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MINNESOTA FARM AND HOME Science

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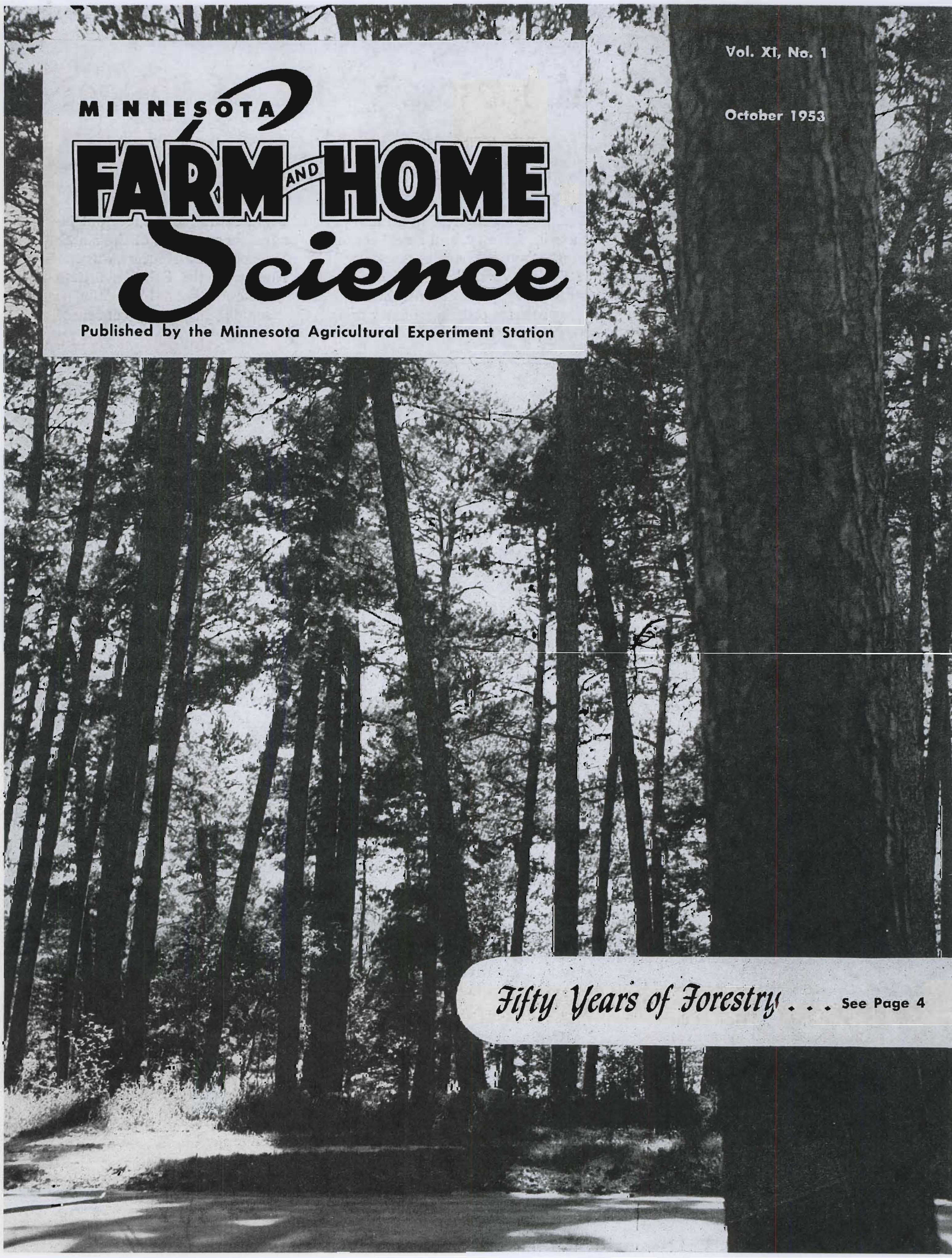

Fifty Years of Forestry . . . See Page 4

MINNESOTA FARM AND HOME Science

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

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Dean of the Institute of Agriculture—H. Macy

October, 1953

About Our Cover . . .

"But only God can make a tree," Joyce Kilmer once so eloquently wrote in his famous poem, "Trees." The beauty, satisfaction, and protection afforded by our trees whether standing alone on the prairie or in a yard or encompassed in the forest, are appreciated and enjoyed by everyone.

Our cover this issue features trees for these and many other reasons.

For one thing forests today rank fourth as a source of income in Minnesota. What's more two of every five acres of land in our state are covered by trees.

For another thing our School of Forestry is having its golden anniversary.

Just 50 years ago an enthusiastic, pioneering horticulturist, Samuel Green, became head of the newly created forestry division at the University. He had worked long and hard to make his dream of a forestry school come true. Two years later, the school had its first graduate.

Professor Green headed forestry work until his death in 1910. It was only fitting, then, when a new forestry building was built many years later, that it be named Green Hall.

Later the outstanding work of Edward Cheyney from 1910-1925, Henry Schmitz (now president of the University of Washington) from 1925-1947, and now Frank Kaufert from 1947 to the present has moved the school forward as a leader in teaching, research, and public service.

More information about forestry research conducted by the University throughout Minnesota can be found on page 4.

Minnesota's Men of Science

Editor's Note—This is the twelfth in a series of articles introducing scientists on the St. Paul Campus of the University of Minnesota. Here we present Frank Kaufert, director of the School of Forestry.

A genuine interest in building one of Minnesota's most important industries, forestry, and a real concern over the conservation of the state's forest resources have characterized the efforts of Frank Kaufert, director of the University's School of Forestry. Now with the School's fiftieth anniversary celebration scheduled during October, special attention is being focused on this industry and on the people so intimately concerned with it.

Frank Kaufert

Frank Kaufert will tell you that two-fifths of the land of Minnesota, or nearly 20,000,000 acres, is in forests; that forestry as an industry means $160,000,000 a year to the state; and that the natural beauty and soil conserving effects of trees add materially to the wealth and attractiveness of the state.

As director of the School of Forestry, it is his job to train young men in all branches of forestry—from forest rangers to wood products manufacturers. The job goes beyond that, however, in that he is responsible for helping farmers and other timber owners make our forest areas more productive and to find improved uses for forest products through practical research.

Kaufert was born on a farm near Princeton, Minnesota where he spent his boyhood. He received both his B.S. and M.S. degrees from the University. He studied for a year in Germany and then returned to the University in 1933 as an instructor. Two years later he received his Ph.D. degree.

In 1936 he left the University to become wood technologist with E. I. du Pont de Nemours, Wilmington, Delaware. In 1940 he returned to the University as associate professor and in 1942 he was granted leave to do research and instruction in war projects at the Forest Products Laboratory, Madison, Wisconsin.

He returned to the University in 1945 as professor and assistant chief of the forestry division. In 1947 he succeeded Henry Schmitz as head of the division which was later renamed the School of Forestry.

As a research worker, Kaufert has specialized in wood utilization, wood preservation, forest pathology, tree improvement, and forest management. As a result of his work 12 U.S. patents have been granted on manufacture and use of chemicals, several of which now are being used in large volume.

Kaufert is chairman of the "Keep Minnesota Green Committee." He is a member of the council of nine of the Society of American Foresters, and has been officer and director of several professional and academic societies. He is a member of Alpha Zeta, Xi Sigma Pi, Sigma Xi, and Gamma Sigma Delta.

In addition he has been the author of numerous bulletins and technical papers.

The Farmer's WORK

S. A. ENGENE and
NIELS RORHOLM

MINNESOTA FARMERS work 9 to 10 hours a day on work days and about 4 hours on Sundays and holidays. This totals 3,000 to 3,300 hours a year.

These figures were obtained from labor records kept by 30 southern Minnesota farmers in 1951 and 1952. Details as to hours worked and organization of the farms are shown in the table.

Source and Use of Labor on Farms
Southern Minnesota—1951-1952

	Dairy farms	Feeder cattle and hog farms
Number of farms	21	9
Source of labor	*Man hours per farm*	
Operator	3,296	3,065
Family	776	540
Hired	1,610	1,166
Total	5,682	4,771
Use of labor		
Crops		
Grain	256	281
Corn	348	514
Hay	252	211
Other crops	107	181
Hauling manure	148	144
Fall work	71	144
Total	1,182	1,475
Livestock		
Dairy cattle	2,365	242
Feeder cattle	36	474
Hogs	423	753
Chickens	389	276
Other livestock	71	91
Total	3,284	1,836
Miscellaneous		
Buildings and fences	432	493
Machinery and equipment	234	405
Miscellaneous	422	521
Work for others	128	41
Total	1,216	1,460
All work	5,682	4,771
	Amount per farm	
Acres in farm	190	290
Acres in harvested crops	135	222
Number of dairy cows	21.4	1.4
Pounds feeder cattle produced	775	21,042
Pounds hogs produced	22,825	50,242
Number of hens	179	166

How Long Is the Farmer's Work Day?

The number of records studied was rather small, too small to give as definite an answer as we want to the question, "How long is the farmer's work day?" However, similar results have been obtained from records kept by farmers in other areas in previous years. Here are some of those figures.

Area	Number of hours: Work days	Number of hours: Sundays
Nicollet county, 1941-45	9.6	6.0
Winona county, 1935-40	10.3	4.1
Stevens county, 1932-33	9.8	3.9
Pine county, 1925-27	9.3	4.4
Steele county, 1920-24	11.1	6.1
Rice county, 1902-07	8.9	3.6

Judging from all these figures, 9 to 10 hours a day for work days seems to be a fair average. This, however, is a shorter work day than farmers frequently estimate. At least two factors account for this difference.

First, these farmers reported only the time actually spent at work. Mealtimes, personal visiting, and so on have been omitted. It does not count the work day as being from the time the farmer starts work in the morning until he quits at night. Also, an occasional day off brings the average down.

Second, farmers differ greatly in the length of their work day. About one out of four of these farmers worked more than 3,500 hours a year—that is, 11 hours a day or more. An equal number worked less than 2,500 hours a year—that is, about eight hours a day.

The dairy farmers put in more hours a year than did the cattle feeders and hog men. Dairymen averaged about 3,300 hours a year per operator or about 10 hours a work day. The cattle feeders and hog men had less work to do during the winter. We did not get any records from cash crop farmers. They probably would have still less work in the winter.

Who Does the Work?

The farm operator did more than half of the work on these farms. On the dairy farms he worked 3,296 hours, his wife and children 776 hours, and hired help 1,610 hours. This includes only farm work; housework is omitted.

As an average, members of the family other than the operator did not do much work on these farms. On more than one-third of the farms they did scarcely any work—less than 200 hours a year. Only four of the 30 farmers studied had the equivalent of one full-time family worker.

Twelve of these 30 farmers hired a full-time man. Another 12 hired less than one month of labor during the year. Only one farmer hired substantially more than half of the labor used.

These farms, then, were clearly family farms, even though they were slightly larger than the typical farms in their community. Mechanization has enabled the farm family to handle a large amount of work.

Field work takes a small part of the farmer's time. The dairy farmers spent only 1,182 hours on crops. That is about full time for 4½ months for one man. The cattle feeders and hog farmers, with bigger farms, spent somewhat more time in the field—about six months. This includes all of the work on crops, from the time the farmer begins to prepare the land until the crop is stored.

How Many Hours Are Spent Per Acre?

Many farmers are interested in the hours spent per acre. The average amount spent on crops was 8.8 hours per acre on the dairy farms and 6.6

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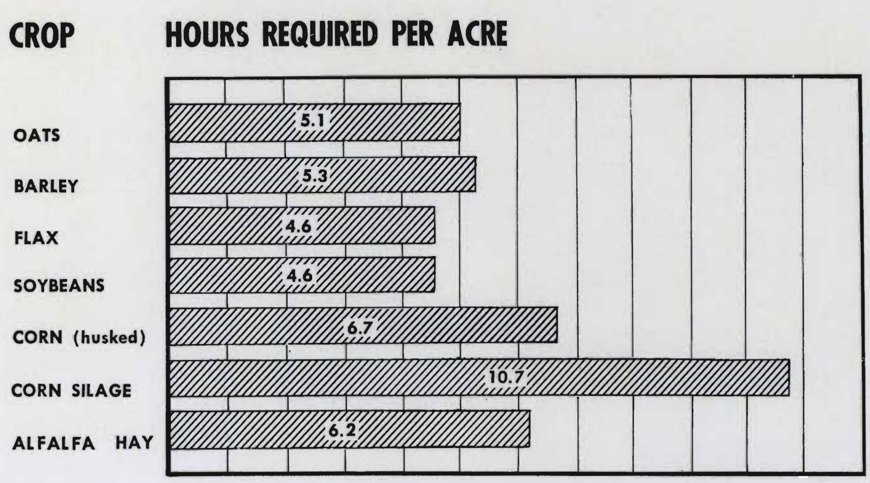


S. A. Engene is associate professor and Niels Rorholm is research assistant in agricultural economics.

Fifty Years of *Farm Forestry Research*

The School of Forestry is celebrating its 50th anniversary. Here a staff member reviews some of the research directly affecting farmers.

DONALD P. DUNCAN

UNKNOWN to you, that windbreak or that new fence on your farm may be based on experimental work done by your University's School of Forestry. Forestry problems affecting the Minnesota farmer have always been paramount in the research programs of the School.

Actually our research dates back to 1900—three years before the establishment of a full-fledged forestry curriculum—when the Chapman plantations were established at the North Central Experiment Station.

Since then the School has undertaken research problems dealing with woodlots, preservative treatment of wood fence posts, farmstead windbreaks, the use of home-grown wood on the farm, and the extent and influence of grazing on the farm woods.

Right now we're working with such farm forestry problems as Christmas tree production on the farm, a low cost wood-treating tank, farm fencing, chemical control of brush, farmstead windbreaks, and the testing of hybrid trees, seed from widespread sources, and exotic species. Working with us on much of this research are other University departments and the Lake States Experiment Station.

Farm Fencing

Farm fencing research has resulted in the establishment of a new Minnesota industry. In this industry thinning material from the forest is being used to produce smooth, straight, treated wood posts. Every year, Minnesota farmers set 12 to 15 million posts. About 150 million posts are now in use on Minnesota farms.

Our research concerns post treatment, machine setting, and improved arrangement in farm fences. Treated posts, for example, will last 20-30 years.

If all wood fence posts were treated, Minnesota farmers could save about five million dollars annually. If these posts were driven instead of being set by hand, an additional million dollars each year would be saved in reduced labor costs.

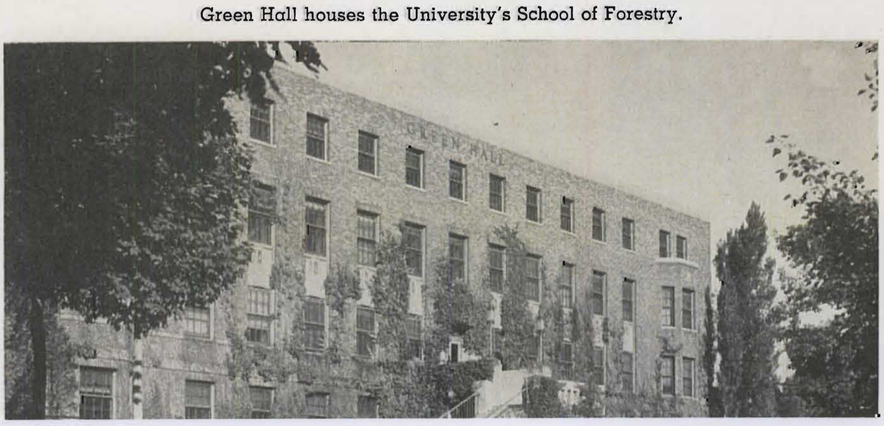
Farmstead Windbreaks

Between 1922 and 1927, more than 300 demonstration and experimental farmstead windbreaks were established in Minnesota. These marked the start of designed windbreak plantings in the state. Such designed plantings have saved 40 to 50 thousand acres of farm lands for other uses. Regular resurveys of these plantings have given us the basis for recommendations for better species selection, spacing, and maintenance. At Rosemount, experimental windbreaks of variable spacing and design are aimed at answering controversial questions still remaining.

Current research on windbreaks in the Red River Valley is directed toward learning which species are most capable of growing on severely alkaline sites.

In southwestern Minnesota, we are studying the improvement of windbreaks by thinning. We wish to discover the influence of thinning upon snow accumulation, tree growth, and tree resistance to insects and disease.

Green Hall houses the University's School of Forestry.



Poplars and Exotics

At Rochester, in cooperation with the Mayo Institute of Experimental Medicine, we have gathered some 150 selections of poplars. Of these, seven or eight show particular promise for farm use in windbreaks and for planting on bottomlands subject to periodic flooding. These grow rapidly, are resistant to disease, and some have desirable straight grain qualities. In Rochester plantings, the best selections six years after planting are 30 to 35 feet tall.

In addition to the poplar tests at Rochester, a number of exotics are being tested at Rosemount for windbreak and other planting possibilities in Minnesota. Some of the shrub species as well as some of the taller willows appear to be particularly promising. Seed of Colorado blue spruce from 14 sources is being tested for disease resistance. This tree is the best conifer for windbreak planting on the heavy soils of western Minnesota.

Farm Woods

We are doing special farm woods management research at the North Central Experiment Station at Grand Rapids to serve this section where forest land provides a very important part of the farmer's income. The Chapman plantations, now over 50 years old, are yielding information on planting returns and growth possibilities for the farm woods of that area.

The 1951-52 harvest cutting from the woodlands on the station showed a return possibility of $1.35 per hour for labor over and above stumpage returns and equipment depreciation costs. New plantings are being made there on land not suited to agricultural uses to find out if forest crops will pay on such areas.

Brush Control

Our research in the control of woody weeds or brush has state-wide implications for both the farmer and the general public, because of its importance to roadside and utility line maintenance. In 1952 alone, conservative estimates of savings on road and utility lines maintenance resulting from the chemical spraying of brush exceeded four million dollars. In addition, more than 200,000 acres of pasture, meadows, and brushlands were sprayed in 1952.

Many problems of a farm forestry nature still remain. The solution of these problems through research is one of the major objectives of the University's School of Forestry.

Donald P. Duncan is assistant professor of forestry.

How to Judge
Drain Tile Quality

Fig. 2. Broken pieces of high quality concrete tile *(A)* and low quality tile *(B)* after soaking in water 10 minutes. Light color of tile *A* shows area not penetrated by water.

CURTIS L. LARSON

THE WET WEATHER of the past few years has created a tremendous demand for tile drainage in southern Minnesota. Almost every farm in this section of the state has at least a few acres that need tile drainage. Many farmers are spending $100 to $150 per acre to turn these wet areas into productive cropland. Although this is a rather large investment, it is usually repaid by increased crop yields within a few years.

To pay its way, a tile system must be well planned and carefully installed. If you need tile drainage on your farm, have the tile system staked out and surveyed by someone qualified and experienced in this work. When you choose a drainage contractor to install the system, be sure he has a reputation for good work rather than low prices. Just as in buying a pair of shoes, the lowest price is not always the best bargain.

The life of a tile drainage system depends not only on a good job of installation but on the quality of the tile. Good quality tile are needed to withstand the effects of weather and the weight of the soil. Under certain conditions of exposure found in Minnesota, top quality tile are needed to prevent failure within a few years' time. Good quality tile sell at the same price or only slightly higher than poor tile. So why invest your money in a doubtful product?

How can you recognize good and poor quality drain tile? This is a problem which confronts most landowners planning to purchase drain tile. It's not easy, unless you've spent some time testing drain tile. You need to know what to look for in judging tile quality.

Curtis L. Larson is assistant professor of agricultural engineering.

Choose Dense-Walled Tile

The density and strength of the material in a drain tile are the main factors governing its quality. A dense-walled tile will have ample strength to support the load imposed on it by the soil and by heavy machinery. Furthermore, a dense tile will absorb only a small amount of water and harmful chemicals, such as soil acids and soil sulfates. In this way dense-walled tile resist deterioration and last longer.

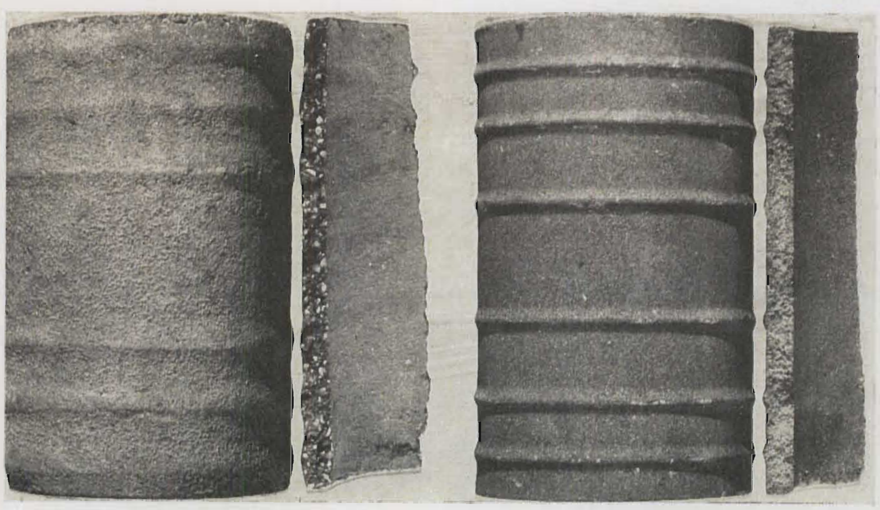
Here are a few things you can look for in judging the quality of concrete drain tile. Check these points by comparing the two tile shown in figure 1.

1. Inspect the outside of the tile. A dense, high quality tile has a sticky appearance on the outside. This is an indication that sufficient cement and water were used in the mix. A low quality tile may appear smooth on the outside, but is obviously porous. This is the result of too dry or too lean a mix.

2. Look at the inside of the tile. The inside of a concrete tile need not be perfectly smooth, but should be well sealed. If many open pores can be seen on the inside wall, the tile is very likely porous throughout and poor in quality.

3. Inspect a broken piece of the tile to determine the type of sand used in the mix. A mixture of fine and coarse sand particles with cement, properly compacted, gives the densest and strongest tile. It is very difficult to obtain the density needed using fine sand alone. In the high quality tile shown in figure 1, about one-fourth of the sand and gravel consisted of particles ⅛ to ¼ inch in size.

Aging or "curing" is another important factor in concrete drain tile. Newly made or "green" drain tile are soft and weak and will support very little load. If you are purchasing concrete drain tile, find out when they were made. Do not install them in the ground until they are about four weeks old.



GOOD QUALITY   POOR QUALITY

Fig. 1. Concrete drain tile of good and poor quality. Compare appearance of outside, inside, and broken edge of each tile.

A Test You Can Make

A simple test of tile density is to immerse a dry tile in water. To make sure it is dry, keep it in an oven overnight at about 200° F. If it bubbles vigorously in water, it is undoubtedly a porous, low-quality tile. A dense tile will give off only a few small bubbles.

To complete this test, break the tile with a hammer after it has been in water about ten minutes. With a high quality tile, such as tile *A* in figure 2, only a slight penetration of water can be seen after this test. With a porous tile, such as tile *B*, water will soak all the way through the tile in ten minutes. Drain tile of intermediate quality will have a partial or irregular penetration of water.

Drain Tile Testing

If you want to be sure of the quality of the tile you buy, ask the manufacturer if his tile has been tested recently by a testing laboratory. A good tile manufacturer has his tile tested regularly to make sure he is producing good quality tile.

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Fig. 1. About 40 per cent of the fluid milk sold in Minnesota is now marketed in paper cartons.

Changes in

Fluid Milk Distribution

C. CURTIS CABLE, JR., AND E. FRED KOLLER

IMPORTANT CHANGES in the way your milk is distributed have been made during the past 15 years. If you live near a small city or town in Minnesota, the milk which you deliver for bottling may be going to consumers 50 to 100 miles away instead of in your home town. Also your milk may be sold in paper cartons now instead of glass.

These are among the major changes found when we studied fluid milk distribution in the smaller communities of the state. This study was made in the summer and fall of 1952 and during the past summer.

Fluid Milk Sales Large

About 1.1 billion pounds of milk, or almost 14 per cent of all the milk produced annually in Minnesota, is sold for fluid use. Approximately 46 per cent of this total fluid volume is bottled and sold in the smaller towns of the state. The remainder is sold in the Duluth and Twin Cities markets.

A total of 236 dairy plants, located outside the two major urban areas, were bottling fluid milk in the summer of 1952 (see table 1). The volume of milk bottled by many of these firms was small and intended primarily for local consumption. Slightly over half of the daily output of all plants was bottled by the state's 30 largest dairies.

About 60 per cent of the total daily volume in May 1952 was bottled in glass. However, in recent years there has been a large increase in the use of disposable paper containers. Only 37 of the 236 dairies studied in the summer of 1952 had paper packaging equipment, yet their total output of cartoned milk was 40 per cent of the total milk bottled and cartoned daily by all dairies.

None of the 96 smallest dairies was using cartons in May 1952, while all four of the largest ones were packaging all or some of their fluid milk in this way.

The proportion of plant output which was packaged in paper increased as size of plant increased. For example, only 6 per cent of the total daily output of the 52 plants in the second smallest size group was packaged in paper, while about 92 per cent of the combined daily volume of the four largest plants was in cartons. Approximately 86 per cent of all milk packaged in paper came from the 17 largest volume plants which had paper packaging machines.

Sales Areas Have Expanded

Out of the 236 dairies, 75 per cent were distributing fluid milk products in outside markets (see table 2). About 93 per cent, or 50 of the 54 largest plants were distributing milk in other towns. In contrast, only half of the 96 smallest plants had expanded their distribution areas to include an outside town.

Approximately 53 per cent of the total daily milk output was distributed in towns other than the one in which it was bottled (see table 2). About 73 per cent of the milk packaged in paper and 40 per cent of the milk in glass was distributed in outside towns. The proportion of milk sold in outside markets increased as size of plants increased. Only 16 per cent of the volume of the 96 smallest plants went to outside towns, while 86 per cent of the volume of the largest plants was distributed in this way.

Of the 177 plants which were distributing in outside markets, 125 were selling in five or less outside towns, 29 in 6 to 20 towns, 17 in 21 to 50 towns, and 6 in 50 or more towns.

It was found that as plants increased in size their products were being distributed in a larger number of outside towns, including some in surrounding states. About two-thirds of the plants were selling in towns less than 25 miles away, while nine were distributing to markets as far as 100 miles away.

Reasons for Larger Market Areas

The increasing demand for pasteurized milk was an important factor in the increased sale of milk to outside towns. Compulsory pasteurization became effective in Minnesota in July 1950. Most of the producer-distributors and some of the smaller plants did not have the sales volume to justify the additional investment necessary to meet the requirements of the law. Consequently, they quit bottling and distributing fluid milk, and left their markets open to other firms.

Consumer acceptance of the paper carton also encouraged distribution in outside towns. Some firms began distributing to outside markets the same year they began putting milk up in paper, while others increased their outside volume after installing paper packaging equipment. The use of paper containers made it possible to transport larger loads of milk at lower per unit costs. The return of empty glass bottles was also eliminated. These factors made it profitable to extend marketing areas.

A third major factor contributing to the growth of marketing areas was the large investment in equipment and un-

Table 1. Milk Bottled Daily by Dairies in Smaller Towns of Minnesota by Volume of Business, May 1952

Size of plant (pounds of butterfat bottled annually)	Plants		Fluid products bottled daily		
	Total number	Number with paper machines	Glass	Paper	Both
				quarts	
Less than 25,000	96	0	50,976	0	50,976
25,000- 49,999	52	5	65,468	4,265	69,733
50,000- 74,999	34	5	79,288	6,937	86,225
75,000-149,999	24	10	57,048	29,911	86,959
150,000-499,999	26	13	106,626	107,891	214,517
500,000 and over	4	4	9,112	101,579	110,691
Total	236	37	368,518	250,583	619,101

C. Curtis Cable, Jr., was research assistant and E. Fred Koller is professor of agricultural economics.

Table 2. Distribution of Milk in Outside Markets by Minnesota Dairies According to Volume of Business, May 1952

Pounds of butterfat bottled annually	Plants		Percentage of total fluid products distributed outside daily		
	Total number	Number distributing outside	Glass	Paper	Both
Less than 25,000	96	48	16	0	16
25,000- 49,999	52	48	16	19	16
50,000- 74,999	34	31	35	7	33
75,000-149,999	24	20	49	37	45
150,000-499,999	26	26	64	75	69
500,000 and over	4	4	57	88	66
Total	236	177	40	73	53

used capacity in many plants. By bottling and packaging more milk most plants found that they could reduce unit costs. In order to sell an increased output most of the plants had to expand their sales area to include several towns.

Competition Created

The widespread expansion of fluid milk marketing areas, particularly by the larger plants, has resulted in a highly competitive situation throughout most of the state. Many plants are distributing in the same outside markets, and considerable overlapping of routes and duplication of services results. In consequence the distribution of milk in some cases is not very efficient.

A few of the plants in the state have cut prices in some outside towns in an attempt to gain a foothold in the market. Other plants which have expanded their marketing areas meet the local price in each of the outside towns in which they distribute milk. In some cases, this results in a price difference as much as two cents between towns for the same product. Many of the firms which had paper packaging equipment were obtaining one cent more for products in paper than for the same items in glass.

Many of the smaller plants have been hit hard by this intense competition. Their volume has been reduced, and financial losses have forced some to discontinue their processing and bottling operations.

Small Plant Adjustments

To meet the increased competition in their area many of the smaller milk plants are reviewing their operations to improve their efficiency, service, and quality of products. Others are meeting the competition of large central plants by handling milk packaged in paper by some other plant. This practice is an attempt to maintain store and other wholesale business. It is in these outlets that paper containers have made the greatest gains.

Some small local dealers are meeting outside competition by installing small-size paper packaging machines which have been developed recently. From data obtained in July 1953, it is estimated that the number of plants with paper packaging machines has about doubled since the summer of 1952. Approximately four-fifths of the dairies which have installed paper equipment in the last year were bottling less than 2,500 quarts daily in 1952. This makes a total of about 74 plants outside of Duluth and the Twin Cities which will be packaging milk in paper by the end of this year. The growth of paper machines in the state by years is shown in figure 1.

Although some of these small packaging machines can be purchased for less than $2,000, container costs run as high as 2.8 cents each for one-quart cartons. Also, because of the small filling capacity, labor costs for filling are as high as one-third of a cent per quart. Because of these high costs, it is likely that the plants with small paper machines may still have difficulty in meeting the increased competition in their areas.

In general it appears that the distribution of milk in outside towns is here to stay, and that some firms will continue to increase outside sales in the future. In consequence, it is likely that some of the less efficient local plants will be forced out of business.

As these changes are made some

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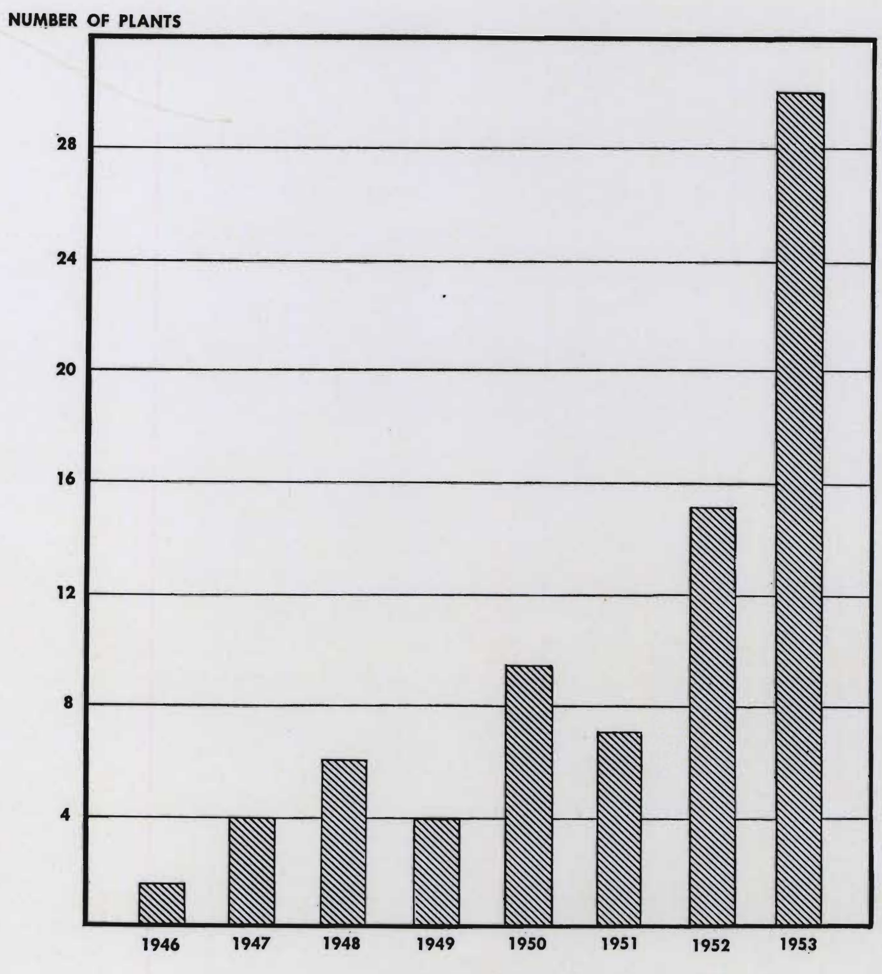


Fig. 2. Number of milk plants with paper packaging machines in smaller towns of Minnesota by first year machine was installed.

What's New in Water Systems

E. R. ALLRED

NEW PRODUCTS and equipment for water systems have been introduced during recent years. Two major developments along this line have been the introduction of submersible pumps and the use of plastic pipe for underground installation.

Submersible Pumps

As the name implies, a submersible pump is one in which the entire pumping unit is located below the water surface in the well. A typical installation is shown in figure 1. Such pumps are especially suited for those wells in which the water is relatively free of sand and have a depth greater than 60 feet.

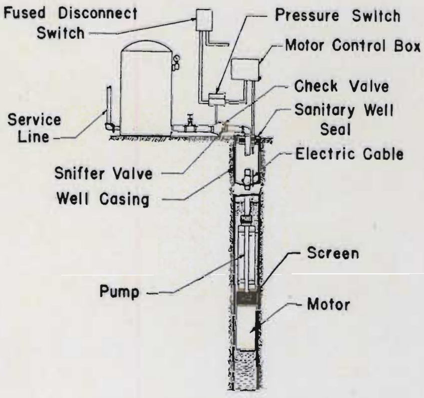
A cylindrical-shaped electric motor, located near the bottom of the well, is directly connected to the pumping mechanism by means of a short drive shaft. Water entering the pump through a screen, located immediately above the motor, is discharged into a drop pipe which extends to the ground surface. The drop pipe also acts as a means of suspending the motor-pump assembly in the well.

Submersible pumps, in the larger sizes, have been used for irrigation wells and in the oil industry for many years. Only in recent years, however, have they been adapted for use in the smaller diameter, domestic wells of the average farm and suburban home. At the present time, complete lines of submersible pumps are being made by nearly all of the leading manufacturers, and are available for use in well casings four inches or more in diameter.

Require Little Servicing

To service a submersible pump it is necessary to withdraw the entire unit from the well. Such pumps are constructed, however, to require as little attention as possible. In most models all moving parts in the motor and pump are water cooled and water lubricated.

The rotor and stator of the motor itself are completely sealed to prevent damage from moisture. If properly installed, a submersible pump should give many years of trouble-free service.



SUBMERSIBLE PUMP

Fig. 1. Diagram of a submersible pump installation.

Under certain conditions, submersible pumps have distinct advantages over other types. Since the motor and all other moving parts are located beneath the water surface in the well, the system is self-priming and pumping noises can be largely eliminated. Having no up and down movement of any parts, such as with the reciprocating pump, they can be installed in wells which are not drilled entirely straight. Also, since the motor and pump are located immediately adjacent to each other, there is a minimum loss of mechanical energy between the two. This condition results in a system having both high capacity and efficiency.

Submersible pumps are seldom used in wells less than 60 feet in depth. Because of their special construction, the cost of such pumps does not compare favorably with conventional shallow-well types. For deep well installations, however, the submersible pumps are generally found to be less expensive. According to a recent cost estimate made by a leading local distributor (for a well 150 feet in depth) a submersible pump was found to cost 16 per cent less than a reciprocating type and approximately 30 per cent less than an ejector type.

Plastic Pipe

Most plastic pipe is made from a basic compound called poly-ethylene. It was first produced in 1943 and has been used for piping since 1947. Many considered such pipe strictly a substitute for various metallic pipe. Its general acceptance by the public and the successful performance obtained from its use indicates that it has earned a rightful and permanent position in the plumbing industry. Although production has been increased tremendously in recent years, the demand in many cases exceeds the supply.

On the farm this pipe is generally used for all types of underground installations. Although complete field and laboratory tests have not been made at this time, it should be of extremely long life, since it is not affected by water and soil acids. In various counties located in southwestern Minnesota, certain underground metallic pipe is destroyed by corrosion within two years. Plastic pipe is being widely installed in these areas to meet this problem.

Saves Labor

The greatest advantage of using plastic pipe is in its saving in labor. Because of its light weight, long lengths can easily be handled by one man (see figure 2). This eliminates many of the fitting, threading, and coupling chores needed with other types.

There are two general types of plastic pipe available for farm use—the flexible pipe and the rigid pipe. The flexible type is the most commonly used at present. It comes in the standard piping sizes up to six inches. Since it has a very smooth interior surface, pumping

Fig. 2. Workman carrying a 400-foot coil of ¾-inch plastic pipe (approximate weight 56 pounds).

E. R. Allred is associate professor of agricultural engineering.

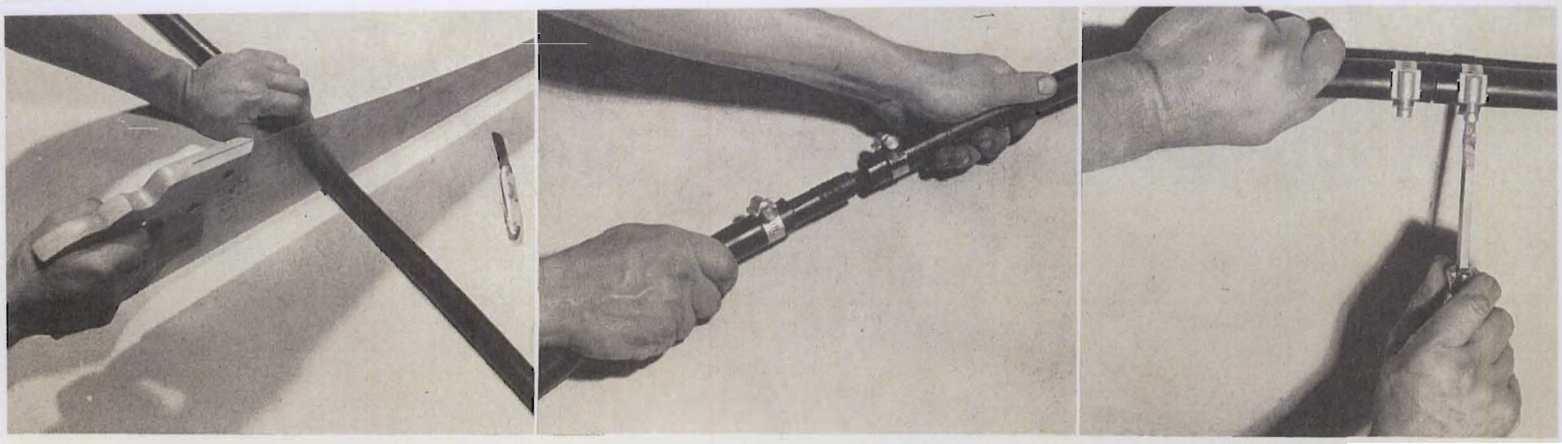


Fig. 3. To couple plastic pipe, first cut pipe to proper length. Make connection with insert-type coupler and clamps. Tighten stainless steel clamps with screwdriver.

head losses are less than for most metallic pipe.

A complete line of standard fittings is available. The pipe can be coupled to another length of plastic pipe (see figure 3) or joined to any standard size metal pipe or pump connection.

Certain precautions should be taken in handling and installing plastic pipe:

1. **Do not use it on hot water lines.**
2. **Always investigate existing building codes or other regulations that may affect its use.**
3. **Do not install plastic pipe where it has prolonged exposure to direct sunlight (such exposure will eventually weaken the material.).**
4. **Snake the pipe one foot or more per hundred feet of trench to allow for contraction.**
5. **Run cold water through the line, prior to backfilling, to allow pipe to contract.**
6. **Take care in backfilling to be sure that large and sharp-edged rocks do not damage the pipe.**

The cost of plastic pipe compares favorably with other types. It is considerably lower in price than copper pipe and approximately the same as galvanized pipe in price per foot. The greatest saving in its use is realized, however, in labor, rather than the cost of the pipe itself.

The Farmer's Work . . .

(Continued from page 3)

hours on the feeder cattle and hog farms. The larger, more nearly level fields on the feeder cattle and hog farms account for a good deal of the difference between these two groups of farms.

The average hours of labor used to raise and harvest an acre for each of the principal crops on these farms are shown in the figure.

How Many Hours Per Head of Livestock?

Livestock work took a large part of the farmer's time on the dairy farms. The dairy cattle alone took more than two-thirds of one man's time. The hogs and chickens brought the livestock chore time up to 3,284 hours. This is almost equal to the total hours worked by the operator during the year.

Livestock chores took less time on the feeder cattle and hog farms. These livestock take much less care in proportion to the feed consumed. In fact, the cattle feeders and hog men spent only slightly more than half as much time on chore work as did the dairy farmers, even though they had more livestock, as shown by the fact that they fed one-third more feed.

The average amount of time to take care of one unit of the various kinds of livestock on these farms was:

One dairy cow—102 hours per year

One head of young dairy stock—18 hours per year

Feeder cattle—2.1 hours per 100 pounds gain

Hogs—1.7 hours per 100 pounds gain or 4.2 hours for a 250-pound hog

One hen—2.0 hours per year

The crop and livestock work is the most important work because it brings direct income. The farmer, however, has other jobs—jobs that contribute to the income only indirectly. Buildings and fences must be maintained, machinery must be repaired, and he has farm shopping to do.

These farmers spent about as much time on this miscellaneous work as they did on the field work. It is an important part of the farmer's work day, and yet a part he must hold to a minimum in order to have adequate time for the crops and livestock.

Drain Tile Quality . . .

(Continued from page 5)

Drain tile tests are made by the Department of Agricultural Engineering at University of Minnesota and by other testing laboratories. Two tests are made on each of five tile of any one size. The first is a test for breaking strength or the load they will support. The second is for density or "absorption," which is the amount of water that a tile will absorb.

Certain standards of breaking strength and absorption have been set up by groups interested in good drainage practice. There are two grades of drain tile, Standard and Extra-Quality. To be rated as Standard, concrete drain tile must have a breaking strength of 1,200 pounds or more per foot of length. They must also have an absorption of 10.0 per cent or less.

For ordinary conditions of exposure, drain tile should be of Standard quality. The Production and Marketing Administration now requires that drain tile be of Standard quality if a drainage job is to be eligible for conservation payments.

To be rated as Extra-Quality, concrete drain tile must support at least 1,600 pounds per foot and have an absorption of 8.0 per cent or less.

Extra-Quality drain tile should be used for exposure to harmful soil conditions or for installation in unusually deep trenches. For very deep cuts or for severe soil conditions, additional precautions may be necessary.

Fluid Milk . . .

(Continued from page 7)

farmers supplying small local plants with their fluid milk may lose their outlets. Other dairy farmers located near the larger plants will have opportunities to shift from the sale of milk for manufacturing purposes to more favorably priced fluid uses.

What Is the Future for Small Towns?

LOWRY NELSON

"OUR COMMUNITY of 350 people," writes the secretary of the Chamber of Commerce, "is steadily losing trade to Blanktown, 10 miles away. Our population declined by nearly 15 per cent between 1940 and 1950, while Blanktown grew by over 35 per cent and now has 4,000 people. Is there anything we can do to keep our town going?"

There is no easy answer to this question. Moreover, there is no public service available to the small town, such as is provided for the farm population. The small town at present is going to have to sink or swim, depending upon the turn of the wheel of fortune and on the initiative and ingenuity of its local inhabitants.

But meantime, it may be of interest to examine the population trends of small centers according to their size. First off, it may be worth noting that the figures apply only to incorporated places; although it should be borne in mind that there are many more unincorporated hamlets than there are incorporated places.

However, Minnesota seems to be one of the most "incorporated" states in the Union. (In 1952, it had more government units—villages, townships, cities, counties, and special districts than any other state.) Thus many small places under 250 inhabitants, which would probably not be incorporated in other states, are incorporated in Minnesota.

The relation to size and whether or not a place lost or gained in population from 1940 to 1950 is shown in table 1.

Small Places Lose Most Heavily

It is quite evident from these figures that the smaller places lose most heavily. More than half of those with less than 250 people in 1940 had fewer by 1950. And of those with from 250 to 500 in 1940 over a third declined during the 10 years. Losses were heavy among all the centers under 1,000 population. Those with from 2,000 to 2,500 did not hold up as well as the larger places up to 25,000, but it appears that once a place reaches the 2,000 mark it has a good chance to hold its own.

Yet in spite of the fact that so many of the small places lost population, there were actually more people living in such places in 1950 than in 1940. This is because there were a number of new small places incorporated during the decade. Of 39 newly incorporated places 25 were under 250 population and five were from 250 to 500. The numbers and proportions of Minnesota's population living in the different-sized places are shown in table 2.

Table 1. Number of Incorporated Places in 1940, by Size, Which Gained or Lost in Population by 1950

Size of place	No. of places 1940	No. which gained 1940-50	No. which lost	Per cent which lost
Under 250 ...	201	95	106	52.7
250- 499	196	127	69	35.2
500- 599	149	107	42	28.2
1,000- 1,499	63	53	10	15.9
1,500- 1,999	37	30	7	18.9
2,000- 2,499	18	16	2	11.1
2,500- 4,999	34	29	5	14.7
5,000- 9,999	29	26	3	10.3
10,000-24,999	11	10	1	10.0
25,000 over ...	4	4	0	0.0
Total	743	497	245	33.0

Are the cards "stacked" against the small town? The figures on population as presented would seem to indicate as much. But it has been predicted by sociologists over a quarter of century that such was the case, and yet each decade finds them still numerous, and some of them thriving and "graduating" into larger sizes.

There can be little doubt, however, that some of the small places will gradually disappear. The car, good roads, the reorganization of schools, the competition in business with larger centers, all help to make life difficult for the little ones. But life is not without hope.

How Some Maintain Population

Smaller places may maintain population in spite of the decline in the numbre of business establishments and their total patronage, although there tends to be a correlation between the business volume and the population. One feature of small town life which has developed during and since the war on a larger scale than heretofore is the tendency for residents of these places to find work in neighboring towns and cities to which they commute daily. For example, there are 8 or 10 persons in Dundas (population 450) who work in Northfield, 3 miles away; in Elysia (population 400) there are 8 or 10 who work in Waseca and 4 or 5 in Mankato.

In short, those who like to live in the small town may do so and earn their livelihood elsewhere as long as jobs are available. The car and good roads make one's place of residence almost incidental. People drive even 40 or 50 miles to work, although much shorter distances are more common.

Also, business houses in small places have their function today. There are certain services which can be had as well in the small place as in the larger centers. A count of the different types of business concerns in places around the 500 population mark shows certain types occurring with uniformity.

Grocery stores seem to survive quite well. Of course, there may be those who will go into the larger place and stock up on groceries at the super market, but they will depend upon the hamlet or village store for various staples during the week.

Hardware stores are another hardy perennial in the small town. Often the

(Continued on page 13)

Table 2. Number of People Living in Incorporated Places in Minnesota by Size, 1940 and 1950

Size	Population		Increase	
	1940	1950	Number	Percentage
Under 250	33,967	35,187	1,220	3.59
250- 499	69,291	69,246	—45	—.06
500- 749	57,629	57,813	184	.31
750- 999	45,766	43,692	—2,074	—4.51
1,000- 1,249	40,962	41,831	869	2.11
1,250- 1,499	37,192	42,501	5,309	14.31
1,500- 1,749	41,898	34,140	—7,758	—18.51
1,750- 1,999	20,863	37,233	16,370	78.51
2,000- 2,499	40,960	48,631	7,671	18.7
2,500- 4,999	114,120	131,797	17,677	15.5
5,000- 9,999	197,732	215,896	18,164	9.2
10,000-24,999	170,763	238,849	68,086	39.9
25,000-99,999	26,312	83,326	57,014	216.7
100,000 and over	881,171	937,578	56,407	6.4
Total	1,778,626	2,017,720	239,094	13.4

Lowry Nelson is professor of rural sociology.

A New Disease in Swine . . .

Infectious Atrophic Rhinitis

H. C. H. KERNKAMP

A NEW DISEASE, affecting the nose and nasal cavity, infectious atrophic rhinitis of swine, is causing many Minnesota farmers concern today. First spotted in Minnesota in 1945, more and more cases are coming to our attention.

From the farmer's standpoint the greatest loss comes in general unthriftiness and failure to make good gains. For example, healthy, vigorous pigs weighing from 50 to 100 pounds require about 300 pounds of a well balanced ration to produce 100 pounds of gain. Many times pigs affected with infectious atrophic rhinitis require from 600 to 800 pounds, making it unprofitable to feed them out.

However, others grow and gain normally. In still others, the growth and development is held back for only a short time.

We still don't know what causes infectious atrophic rhinitis. Some believe it is a protozoan. Others think it is a pleuropneumonia-like type organism; others a bacterium; and still others a combination of two or more of these.

Infectious atrophic rhinitis is a disease of young swine since it hits pigs between two and eight months especially hard. Pigs are most susceptible during their first six to eight weeks, especially the first three weeks. Some veterinarians believe the disease can be contracted by pigs 12 weeks old but after that their susceptibility falls off rapidly. In experiments it is difficult to establish the disease in pigs much over three weeks.

The period of incubation (time between when the infective agent enters and establishes itself in the body and when the first symptoms occur) varies from three to six weeks. This is a point to consider when buying young pigs and introducing them into a disease-free herd. The pigs may appear to be sound and healthy only to "come down" with the disease later.

From the standpoint of this disease, it would be advisable to procure 10- or 14-week-old pigs because some symptoms of this disease probably would be displayed if they had been infected. Frequently affected animals pass the untrained observer because the signs or symptoms are not clear. Some cases are detected only by close inspection of the nostrils and with the use of special instruments.

On top of all this we still have the "carrier" problem. This is the pig which has contacted the infection but in which the disease did not develop, or it may be a pig that recovered from the disease but still harbors the infection. Swine of this kind always are potential spreaders of the disease.

Symptoms

Sneezing is a characteristic sign early in its course. This is especially noticeable just after the pig arises and moves about. Infected pigs sometimes undergo a spell of violent sneezing.

A clear and watery discharge from the nostrils is another symptom that occurs early. After a few days the discharge is more viscid and often contains blood. The bloody discharge usually accompanies a violent sneezing spell.

Shaking the head from side to side to dislodge excretions in the nasal cavities is another sign.

Rubbing the snout on the ground or against some stationary object is still another symptom.

A dark spot may develop in the skin and hair just below the eye in many cases.

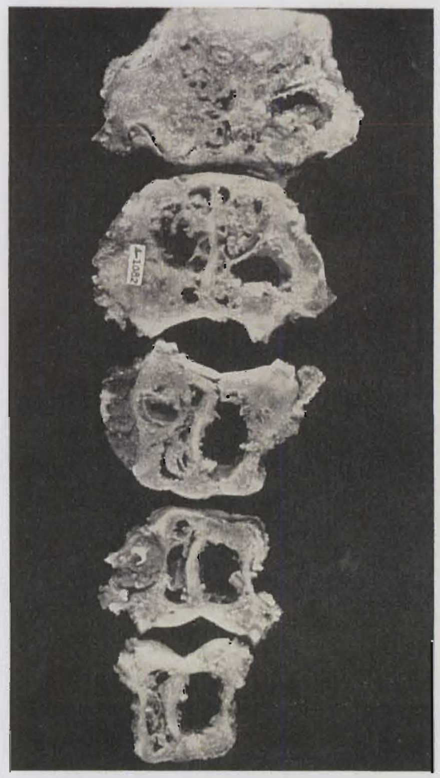
As the disease progresses to its more chronic stage, the nose and face are disfigured in most cases. The nose may bend to one side or upwards; sometimes it is shortened from front to back. The lower jaw is not involved.

Generally speaking, the bending of the nose is a sure sign of the disease. Post-mortem examination would reveal bones and other parts of the nasal cavity destroyed.

It is well to remember that partial or complete destruction of the nasal turbinate bones may occur without any change in the shape of the nose and face. Cases of this kind are not easily detected as the pig moves about in its pen or sty. A careful inspection of the nostrils with special instruments may be necessary.

While retarded growth rate is an important characteristic of this disease, it must be kept in mind that this symptom also occurs in many other diseases.

Atrophic rhinitis often increases progressively from one farrowing season to the next for two or three years following the first outbreak. As a rule, only a small proportion of the susceptible pigs (2 to 4 per cent) are affected the first year. The next year this usually increases to 8 to 12 per cent and the third year to 30 to 50 per cent unless an attempt is made to stop it.



Cross section of the nose of a pig affected with infectious atrophic rhinitis. The lower section is from the forepart of the nose and the upper section from the area close to the brain. The right half of each section shows complete destruction of the nasal turbinate bone. This turbinate bone can be seen on the left half.

What Can Be Done to Control the Disease?

At present there is no satisfactory medical cure known. Measures designed for its prevention and control appear to be the solution to this problem.

The consensus seems to be that one should dispose of the herd and replace it with animals from herds known to be free from the disease. This, according to Dr. L. M. Hutchings of Indiana, "is drastic action but necessary if the disease is to be stopped on the farm."

Another plan, somewhat less drastic but also less effective, is to dispose of only the affected swine. Unfortunately some swine may be kept which look like normal animals but are "carriers" and able to spread the disease to susceptible baby pigs.

(Continued on page 15)

H. C. H. Kernkamp is professor and acting head in the School of Veterinary Medicine.

WEAR or LAUNDERING — Which Is More Harmful to Cotton Fabrics?

ETHEL L. PHELPS, FRANCES P. McLEAN, MARIAN M. MOORE, LOUISE S. GREENWOOD, JUNE VERY, NORMA H. HOLM, and VIVIAN WHITE

MANY WOMEN wear "uniforms" of some kind for their daily work—house dresses for the homemaker or some type of standardized garment for certain types of professional work. Hence most women are genuinely concerned about the durability of such garments.

Uniforms made of cotton fabrics are rarely laundered in the home and usually are worn to the end of serviceability. House dresses, on the contrary, are most often laundered at home. Many of these house dresses are made of the same kinds of cotton fabrics often selected for uniforms, namely broadcloth, poplin, suiting, or jean. In addition, these fabrics are used for various types of men's shirts and for children's clothing.

Since it is known that cotton fabrics are influenced by both laundering and wear, the question of whether laundering or wear causes the greatest damage is pertinent to homemakers as well as to professional workers.

The fabrics selected for this study were all white, so the problem of colorfastness was not considered. While fading of color might result in some garments being discarded before they are worn out, the findings reported here should be reassuring to both homemakers and other consumers in that they answer the question—which is more harmful to these cotton fabrics, wear or laundering? **Care in laundering can protect garments to some degree; but wear inevitably will take its toll.**

What part of the ultimate deterioration of such materials is due to laundering? It has been said that an undue share of blame for the failure of textiles often is attributed to the laundry. Launderers protest that many faults and weaknesses, which cannot be traced quickly or accurately to their true origin, first become apparent in laundering.

What effect does wear have in the breakdown of cotton fabrics? Textiles research workers in the School of Home Economics, University of Minnesota, have studied, over an extended period, the serviceability of four types of cotton materials and have concluded that wear tends to be considerably more harmful to such fabrics than laundering.

Lengths of cotton broadcloth, poplin, suiting, and jean, of good quality and each considered to be characteristic of its kind, were made into uniforms which were assigned to five St. Paul doctors' and dentists' attendants who had agreed to wear them as a part of the study.

These subjects were chosen at random, but, since they all participated in comparable activities and since also the uniforms they wore were identical, they were accepted as typical of workers in their field. Three uniforms of each fabric were issued to each nurse-attendant. Each uniform was worn one working day and then laundered at a commercial laundry which follows recommended procedures.

To determine the relative serviceability of the four materials selected, certain fabric properties (for this study, weight, thickness, breaking strength by the grab method, bursting strength, and elongation) were measured after laundering alone and after wear with laundering. From the data accumulated it has been possible to isolate the proportions of breakdown which are due to wear alone and to laundering alone.

Five uniforms of each fabric were withdrawn from service after 20, 40, and 60 days of wear to show the progressive effects of increasing wear with laundering. These were sampled and the fabric characteristics measured to permit comparison with the new materials and with unworn control lengths of the same materials which underwent identical laundering procedures at the same time in the same laundry.

With laundering alone, weight tended to increase for all four fabrics during the first 20 launderings (due probably to shrinkage) and to decrease thereafter until values recorded after 60 launderings were quite comparable with those reported for the new materials. When wear was combined with laundering, the broadcloth and poplin became a little heavier after the first few washings, but suiting and jean decreased in weight throughout the study.

Increases in thickness were observed after the first few washings, which could have been due to shrinkage, and this in turn could be attributed to the release of tensions present in the new cloth, and/or to differences between the pressure applied in finishing and that used during the ironing or mangling process at the commercial laundry. In any event, changes in thickness noted thereafter were small and similar both for fabrics which were laundered only and for those which were worn and laundered.

Changes in breaking strength, warpwise and fillingwise, accompanied both laundering and wear in the four fabrics. Decreases were more marked warpwise than fillingwise as laundering with wear increased. The rate of decrease, warpwise, due to successive launderings without wear was less rapid than that due to laundering plus wear. After each period of laundering without wear, fillingwise strength for all four fabrics was greater and decreased more slowly with increasing laundering than it did for fabrics which were worn and laundered.

Increasing laundering without wear caused marked and consistent decreases in bursting strength throughout the investigation for the jean, through the fortieth washing for poplin, after the twentieth washing for suiting, and apparently had no adverse effect on the broadcloth. As laundering with wear increased, bursting strength decreased markedly and consistently for all four fabrics.

Elongation under stress varied from the beginning to the end of the experiment and no general trend was observed with increasing launderings. Fabrics laundered without wear elongated more under breaking forces than did the worn and laundered materials. Elongation under bursting forces was not altered significantly by laundering either with or without wear. At the end of the study the bursting elongation was nearly equal to that recorded for the new fabrics, although for the jean and suiting, it did show a tendency to decrease as wear increased.

The relative effects of laundering and of wear were considered also from the standpoint of the residual weight, strength, and elongation observed after 60 launderings without and with wear (see figure). The values recorded for the new materials represent 100 per cent of each property studied.

It is obvious that for all four fabrics laundering alone 60 times caused considerably less damage than did the same number of launderings combined with wear. In some cases residual values after 60 launderings without wear for weight, breaking strength, and

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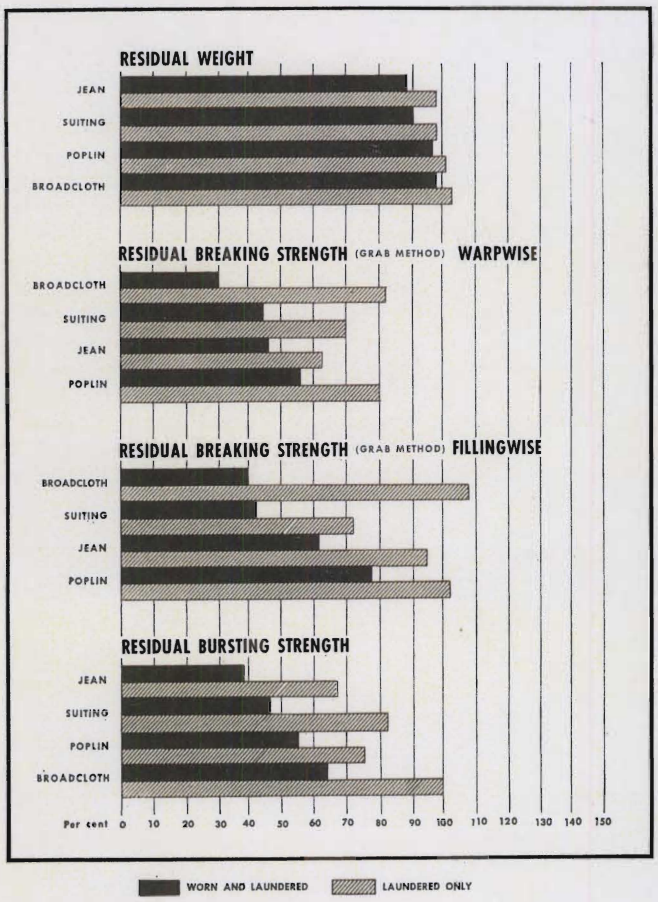
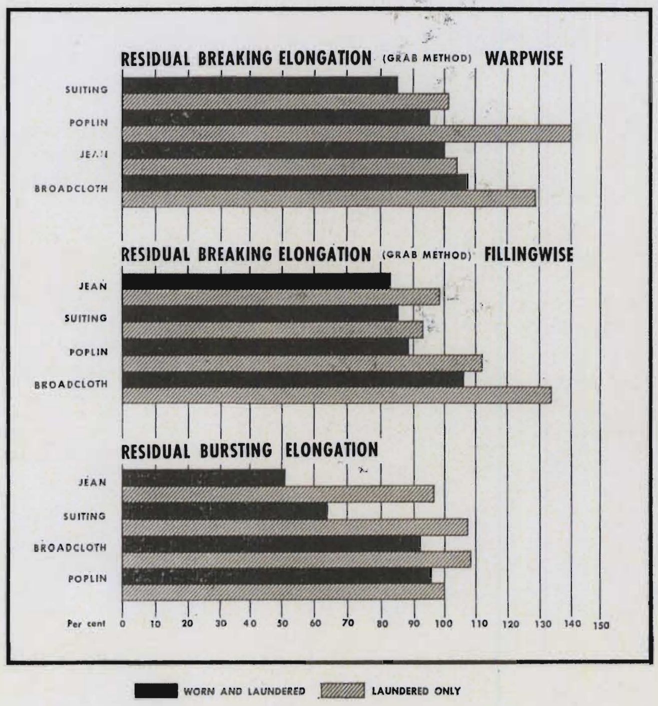
Ethel L. Phelps is professor of textiles and clothing and the other authors are all former research assistants in the School of Home Economics.





Residual values for fabrics worn and laundered 60 times compared with fabrics laundered only, expressed as a percentage of the values for the new materials.

elongation were greater than the values recorded for the new materials. Such increases could have resulted from shrinkage, which would have the effect of making the fabrics heavier and stronger and causing them to stretch more in one direction or the other.

Apparently the proportion of any property that is retained after repeated launderings may depend upon the construction of the fabric more than upon the property measured. Residual values after 60 launderings with wear did not follow the same pattern.

The roles that wear and laundering play in the wear-life of these cotton fabrics are demonstrated in the figure. Comparison of the residual values recorded after laundering alone with those observed after laundering with wear gives some indication of changes which may be attributed separately to laundering or to wear.

In nine cases laundering losses were smaller than wear losses. In six cases laundering losses were essentially equal to wear losses. Laundering alone caused some gains as opposed to losses resulting from wear. Other gains due to laundering were equalled or exceeded by wear losses. In only one instance was loss from laundering alone appreciably greater than that attributable to wear.

Obviously, wear was markedly more detrimental than laundering to these fabrics. The differences among the fabrics were not uniform since the effects of wear and of laundering varied for the four materials. Actually, however, in nearly a fourth of the comparisons reported laundering without wear resulted in increases rather than decreases in the properties measured. Where both laundering and wear caused losses, the detrimental effect of wear was two or more times as great as the deterioration which could be attributed to laundering alone.

Future for Small Towns? . . .

(Continued from page 10)

sale of implements is carried on by hardware merchants as well. It has to be a very small place to lack an open lot filled with tractors, plows, hay balers, etc. Then, of course, there are the filling stations—for men and machines—which survive even in the open country. One will find as many as three or even more taverns and garages in places of around 500. Taverns sometimes sell other items, such as canned foods, and not infrequently have restaurants connected with them.

Finally, a good deal depends upon the will of the people in the small community to survive. Organized effort to improve the services offered to the farm families in their trade areas will often overcome the competition of the larger centers.

There are natural advantages on the side of the village merchant, banker, etc. Their relations with local people are on a basis of informality and personal acquaintance. Much of the business is still carried on credit—the super markets demand cash and carry.

In the words of the late Wendell Willkie used in another context, there is a "reservoir of good will" favoring village Main Street. But this reservoir can readily be dissipated by slovenly and archaic merchandising methods. Farm families nowadays can choose among several centers. They will tend to go to the nearest place for many things unless they are attracted to others by the better services available.

Jack Pine Seed Selection

Prof. Schantz-Hansen inspects jack pine of good form grown from seed collected from poorly formed tree at Cloquet.

THORVALD SCHANTZ-HANSEN and R. A. JENSEN

THE CERTIFICATION of over 300 tree farms by the Keep Minnesota Green organization is evidence that the farmer is beginning to think of wood as an important farm crop. This brings the very real responsibility and challenge to foresters of seeing that the largest and best crop is produced.

Where the woodlot is already established, much can be done to improve it. The wood crop can be cultivated by thinnings to increase the yield, the rate of growth, and the quality. Just as the farmer, in prehybrid days, used to save the earliest and best ears of corn for next year's crop, so the superior trees of a stand can be left to produce the seed for the next crop.

It is when the new crop is to be planted that the question of "where the seed came from" becomes important. A mistake in selecting the seed cannot be corrected in the following year. Such mistakes often are not evident for 40 years or more.

Experience in Europe with planting seed from genetically poor trees and seed from the wrong geographical source has led to the adoption of laws requiring the certification of the source of seed for all important forest species. In some countries these laws are as strong as those for agricultural seeds in this country.

Any tree species which occurs over a wide latitudinal and longitudinal range develops distinct forms or races. This is especially true if the species is intolerant. *The Danish Tree Seed Manual* recognizes the possible existence of geographic races, form races, climatic races, and soil type races. Any or all of these may be found in any widely distributed species. Our knowledge of these differences is as yet fragmentary, but since a long time is required to find the answers and the economic values involved are great, a start must be made.

Thorvald Schantz-Hansen is professor of forestry and director of Itasca Forestry and Biological Station, Cloquet; R. A. Jensen is assistant scientist at Cloquet Experimental Forest.

Importance of Jack Pine

Jack pine is a tree of wide distribution in this country. It spans the continent from the Atlantic Coast to the Rocky Mountains and from northern Indiana to the limits of tree growth in Canada. In growth habit it varies from the almost prostrate form found on the Atlantic Coast to trees of good form 80 to 90 feet tall and sometimes 2 feet in diameter in Minnesota and Ontario.

That this once worthless tree has become an important economic asset is shown by the fact that the average annual harvest of jack pine pulpwood in the Lake States area was 421,000 cords from 1942 to 1951. At current prices this represents a value of $7,578,000 delivered at the mill. More than half of the annual cut was produced in Minnesota. Yield tables show that under favorable conditions an acre of jack pine will yield more volume at 50 years of age than any other native species found on the same soil.

Rapid growth, ease of regeneration, and response to thinning make jack pine a desirable tree for the northern woodlot. Little is known about the various forms or races that may occur. To study some of these problems, seed collections were made in 1939 and 1940 through the cooperation of forestry organizations in the United States and Canada.

Experiments at Cloquet

The seed was planted in the nursery at the Cloquet Experimental Forest and then planted on a uniform site after two years in the seedbed. Each selection was planted in a block of 25 trees using a 5'x5' spacing with 10 feet between blocks. The exact location of each selection was determined by lot. The first planting was made in 1942 and was duplicated in 1943. A third planting was made in 1944 of the selections with stock still available.

The table gives the number of trees surviving, the average total height, the annual height growth, form classification, and the winter injury in the spring of 1948 for the two complete blocks.

Survival was generally very satisfactory, most often between 90 and 100 per cent. In no case did the survival bear any relationship to the source of the seed. The lowest survival, 80.5 per cent, occurred in stock from Cloquet seed and Wellston, Michigan seed.

It is difficult to draw any firm conclusions about rate of growth at this juvenile stage. In the table the selections are arranged in descending order according to the rapidity of height growth. The height growth ranged from 1.22 feet per year for the New Jersey selection to .38 feet for the Eau Claire, Wisconsin selection. The poor showing of the latter selection is probably due to genetically poor parent stock. In general the seed from southern areas has shown the best growth rate while that from the northern sources, the poorest. Studies now in progress indicate that the far northern selections complete their growth about three weeks earlier than the more southerly selections.

All selections have been hardy as far as damage from normal early and late frosts is concerned. In the spring of 1948 damage was noted in some of the selections and in native trees throughout the forest. This was probably due to a sudden change from relatively warm weather to severe winter following a storm on November 7, 1947. The data on winter injury is shown in the table. The severest injury was noted in the selections from the southern peninsula of Michigan. In all other selections where it occurred, it was scattered and light. The condition causing the injury may not be duplicated again for many years. It can, however, happen again before these trees are ready for harvest.

The value of a tree as a final crop tree depends upon its form, its rate of growth, and the quality of the wood produced. The data in the table show no relationship between the form of the tree and the character of the parent. All the trees are predominantly of poor form at this time. In time many of the poorly formed trees may develop into good trees.

Much of the poor form can be attributed to insect attack. A pine shoot borer and the pitch nodule maker have attacked the growing tip of the main trunk, either killing it or causing it to break. When this occurs, one or more side branches replace the main trunk,

Survival, Growth, Development, and Hardiness of Jack Pine Source-of-Seed Plantings at Cloquet Forest

	Source	No. trees	Survival in 1950	Total age	Average annual height growth	Average height in 1950	Percentage of trees in each form class			Percentage of trees with winter injury in spring 1948			
							Good	Fair	Poor	Killed	Severe*	Moderate†	Light‡
			per cent	years	feet	feet							
1	Bass River Forest, N. J.	50	100	10	1.22	12.20	2	14	84	......	......	......	......
2	Hinckley, Minn.	50	100	10	1.19	11.95	8	14	78	......	......	......	......
3	Peterson, Minn.	50	100	10	1.12	11.25	0	2	98	......	2	8	30
4	Manistique, Mich., Good Form	250	98.5	10	1.11	11.15	0.5	5	94.5	......	0.5	2.5	13.5
5	Chalk River, Ont.	50	100	10	1.02	10.25	6	2	92	......	2	8	10
6	Chalk River, Ont.	50	100	10	1.02	10.25	6	2	92	......	2	8	10
7	Manistique, Mich., Poor Form	250	95.5	10	1.00	10.05	2	7	91	......	2.5	4.5	31
8	Sandilands Forest, Man.	50	96	10	1.00	10.05	4.5	2	93.5	......	......	......	......
9	Jenkins, Minn.	350	99	12	1.00	10.05	4	7	89	......	......	......	2
10	Cloquet, Minn., Good Form	500	80.5	11	.97	10.75	3	5	92	0.5	......	2	0.5
11	Ft. Francis, Ont.	50	98	10	.97	9.70	4	4	92	......	......	......	......
12	Chisholm, Minn.	400	97.5	12	.96	11.60	2.5	6.5	91	......	......	......	......
13	Park Rapids, Minn.	500	97.5	12	.96	11.50	3	5.5	91.5	0.5	......	1	1
14	Cloquet, Minn., Open Cone	775	91	11	.95	10.45	2.5	5.5	92	......	......	......	0.5
15	Cloquet, Minn., Random	500	97	12	.94	11.35	5.5	5	89.5	......	......	......	0.5
16	Baldwin, Mich., Good Form	50	98	10	.92	9.20	6	6	88	......	37	41	14
17	Baldwin, Mich., Poor Form	50	90	10	.91	9.15	......	......	100	8.5	65	12	10
18	Burlington, Vt.	50	98	10	.89	8.95	2	2	96	......	6	15.5	18.5
19	Wellston, Mich., Poor Form	225	89.5	10	.88	8.85	......	......	100	4.5	12.5	30.5	23
20	Huron, Mich., Good Form	250	94.5	12	.87	10.50	......	0.5	99.5	2	34.5	23.5	25.5
21	Cloquet, Minn., Poor Form	700	95	11	.86	9.55	3.5	5	91.5	......	......	......	0.5
22	Lake St. John, Quebec	50	100	10	.84	8.40	8	4	88	......	......	2	......
23	Grand Marais, Minn.	500	96.5	12	.83	9.95	4	7.5	88.5	......	......	......	1.5
24	Huron, Mich., Poor Form	250	94	12	.82	9.85	......	1.5	98.5	1.5	43	26.5	20.5
25	The Pas, Manitoba	50	100	10	.81	8.15	2	......	96	......	......	......	......
26	Wellston, Mich., Good Form	200	80.5	10	.79	7.90	0.5	......	99.5	2	29	17	15
27	Ft. McMurray, Alb.	50	100	10	.75	7.50	......	......	100	......	......	......	......
28	Miramichi, N.B.	50	94	10	.65	6.50	2	4	94	......	2	2	4
29	Regina, Sask.	50	84	10	.64	6.45	......	......	100	......	......	......	......
30	Iroquois Lake, Alb.	50	94	10	.55	5.55	0	2	98	......	......	......	......
31	Bar Harbor, Me.	50	94	10	.39	3.90	......	......	100	......	......	......	......
32	Eau Claire, Wis.	50	100	9	.38	3.90	4	4	92	......	......	......	......

* Severe—more than two-thirds needles brown.
† Moderate—one-third to two-thirds needles brown.
‡ Light—less than one-third needles brown.

and a poorly formed tree results. When the trees were very young, these insects were present in epidemic proportions.

In 1947, 52.6 per cent of the trees had the growing tip killed by these insects. In 1950, 5.7 per cent were so damaged. Either the insects are not so abundant or the trees have grown above the size at which the insects work best.

No final statement can be made at this time since the trees are young. There are, however, some indications which are noteworthy.

1. Trees from seed collected in lower Michigan are not a good risk for planting in the climate of the Cloquet area since they may winter kill.

2. Within limits the trees moved northward grow faster than those from the far north.

3. Insect damage has a marked effect on the tree form which obscures the influence of the character of the parent on the progeny.

Infectious Atrophic Rhinitis . . .

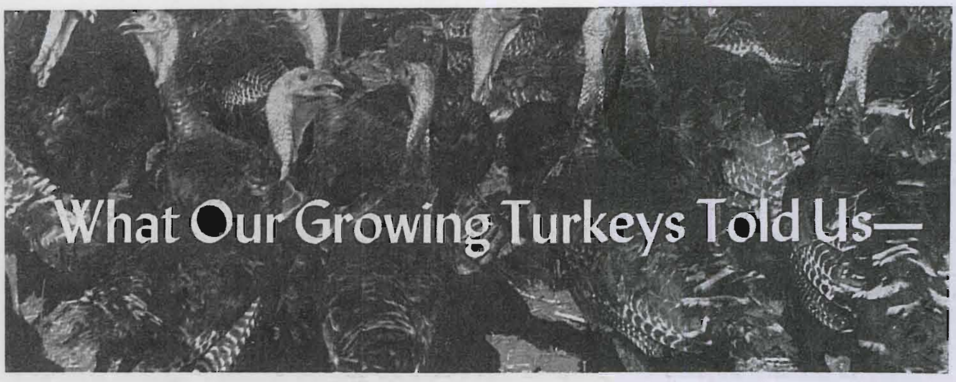
(Continued from page 11)

After the infected swine have been removed from the premises and before restocking with noninfected pigs, it is important that the pens and alleyways housing diseased pigs, as well as feed and water troughs and other utensils, be cleaned and disinfected. One of the coal tar disinfectants prepared and used as directed by the manufacturer is suitable for this purpose. The surfaces of yards and pastures and also of pens and runways that are exposed to the direct rays of the sun for two weeks or more should be safe for restocking with "clean" animals.

A control plan for herds where it isn't practical to dispose of sows that may have been infected as gilts is to separate the sows into groups of two or three at farrowing time and to keep them and their offspring together for six or eight weeks. If infection is present and spreads to any of the pigs, clinical signs of the disease probably will develop by this time. Another way of avoiding its spread by close contact is to separate newborn pigs from their infected or "carrier" dams very early and raise them on substitutes for their mother's milk.

Infectious atrophic rhinitis is serious and is widespread. A survey recently made by the American Veterinary Medical Association shows that an increasing number of herds contain affected swine. Evidence indicates that the disease is spread by contact when the pigs are still very young—less than six weeks of age.

Since infectious atrophic rhinitis may be mistaken for necrotic rhinitis ("bullnose") or for a disturbance affecting one of the endocrine glands—the parathyroid—which sometimes causes misshapen nasal and facial bones, a veterinarian should be called when symptoms appear.



What Our Growing Turkeys Told Us—

A. M. PILKEY and H. J. SLOAN

WE LIKED fresh green pastures better than bare ground. We liked granulated and pelleted feed but the boss's pocketbook did not. We did all right on an all-plant protein ration but no better than on the Minnesota standard ration containing animal protein.

These are some of the answers to questions your University staff mambers have asked the turkeys for the past three years at the Northwest Agricultural Experiment Station at Crookston where a part of the University turkey feeding trials are conducted. Other turkey feeding and breeding trials are conducted at the Rosemount Research Center.

This series of turkey feeding trials was a continuation study under field conditions of laboratory tests made at St. Paul and this report is made from a summary of the averages for the growing seasons of 1950, 1951, and 1952. The Minnesota standard turkey ration formula was used for the growing mash and for the granules and pellets. Granules were fed for 6 weeks, small pellets for 2 weeks, and range pellets for 16 weeks. In the pasture lots, millet-rape and bromegrass were used. The bare lot was kept cultivated and free of all green growth.

All birds were Broad Breasted Bronze divided into lots of approximately 100 birds each, on one acre, and were started about the middle of May and continued through October. Records were compiled each of six four-week periods. Feed and water were supplied automatically and range shelters were used. The retail cost of the ingredients of the standard turkey ration was $71.22 a ton in 1950, $82.58 in 1951, and $95.00 in 1952. This cost did not include the cost of sacks or mixing.

The standard Minnesota ration for the starting and growing of young turkeys consisted of the following ingredients: 450 pounds finely ground yellow corn, 50 pounds pulverized heavy oats, 50 pounds alfalfa meal, 100 pounds meat and bone meal, 25 pounds fish meal, 300 pounds soybean oil meal, 10 pounds bone meal, 10 pounds oyster shell ground, 5 pounds iodized salt, ¼ pound manganese sulfate, ½ pound dry vitamin D_3, 3/10 pound riboflavin supplement, 1/5 pound B_{12} supplement, and 1 pound antibiotic supplement. Whole yellow corn and heavy whole oats were supplied the birds free choice after eight weeks.

Good pasture decreased the cost of raising turkeys over a period of three years by more than 2 cents per pound of live turkey produced at 24 weeks of age as compared to bare lot feeding of the same feed formula. It required ⅓ of a pound less feed on pasture to make a pound of live turkey at 24 weeks. Each turkey required 2½ less pounds of feed when pasture was supplied as compared to no pasture.

Death losses increased 2½ per cent when turkeys were reared on heavy black bare soil. This loss was due, in part, to birds becoming mud-logged. Physical development was retarded on bare ground. Slow feathering was recorded on bare lot—the hens by 1.7 per cent and the toms by 6.8 per cent as compared to the turkeys on pasture.

The finish and quality of fleshing was 2 per cent slower for the hens and 7¼ per cent less with the toms on bare lot than on pasture on the average of three trials. **Good pasture is estimated to be worth more than $20 per acre on the basis of the data compiled in these trials.**

The granulating and pelleting of the Minnesota standard turkey growing ration increased the body weight of the hens ⅓ of a pound at 24 weeks and the toms ½ a pound after 28 weeks of feeding. Feather development was 6 per cent faster with the hens and 1⅓ per cent faster for toms when their mash was pelleted. The feeding of pellets improved the fleshing and quality of meat by 1.7 per cent on the hens and the toms by 2.7 per cent.

It required about the same amount of feed to make a pound of gain whether or not the feed was pelleted. The birds ate 3.85 pounds more feed per turkey to 24 weeks when the mash was pelleted than when the same feed was fed as mash. The averaged results show an increase of 2½ cents per pound of live turkey produced at 24 weeks.

Some loss of pelleted feed resulted because of rain when the pellets were fed in open troughs. The pellets reverted back to mash form and were refused by the turkeys; the turkeys would eat the soaked mash.

The feeding of pellets eliminated waste by billing out, wind waste, mash sticking to beaks, and crowding around feeders. Also pellet sacks were clean, dustless, and easy to handle.

The feeding of granulated and pelleted mash, on the average of all tests, was not as profitable as the feeding of mash because each turkey ate 3½ additional pounds of mash in pellet form, 2 pounds more corn, and 4¼ pounds less oats. Since the pellets and corn were more expensive than the oats, costs increased.

The all-plant protein fed turkeys did not make quite as good gains as did the turkeys fed animal protein. The hens were not so well feathered, but the toms showed some increase when fed plant protein only. There was some improvement in fleshing, slightly increased mortality, and it took an extra pound of feed to raise each turkey to 24 weeks of age on all-plant protein than on animal protein.

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