	582.8
Vasa Township	489.5
Young America Township	344.2
Minnesota	
Rural nonfarm (village and town)	343.0
Urban	239.2
Farm	431.4
Minneapolis	204.0
Rural nonfarm	357.5
Urban	227.4
Farm	409.4

four major nationality groups in four farm areas, and these areas were selected to represent the largest nationality groups in Minnesota.

These townships are also well above small towns and the nonfarm population found in the open country. Several earlier studies have already indicated that farmers have larger families than residents of small towns.

Minneapolitans have only half as many children as the average of our five townships, and only about one-third as many as the German-Catholic group in St. Martin Township in 1940.

The five townships also have slightly higher ratios than the farm average for the United States, and again much higher than the rural nonfarm and the urban sections of the nation.

The great difference among the five townships, varying all the way from 582.8 for the German Catholics to 325.9 for the Norwegians, is the important revelation of this study. The state average, which is about on a par with the average of the five townships, hides this wide difference.

In conclusion, from this study we can see that both religion and nationality are important factors in determining the size of farm families.

The size of farm families has declined almost steadily from 1875. Catholic groups, however, have maintained their leadership in large families, but even they have declined as well.

## Ground Water . . .

(Continued from page 13)

runoff. Soon it may be necessary to return this water to the same ground strata by closed conduits after it has been used so as not to deplete some of the deep water supplies.

The Minnesota Conservation Department is doing a notable job of controlling lake levels through the use of water-control structures. U. S. engineers are maintaining uniform stream flow through storage reservoirs. Soil conservation practices not only hold the fertile soil in place but also make possible the better use of rain.

## Feeding Potatoes . . .

(Continued from page 6)

### Marketing the Steers

The steers were sold on June 2, at Grand Forks, North Dakota. The following tabulation of prices received will give a comparative idea of the range in grades of the steers in the respective lots.

Price per hundredweight	Lot 1	Lot 2	Lot 3	Lot 4
	(Number sold)			
\$23.00	1	1	2	.....
\$24.25	1	.....	.....	.....
\$24.50	.....	3	1	.....
\$24.75	.....	.....	.....	4
\$25.25	3	2	3	1
\$26.00	1	.....	.....	.....
Average dressing				
per cent	57.31	57.27	56.55	55.82
Carcass grades				
Choice	2	1	.....	1
Good	1	3	3	4
Medium	3	3	3	.....

This feeding trial resulted in the following conclusions:

1. A ration of farm-grown feeds with a protein supplement produced satisfactory gains.
2. Steers fed grain and good quality roughage were slightly better finished than similar lots fed potatoes and limited grain.
3. The steers fed whole potatoes made cheaper gains than the grain-fed steers.
4. It is not profitable to slice potatoes for fattening cattle.
5. Whole potatoes and a good quality roughage had a feeding value of 39.3 cents per hundredweight. Substituting oat straw for a better quality roughage, the potatoes had a feeding value of 55.8 cents per hundredweight.
6. A cheap class of roughage appears to be entirely suitable with a full feed of whole potatoes in rations for fattening cattle.
7. The kind of steers fed potatoes in this experiment generally produced satisfactory dressing percentages and carcass grades.

### Farm and Home Science Honored

Our magazine has been ranked near the top in its field in the annual competition of the American Association of Agricultural College Editors. This group awarded a red ribbon to the magazine, placing it among the top half-dozen in the nation.

## Variant Pullorum . . .

(Continued from page 5)

to prepare a single testing agent. Such an antigen is called a "polyvalent" or mixed antigen, and is showing considerable promise in detecting both forms of the disease when it is used in conducting rapid whole-blood agglutination tests.

Specialists are also investigating the efficiency of an antigen prepared from recently isolated pullorum strains which occasionally show the properties of both standard and variant types.

The variant type of pullorum has been encountered at least once in 50 of Minnesota's 87 counties. Of the 453 outbreaks of pullorum disease among chickens verified in the University's Diagnosis Laboratory during the last 2½ years, approximately one-third have been of the variant type.

Seventy-nine outbreaks of the disease were diagnosed in turkey poults during the same period, and approximately 13 per cent of these were of the variant type.

Only rarely were both types of the disease diagnosed from the same outbreak. On the other hand, certain flocks have yielded either the standard or the variant type consistently during the period of this survey.

### Conclusions

The University studies show us several important facts:

1. Variant pullorum disease has been found widely distributed in Minnesota. However, the standard type has been encountered much more frequently.
2. If the present pullorum-control program is to be effective, the variant type of infection must be taken into consideration.
3. Standard antigen has done, and is continuing to do a good job of eradicating the standard type of pullorum disease. This standard antigen, however, is not effective in eliminating the variant type of pullorum. Infected birds must be examined in the laboratory to determine with certainty whether or not variant pullorum is present in a flock.
4. The wide and indiscriminate use of variant and polyvalent antigens is to be discouraged at this time, because confusing "pin-point" or non-specific reactions are more frequent with these antigens.

Furthermore, variant and polyvalent antigens should be used only in flocks where the variant pullorum is known to be a problem.

For a free list of University bulletins for farmers and homemakers, write the Bulletin Room, University Farm, St. Paul, 1.

# Artificial Lighting for Hogs...

E. F. FERRIN

**F**ARMERS have long been aware of the advantages of artificial lighting in poultry houses during the long winter nights—a longer “day” means more food consumed and thus more eggs.

Some specialists have recently considered the possibilities of night-lighting for growing, fattening pigs, because it is usually true that an increase in the pigs’ feed consumption results in a comparable rise in the rate of gain.

## Gains Not Established

Various reports have appeared, in fact, estimating increases in gains of pigs when lights have been used at night. Few factual reports have been made, however.

To gather data on the consumption of feeds and rates of gains, the Minnesota Agricultural Experiment Station set up a demonstration last winter. The test covered a 48-day period, from January 14 to March 3, 1949.

Before the trial began, the pigs were divided into two lots and their feeding habits were observed during the evening and early morning hours.

Many of the pigs in both lots visited the feeders and waterers after dark in the evening and before daylight the following morning. No attempt was made to clock the habits of individual pigs in the lots, but it was apparent that they consumed considerable feed during the night, even without lights.

When the trial began, the pigs were divided into lots of equal total initial weights, but the average weight per pig varied.

The division was made because it would have been poor management to feed pigs of varying ages in the same lots.

There were 48 young pigs in Lot 1 and 35 older pigs in Lot 2.

Both lots were self-fed, free-choice, shelled corn and a protein-mineral mixture of 30.67 per cent each of dry-rendered tankage, soybean oilmeal, and alfalfa meal, 6 per cent complex mineral mixture, and 2 per cent common salt.

The housing and equipment were identical for both lots, except that lights were installed in Lot 1. In Lot 1, the lights were placed both inside the pen where the pigs slept and outdoors on the feeding floor where water and feeds were always available.

To be sure that disagreeable weather would not limit the consumption of feed, other self-feeders were placed

inside the barn. A clock switch turned the lights on from 10 to 11 p.m. and again from 3 to 4 a.m.

When the lights were turned on, most of the pigs got out of their beds, ate some feed, and drank water. The feeder outdoors was equipped with metal lids over the troughs and the banging of these lids served as an alarm for pigs that were slow in arising.

After two or three weeks some of the pigs became indifferent to the lights and noise and preferred to sleep instead of eat.

Some of the pigs in the unlighted lot ate feed and drank water in the dark. It is possible that the noise of the lids of the feeders in the lighted lot aroused some of these pigs. However, they had been observed eating at night before the lights were installed in Lot 1.

**The rate of gains and feeds consumed are reported in the table below. Considering the difference in the average initial weights of the pigs, the use of artificial light did not seem to influence either the rate of gains or the feed consumed per 100 pounds of gain.**

	Lot 1	Lot 2
	lbs.	lbs.
Average initial weight per pig .....	69.8	96.0
Average final weight per pig .....	136.1	165.0
Average daily gain per pig .....	1.38	1.44
Shelled corn per		
100 pounds gain .....	334.	363.
Protein-mineral mix per		
100 pounds gain .....	56.	58.



Posts 1 (8-inch top), 2 (5-inch top), and 3 (3-inch top) were not treated, and Post 4 was treated with 5 per cent oil solution of pentachlorophenol by cold soaking for 24 hours. Ground line diameter was reduced by decay after three or four years in untreated posts. Post 4 was in perfect condition after seven years of service.

## Fence Posts . . .

(Continued from page 11)

effective as the creosotes used earlier. Posts of such species as jack pine, red pine, tamarack, black ash, and red oak, when treated with this preservative by cold soaking, should serve for 20 years or more. However, mediocre results have been obtained thus far on aspen, cottonwood, and paper birch.

Such durable fence-post species as northern white cedar, white oak, and bur oak are becoming scarce. The good results obtained with certain preservatives and processes, however, indicate a bright future for treated posts.

Because well-treated posts retain their ground-line diameter even after many years of service (figure above), smaller posts can be used. Such posts are cheaper, lighter, and easier to set.

### Steel and Concrete Posts

Two types of steel posts, galvanized and painted, and concrete posts made with a 1-2-2 mix and maximum aggregate size of ½-inch were set in 1934.

At the end of 15 years, the galvanized steel posts had neither rusted nor deteriorated. The painted steel posts lost practically all of their paint during that time, and the surfaces were rusted, after three years.

All of the steel and concrete posts have withstood 100-pound test pulls every year.

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