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## THE FARMER and WORLD PROBLEMS

O. B. JESNESS

**T**HE ACUTE SHORTAGE of food existing in many parts of the world today is one of the costs of World War II. That shortage is at the bottom of the unusually large exports of some American farm products, and hence has a part in keeping farm prices at the present high levels. In a narrow, short-run sense this might seem to be a gain for American agriculture. However, as farmers well know, their interests are considerably broader than the immediate market situation. They have a grave concern over what lies ahead.

How is the lack of buying power of other countries to be overcome? How are the nations of the world to avoid slipping back into the extensive economic nationalism of the 1930's? Above all else, how can peace be made permanent?

One very obvious condition is that the needs of the world for American farm products and other goods are great, but that the purchasing power in the hands of some of the important buyers falls far short of meeting those needs. The common way of expressing this is that other countries are short of dollars. This is true, but it is important to recognize that the basic cause of that dollar shortage is low production. What the world needs above all else is to restore economic activity in order to meet human needs and wants.

European aid is an American problem. Here a group of children in war-torn eastern Europe receive packages from America.

A war such as the one the world has just been through cannot be waged without tremendous costs. Human and natural resources are wasted. Man power is lost. Manufacturing plants are destroyed. Transportation is disrupted. Chemicals go into explosives rather than into fertilizers. Trade channels become blocked. Innumerable homes and factories are reduced to rubble.

New homes and plants could not be built during war years. Time, labor, and materials are needed to repair the damage. At the present we are in the midst of a situation where the world is trying both to satisfy current needs and to set aside means for repair and rebuilding.

Great Britain supplies an excellent illustration of the consequences of war.

That nation had to devote its resources mainly to war and in addition suffered considerable direct destruction of property through bombing. That nation could not maintain its production for export, and no longer could draw on exports for the payment of its imports. During the war, she had to liquidate a considerable share of her foreign investments in order to acquire needed war materials and food for her population. The returns from those investments formerly came to Great Britain as imports of food and other necessities. That source of imports now is greatly reduced. Shipping and other services which formerly were important payments for imports likewise are greatly reduced for the time being.

(Continued on page 14)



# COOKING FROZEN MEAT

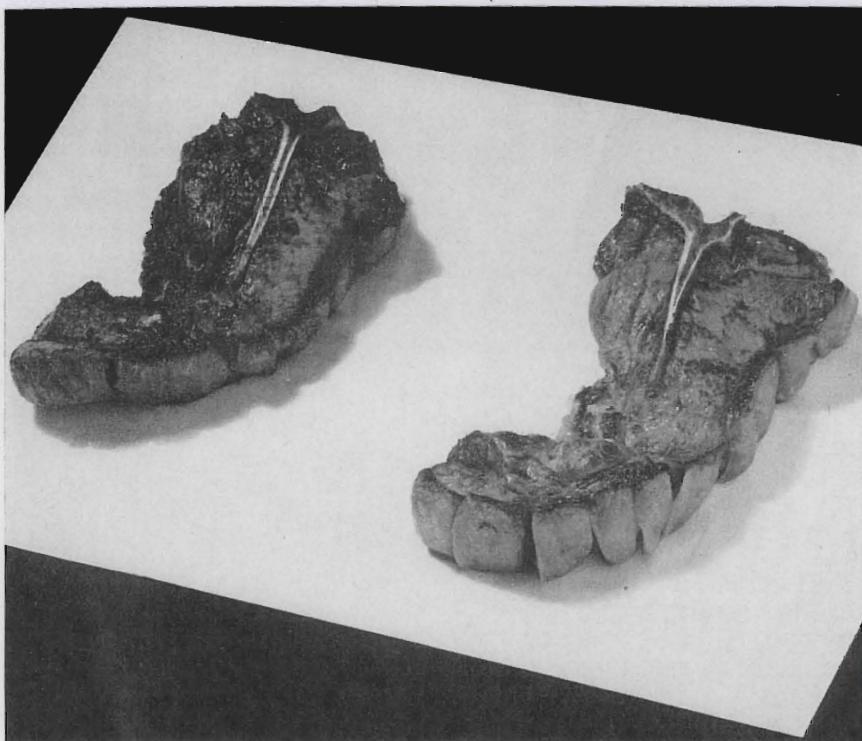
ISABEL NOBLE

**F**ROZEN FOODS, especially frozen meats, are thrusting themselves on more and more homemakers daily, either because of a new home-freezer or an expanding freezer-locker plant in the community. Therefore, the results of research done here and elsewhere regarding the best methods of preparing frozen meats for the table will be welcomed by many.

We will not stop to go into the details of selecting or preparing the meat for freezing, but perhaps we should include the warning that freezing won't improve the quality of the meat. At least, that has been the result of our experiments here at University Farm, although there are some workers who have reported a slight improvement in tenderness. Therefore, I think it is wise to choose meat from high-quality, young animals. High-quality meat, as you probably know, is indicated by a reasonably thick layer of fat along the outside of the cut, and, for beef particularly, by threading of fat through the lean. The youthfulness of the animal is indicated by soft, spongy, perhaps even pinkish, bones. If you are buying the meat for freezing, and are not familiar with the appearance of high- and low-quality meat, you can probably obtain government-graded and stamped meat. The U. S. grade stamps were used so extensively during the war that I expect you are familiar with them, but, if not, the terms used are descriptive of the quality. The terms are U. S. prime, choice, good, and utility.

When we turn to the actual cooking of the meat, the first problem that confronts us is whether or not to thaw it previous to starting the cooking. The answer, as given by our experiments, is that it doesn't matter. Equally satisfactory cooked products may be obtained from meat that has been thawed previous to cooking and from meat that is placed in the oven or over the heat while it is still solidly frozen. Therefore, the choice depends upon one's personal preference or the convenience at the moment.

If you choose to thaw the meat before cooking, we have found that it doesn't make any difference whether you do it in the food compartment of your refrigerator or by letting the meat stand out in the room. In our tests, the palatability of the cooked meat, including the juiciness, was judged equally satisfactory, and the shrinkage, which normally takes place during cooking,



Right: a well-cooked T-bone steak; left: a matching steak which was broiled at such a high temperature that it was charred on the outside before being completely thawed on the inside.

was no greater with one method of thawing than with the other. Of course, the thawing time is much longer when the meat is placed in the food compartment of the refrigerator than when let stand in the room—perhaps as much as four to six times longer.

Anything even approaching an exact thawing time is impossible to give, however, since it depends upon many factors—among them, as you will think of right away, is the size and shape, particularly the thickness, of the piece of meat. But a small roast of around 4 pounds will probably take 1½ to 2 days in a refrigerator and 8 to 10 hours at a comfortable room temperature. A steak an inch or so thick, on the other hand, will probably take overnight in the refrigerator and perhaps around 4 hours at room temperature.

#### Cook Soon After Thawing

Whichever method of thawing is used, the meat should be started to cook within a relatively short time after it has thawed. The low temperature used during the freezing-storage of meat effectively prevents the growth of bacteria and other microorganisms which cause spoilage, but after thawing growth is resumed, and we may expect spoilage to take place as rapidly, possibly even more rapidly, as in fresh meat. Therefore, keep the meat solidly frozen until just long enough before cooking to get it thawed by the method of your choice.

After the meat has thawed, the method of cooking is the same as would be chosen for that same cut when fresh. For example, if the cut came from a tender part of the animal, such as the rib or loin section, one would roast or broil it, while if it came from the chuck or similar section, one would probably use a pot-roasting or braising method.

Since the methods are the same, perhaps we should review the recommendations now generally agreed upon as giving the best results when roasting, broiling, pot-roasting, or braising.

All roasts should be cooked, preferably without searing, in a moderately low oven—that is, in an oven at 300° to 350° Fahrenheit. No water is added and the pan is left uncovered during cooking.

#### Searing Not Necessary

The practice of searing was based upon the theory that quick browning of the outside of a roast "sealed in" the meat juices and thus prevented their loss. Experiments have proved this idea to be incorrect. They have shown, in fact, that roasts which were seared lost greater weights during cooking than similar ones which were not seared. The difference in weight-loss was due mainly to a difference in the amount of fat rendered out of the tissues, and not to a loss of juices. Therefore, the old idea of "searing to keep in the juices" had to be discarded.

Moreover, searing is not necessary to develop the aroma and flavor in the

outside slices or the rich brown color of a roast or drippings that is so enticing. Indeed, in some experiments, roasts which were not seared were judged more attractively browned than ones which were seared. Thus, unless unusually brown roasts are wanted, it is best to follow the lead of experimental laboratories and omit the searing.

#### Low Temperatures Recommended

Moderately low oven temperatures are recommended for a number of reasons. One of the most important is that they cause much less loss in weight from the meat during cooking than do high temperatures. Thus they give more plump, juicy roasts. Just how much the shrinkage may amount to will vary with the oven temperature, the kind of roast, and many other factors, but for 8- to 9-pound standing rib roasts, differences of 1 to 1½ pounds in the weights of cooked roasts have been found experimentally. This causes not only a drier-tasting roast but also fewer servings per pound of meat.

Another reason for recommending moderately low, rather than high, oven temperatures is that the roasts are uniformly done with the low temperatures, while unevenly cooked by high ones.

Beef and lamb roasts may be cooked to any stage of doneness preferred, but pork must be cooked to the well-done stage—that is, cooked until a thermometer, placed so as to indicate the temperature at the center of the roast, reads 185° Fahrenheit.

The newest method recommended for broiling uses a constant moderate temperature of about 350° Fahrenheit. The advantages of this method over the high-temperature one are that the meat requires less watching during the cooking period and that less smoke is formed during the broiling process.

Recommendations concerning pot-roasting and braising have not been altered for a long time. In both methods the meat is first browned in a little fat. It may or may not be floured, as desired. The vessel in which it was browned is then tightly covered and placed over low heat or in a moderately low oven. If enough liquid doesn't seep out of the meat within 10 to 15 minutes to surround the meat with steam, add a small amount of water and continue cooking until meat is tender.

#### Longer Cooking for Unthawed Meat

So much for the cooking methods that would be usually used for frozen meat after thawing. What modifications, you might ask, should be made if the meat is not thawed before it is

put on the stove to cook? The answer is "none," except to allow a longer time and to use the lower cooking temperatures.

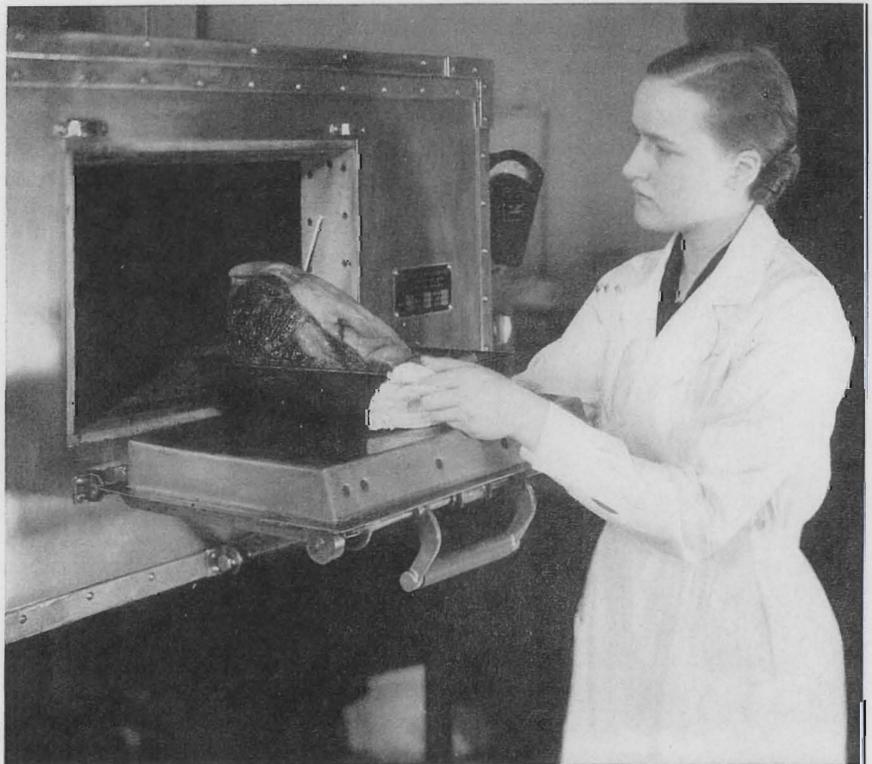
The longer cooking time is necessary because obviously the meat will not cook until it has thawed. Sometimes the necessary increase in time seems surprisingly long, but one must remember that at the freezing point of water, a good deal of heat is required to change the ice crystals to water without raising the temperature of the meat. I am sure you have noticed a similar thing happen if you have ever melted a pan of snow on the stove in order to obtain hot, soft water for any purpose. The exact increase in time required over fresh or thawed meat is difficult to give, because it depends upon the degree of doneness desired and upon the size and shape of the piece. Thus for rare beef roasts it has been found to be about 2½ to 3 times longer, while for well-done ones it is about 1½ times longer. For steaks cooked to the rare stage it has been found to be 3 times longer for inch steaks, and only 1½ times longer for steaks 2 inches thick.

With both roasts and steaks, but particularly with steaks, one should be very careful to use no higher than a moderate temperature during cooking. Otherwise, the surface may become nicely browned before the interior has hardly been cooked at all. In fact, one of my young acquaintances had the sad experience of taking a beautifully browned steak from the broiler, only to find upon cutting that it had not even completely thawed in the center.

Pot-roasting and braising will, of course, also take longer if you start with frozen meat than if you start with a fresh or thawed cut. But the difference in time does not seem as surprising as with roasts or broiled steaks because the cooking period is normally a long one. Again it is difficult to estimate how long thawing will take, but allow perhaps 45 minutes to 1 hour extra for a moderate-sized pot roast and 15 to 20 minutes extra for a piece 1 inch thick which is to be braised.

As so frequently happens, there is one exception to our general statement that cooking meat from the frozen condition is as satisfactory as cooking it after it has been thawed. If the meat is to be dipped into beaten egg and rolled in bread or cracker crumbs, it is better to use meat that has been thawed. The coating does not cling well if the meat has not been thawed.

The most important points in the home cooking of frozen meat can be summarized as follows. First of all, start with as high-quality meat as possible. Then thaw it in the food compartment of your refrigerator or in the kitchen or don't thaw it at all—which ever you prefer or find convenient at the moment. If the meat has been thawed, cook it by the same methods that you would use for a similar fresh cut. If it has not been thawed, then choose the same method as for a similar fresh cut, but allow extra time for cooking and be sure to use a moderately low temperature so that the meat can thaw in the first part of the cooking period and really cook during the last.



An experimental roast comes out of the oven at University Farm.

# FERTILIZERS IMPROVE THE VALUE OF *Alfalfa Hay*

C. O. ROST, PAUL M. BURSON,  
AND FREIDA L. HAMMERS

**T**HE CHEMICAL COMPOSITION of crops directly affects their quality and feeding value. The nutrients of special importance include protein and the mineral elements phosphorus, calcium, magnesium, and potassium, along with a considerable number of trace or minor elements such as manganese, zinc, iron, and copper. That the chemical composition of crops is related to the chemical composition of soils is generally recognized. Soils well supplied with organic matter and available mineral elements produce high-quality crops in so far as feeding value is concerned, while run-down and infertile soils produce less palatable and less nutritious feeds. Some farmers purchase feed from fertile areas because livestock make more rapid and profitable gains than on the same type of feed from poorer soil areas.

While legumes such as alfalfa, clovers, and soybeans differ in their chemical composition, they have a higher feeding value than nonlegumes, such as timothy, millet, and bromegrass. This is true primarily because the legumes are higher in protein and also generally higher in minerals, especially phosphorus and lime.

Three critical nutrients in hay and forages are protein and the minerals phosphorus and calcium. Concentrates are fed primarily for their high protein content. The minerals phosphorus and calcium can be fed in mineral mixtures but are more effective when fed in high mineral forage and hay. Livestock eat such feeds more freely.

Since the intake of phosphorus by crops is closely related to amounts of this mineral available in the soil, the supply of available soil phosphorus will affect the feeding value of crops. The soils in most areas of Minnesota are known to respond markedly to applications of phosphate fertilizers, indicating that they are low in this element. This has been reflected on unfertilized land in a low phosphorus content in hays and forages and has resulted in phosphorus hunger in cattle. When cattle are continuously fed hays and forages containing less than .15 per cent phosphorus (3 pounds per ton) certain abnormalities develop. These are characterized by a depraved appetite resulting in chewing of bones, poor growth, poor reproduction, weakened bones, weakness in young animals, and poor appetite for roughage.

In Minnesota alfalfa is of first importance as a hay crop. It is well adapted to our climate and generally to our soils. It is usually ranked as the

best of the legumes because of its relatively high content of protein and minerals. It is well adapted for seeding in mixtures with other legumes and grasses and so is highly important in soil fertility systems.

## Fertilization Affects Composition

In 1942 the Agricultural Experiment Station began collecting samples of hay from each cutting on fields of alfalfa and analyzed these samples for protein, phosphorus, and calcium. This study was continued until the end of 1945. During the four-year period 69 fields located on five soil associations in the western half of Minnesota and extending from the Iowa line to the Canadian border were sampled and analyzed. On each field, hay samples were collected from unfertilized and superphosphate-treated areas. The results are summarized in table 1.

## Protein Content Increased

Fertilization with high-analysis phosphate definitely tended to increase the protein content of alfalfa hay. In only one year, 1942, was there no increase in the percentage of protein. The four-year average increase for the phosphate-treated land on the 69 fields was 0.75 per cent. While this increase in percentage is not large, it is of considerable importance when considered in connection with the increase in yield obtained on fertilized land. For the 69 fields analyzed, the average yields were 2.13 tons per acre for the unfertilized and 3.14 tons for the phosphate-fertilized land. This was an increase in favor of phosphate of 1.01 tons per acre. A calculation of the yield of protein shows that on the average an acre of unfertilized land produced 828 pounds and a phosphated acre 1,268 pounds of protein. If there had been no increase in the percentage of protein a yield of 3.14 tons would have carried 1,221 pounds of protein or 47 pounds less than the 1,268 pounds which it actually contained. The 47 pounds increase per acre is approximately equal to 150 pounds of 30 per cent protein feed. Thus for every 13 acres of fertilized alfalfa the protein increase about equals 1 ton of 30 per cent protein feed.

## Also Increase Phosphorus Content

At the beginning of the phosphate-fertilization study all operators of the farms reported symptoms of phosphorus hunger in cattle and all were feeding mineral feeds. As their fields were fertilized with superphosphate they reported a disappearance of phosphate-



Miss Hammers in one of the chemical laboratories.

Table 1. Chemical Composition of Alfalfa Hay from 69 Fields in Western Minnesota

Year	Number of fields	Yield		Per cent protein		Per cent P <sub>2</sub> O <sub>5</sub>		Per cent calcium	
		Ck.*	Phos.†	Ck.	Phos.	Ck.	Phos.	Ck.	Phos.
1942	11	2.59	3.57	20.48	20.44	0.25	0.32	1.89	1.89
1943	30	2.08	2.86	18.97	19.61	0.25	0.29	1.40	1.42
1944	10	1.96	3.00	18.27	18.93	0.21	0.22	1.78	1.82
1945	18	2.04	3.44	20.29	21.75	0.22	0.29	1.76	1.74
Average	69	2.13	3.14	19.45	20.20	0.24	0.29	1.63	1.64
Per cent gain for phosphorus			47.4		3.8		20.8		1.5

\* Check or untreated land.  
 † Phosphated land.  
 ‡ Reported as elemental phosphorus and calcium, respectively.

deficiency symptoms and a progressive decrease in mineral feed eaten by cattle. Since the use of superphosphate definitely increased the yields of alfalfa hay it might be expected that it would also increase the phosphorus content. While this is not always so, it was found to be true in the great majority of the hays analyzed in this study. The amount in the phosphated alfalfa averaged slightly over 20 per cent higher than alfalfa from unphosphated land.

The lowest average percentage found in hay from untreated land was 0.21 in 1944. This was the only year in which phosphate did not substantially increase the phosphorus content of the hay. During the course of the study a number of individual samples from unfertilized land containing only 0.18 per cent phosphorus (3.6 pounds per ton) were found. This percentage is near the 0.15 per cent critical amount.

The higher percentage of phosphorus in hays and forages is of extreme importance. It contributes to the improvement of livestock health, it increases the feeding value, it increases the palatability of the feed, as shown by livestock preference for phosphated hay and pasture, and it reduces or eliminates the need for mineral supplements.

**Alfalfa Rich in Calcium**

Fertilization with high-analysis phosphate did not appreciably increase the calcium in the hays analyzed in the study. The fields on which the alfalfa was grown are relatively well supplied with lime so that difference in calcium content would not be expected. The average calcium content for the untreated and phosphated portions of the 69 fields was almost exactly the same—1.63 and 1.64 per cent, respectively. High calcium hay is to be preferred and should be worth more per ton than that produced on soils deficient in lime.

The question may be asked as to what the increases in yield of alfalfa from the use of phosphate has meant

in terms of the increase in tonnage of high-quality hay on the farms on which the 69 fields were located. In table 2 is shown the average increase per farm in tons of hay produced from the use of phosphate fertilizer. Also shown in the table are the pounds of protein and phosphorus in the hay and the equivalent of these in linseed oil meal and bone meal. The last column shows the increase in total digestible nutrients.

On the average 28 tons of alfalfa hay were produced per farm per year more than would have been the case if no phosphate had been used. This additional hay carried approximately 11,300 pounds of protein and was equivalent to the amount of protein carried by 15.3

tons of linseed oil meal. The phosphorus in the hay averaged 157.7 pounds per year and was equivalent to the amount of the constituent carried by 1,577 pounds bone meal. The additional 28 tons of alfalfa which contained approximately 23,800 pounds of total digestible nutrients permitted an increase in the number of cattle kept or better feeding practices or both. This increase in protein and phosphorus was obtained for the cost of the superphosphate which was only a small part of their cost in the form of feeds.

**Cost of Increases Very Low**

Most of the operators of the farms were using five- or six-year crop rotations in which the alfalfa was cut for hay during two or three seasons. An application of 300 or 400 pounds of 0-20-0 or 150 or 200 pounds of 0-47-0 was made once in the rotation and was applied for the grain crop with which the alfalfa was sown. No more fertilizer was added until the land was again seeded to a legume or legume-grass mixture. The fertilizer applied also produced substantial increases in the yields of the small-grain companion crop and the intertilled crops which followed the hay.

Table 2. Average Increase in Amount of Alfalfa Hay Produced Per Farm from Phosphate Fertilization

Year	Increase in alfalfa hay	Protein in increase	Equiv. of protein in linseed meal	Phos. in increase	Phos. equiv. in bone meal	T.D.N. in increase
	Tons per farm	Pounds	Tons	Pounds		
1942	25.8	10,547	14.3	165.1	1,651	26,574
1943	31.7	12,432	16.8	185.8	1,858	32,651
1944	25.4	9,818	13.0	111.8	1,118	26,162
1945	29.0	12,614	17.1	168.2	1,682	29,872
Average	28.0	11,302	15.3	157.7	1,577	28,815



This cow did not have enough phosphorus in its diet.

# NEWCASTLE DISEASE *Spreading*

B. S. POMEROY  
and R. FENSTERMACHER

**W**HAT HAS HAPPENED to Newcastle disease in the past year? Has Newcastle disease become established in the poultry flocks in this area? Is the disease still considered a serious threat to the poultry industry, or has its seriousness been overrated? A year ago the disease was known to exist in at least 13 counties in Minnesota. Today the disease has been encountered in 43 counties. It has been found in all sections of the state.

Since 1926, when it was first recognized as a new and distinct disease of fowls in two widely separated areas of the world, the Dutch East Indies and Newcastle on Tyne, England, the disease has been found in practically all commercial poultry-raising areas of the world. England has experienced two outbreaks. The first was eradicated by drastic action and there were no new outbreaks for 13 years. In the spring of 1947 the disease again was brought in from continental Europe in dressed poultry and has become established in several areas. The English authorities are again trying to eradicate it. During the past year Mexico also has reported serious outbreaks of the disease in both young and adult birds.

At first Newcastle disease was confined to the east and west coasts of the United States. During the past year, it has been diagnosed in practically all of the 48 states, and has become a nation-wide problem. During May, 1946, it was first recognized in Minnesota.

Chickens, turkeys, and other avian species are susceptible to the disease. Under experimental conditions we have been able to infect ducks, geese, sparrows, pigeons, pheasants, quail, partridge, and grouse. The disease was also observed in a laboratory worker that became accidentally infected. It produced a severe eye infection which lasted for a week, but no permanent injuries have resulted.

The American form of the disease has little resemblance in its clinical manifestations to the highly fatal Newcastle disease of foreign countries. However, the outbreaks that are reported in Mexico have the seriousness of the foreign type.

During the past year we were able to obtain information from 73 outbreaks of the disease in young chicks under 4 weeks of age. The average loss was 34 per cent. In a few of the outbreaks a very low mortality was reported, while in others almost a 100 per cent mortality occurred. If the dis-

ease was accompanied by other diseases, such as pullorum disease or paratyphoid infections, the aggregate loss was high.

In adult birds the loss has not been as severe as in young chicks. In most of the outbreaks very few birds die from the infection, but a few cases have been encountered where 5 per cent of the adult birds died.

## Symptoms of Newcastle Disease

Newcastle disease begins as a common cold in young chicks and growing birds. There may be symptoms of gasping, sneezing, and nasal discharge. Chicks emit a rapid, peculiar, low cheeping sound. Within a few days nervous manifestations usually develop. The percentage may vary of the birds that show partial or complete paralysis of one or both legs and wings or twisted head. In some outbreaks no nervous manifestations were noted, but in others a high percentage of the flock showed increased excitability and various nervous disorders.

In adult birds the respiratory symptoms predominate and nervous symptoms may be completely absent; on the other hand, a few adult flocks have been observed where nervous symptoms were present. If the disease affects a flock that is in production, egg production may fall to zero in a few days, and it may take from four to eight weeks or longer before the flock returns to normal egg production. When the birds return to production, the laying of abnormal eggs is common, including some with soft shells, off color, and irregular shape.

## Diagnosis

Newcastle disease in young chicks may be confused with several other diseases. However, respiratory infection followed in a few days by nervous manifestations suggests this disease. The local veterinarian may help in arriving at a diagnosis. For final diagnosis a laboratory examination is necessary, and the Diagnosis Laboratory in the Division of Veterinary Medicine at University Farm is equipped to render this service. Birds suspected of having Newcastle disease should be brought to the laboratory and not sent by a common carrier, such as express or parcel post.

## How to Prevent Newcastle Disease

How can poultrymen prevent the introduction of Newcastle disease into their poultry flocks? How can they avoid the purchase of infected baby chicks?

Since Newcastle disease is a virus infection, it may be transmitted by direct or indirect contact with infected birds. A very high percentage of the outbreaks among baby chicks in Minnesota during the past year were in flocks that had been purchased as started chicks. In the past few years the demand for started chicks has been increasing. Many of the hatcheries were forced to start surplus or extra chicks this past season because of above-normal hatches and lack of demand for chicks due to high feed costs. Unless proper and sufficient brooding equipment is available and complete separation of the brooder room from the



This Newcastle-infected chick is partially paralyzed.

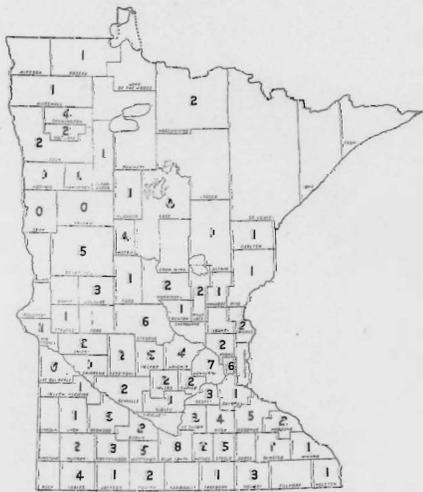
hatchery can be accomplished, hatcheries should avoid the practice of started chicks. Almost anything may act as an intermediate carrier—the poultryman, his clothes, or his shoes. Several outbreaks have been traced to shipment of chicks that apparently became exposed to infected chicks while in transit.

The following practices are recommended:

1. Chicks should be purchased as day-old chicks and not as started chicks.
2. Baby chicks should preferably be purchased from a hatchery operating within the state under the poultry-improvement and pullorum-control program.
3. No new birds should be added to a flock unless placed in quarantine for two weeks.
4. Poultry crates and other poultry equipment should be disinfected before being brought on the farm.
5. Re-use of feed sacks should be avoided.
6. No visitors should be allowed in the poultry houses.
7. All dead birds should be burned or buried.
8. If more than expected losses occur among the baby chicks or the growing or adult flock, the advice of your local veterinarian should be sought and, if necessary, birds submitted to the Diagnosis Laboratory at University Farm.

#### Control and Treatment

At the start of the outbreak a year ago it was believed that the spread of the disease in Minnesota could be limited by quarantining the infected flocks. However, because of the limited cooperation on the part of the poultry industry, the disease has become so widespread that it cannot be eradicated without great cost.



Outbreaks of Newcastle disease in Minnesota from October 1, 1946, to September 25, 1947.



Testing for Newcastle disease by taking tissue from suspected bird. Dr. Fenstermacher, right, puts tissue into test tube held by Dr. Pomeroy.



Dr. Fenstermacher and Dr. Pomeroy inoculating 10-day-old eggs with preparation from tissue of suspected bird. If the bird had Newcastle disease, the embryos in the eggs will die in 48 to 72 hours.

The Livestock Sanitary Board has requested owners of flocks that have been infected with Newcastle disease not to sell any of the survivors except for slaughter. Birds that recover from an outbreak are potential carriers and may be responsible for the introduction of the disease into healthy flocks. In order to avoid the spread of the disease in baby chicks and started chicks, each hatchery has been encouraged to enforce rigid sanitary practices.

At the present time there is no effective vaccine that can be recommended. In some instances the use of a killed vaccine will be of value in controlling the severity and rapid spread on a poultry farm having several units.

#### Effect on Man

Newcastle disease virus has been known to infect human beings. In this country the infection in man has resulted in a severe eye infection that runs its course in a few days. All the reported cases have been among scientific workers who have received the exposure in the laboratory or have associated with the handling of diseased birds in the field. No authentic cases have been connected with the eating of poultry meats and eggs. There is no need for concern by the consumer of poultry products. The caretaker of infected flocks should use the necessary precautions to avoid contaminating his hands and face.

# THE CLOQUET EXPERIMENTAL FOREST



Dr. T. Schantz-Hansen, Professor of Forestry and in charge of the Cloquet Experimental Forest, checking the amount of lumber cut in the spring of 1947.

## T. SCHANTZ-HANSEN

IT WAS BACK in 1909, when Minnesota was still one of the top lumber-producing states, that Professor Samuel E. Green established the Cloquet Experimental Forest as a part of the research program of the Division of Forestry, University Department of Agriculture.

He had been advocating such a step since 1896 and finally secured the gift of about 2,000 acres from lumber companies located at Cloquet. University funds were used to buy eight Indian allotments, making the original area 2,662 acres. Since then the University has purchased land within and adjacent to the boundaries, increasing the area to 3,234 acres. It is hoped that the acquisition program can be continued so that the area will ultimately be between 4,000 and 5,000 acres.

This area provides an excellent opportunity to demonstrate the application of forestry principles, since it is typical of much of the cutover country of the north. The soil is predominantly sandy, a little light for general agriculture. One third of the area represents swamp types. In the forest may be found remnants of the virgin Norway pine stands, a small amount of white pine, and large areas of jack pine, once considered a weed tree but now an important source of raw material for the paper industry. Also represented are aspen and birch, prominent in many of the farm woodlots, and spruce, tamarack, balsam, and cedar in the swamps. The age classes

vary from year-old reproduction to the 140-year-old virgin pine stands.

The work of the Forest Experiment Station falls into three classes: the development of a demonstration forest, research, and educational activity.

### Forest Is on Sustained-Yield Basis

Probably the most striking activity is the management of the forest on a sustained-yield basis. Forestry has in the past been handicapped by not having available large areas managed for sustained yield. As work has progressed on state and federal forests, this need has become less acute. There is, however, still much to be done and much to be learned from the practice of intensive forestry.

Some cutting was done on the forest as far back as 1915, but it was not until 1929 that a formal plan of management was drawn up. This plan was revised in 1939 and another inventory will be made in 1949.

It is through these inventories that the progress toward a well-regulated forest is measured. In a forest where the age classes are properly distributed and where the proper volume is found and the growth rate maintained, it should be possible to cut the actual growth of the forest each year. Since the Cloquet Forest has not been under management long enough to reach this goal, the cut must be somewhat less than the growth.

The inventory of 1939 showed that the annual growth was 203,000 board feet, but the allowable annual cut should not exceed 173,000 board feet.

Thus, by cutting less than it produces, the growing stock is built up. When the area becomes fully productive it is expected that the annual cut can be increased fivefold.

Needless to say, the stands cut each year are handled in such a manner that the productivity of the area can be maintained. In so far as possible, an effort is made to secure the regeneration of the new stand through natural means. This eliminates a rather heavy investment in planting which must be liquidated at the time of final harvest. Where natural regeneration fails, planting is done.

From an economic standpoint, the Cloquet Forest is well located. Four

Skidding jack pine pulpwood is one of the big jobs at the Cloquet Experimental Forest Station.



miles to the east is the city of Cloquet, one of Minnesota's largest wood-utilization centers. Here, in the so-called "good old days," five sawmills were busy turning out lumber night and day. Today the community's economy is based on a paper mill, a wallboard and insulation plant, and a match factory. All these industries use smaller and less valuable timber than the old-time sawmills. Since their activities are not seasonal, however, they do provide a larger market for labor and a more stable economy.

The availability of such an intensive market makes the practice of forestry possible. All species grown and small material removed in thinnings find a market. There is no problem of weed species.

An effort is made, in harvesting the crop, to market it where it will bring the largest return. Saw-log material is taken to the station's own sawmill for lumber. Pulpwood and match bolts are delivered to the industries. Slabs and edgings are sold for pulpwood.

#### Forest Serves as a Demonstration

The management of the forest is intensive enough to serve as a guide and a demonstration for the woodlot owner of the north, and extensive enough to be of value to owners of large tracts of forest land.

The problems in forestry are many and varied. Since timber is not an annual crop, a long time is required to arrive at any solution. In general, the problems fall into two classes: those which have a practical application in handling the forest, and the fundamental problems which deal with principles that may underlie the practical problems.

In the early days the research program was concerned almost entirely with practical problems. Very little in-



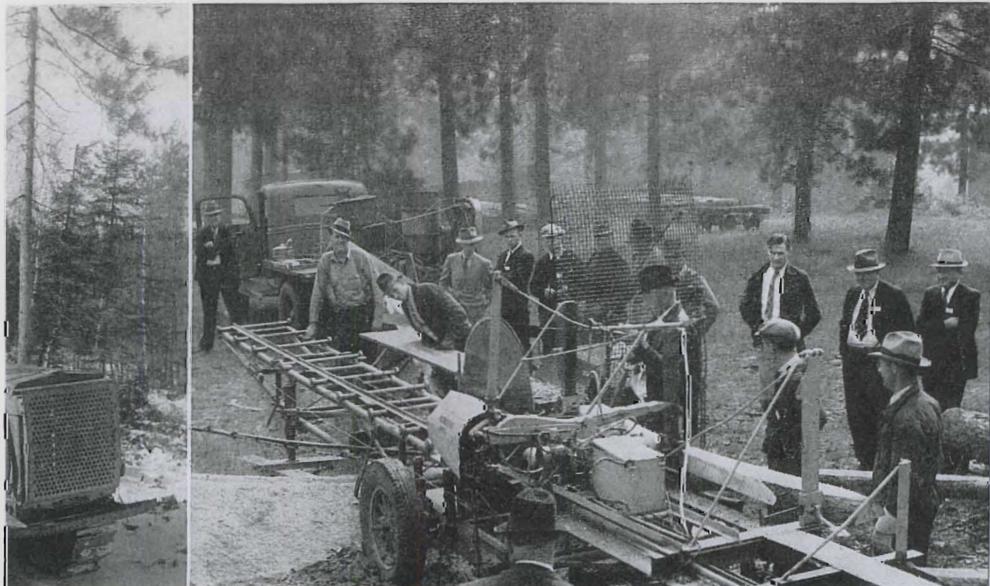
Strip cutting, as in this stand of 90-year-old black spruce, helps maintain a well-regulated forest.

formation was available on which to base any forest practices. It was necessary to develop techniques in collecting and extracting seed, in nursery practice, and in planting. During the period from 1909 through 1917, several hundred experimental planting plots were established to determine the proper species and classes of stock to use on various planting sites and the best season in which to plant.

Experimental thinning plots have been established in Norway pine and jack pine stands to learn when and how much to thin. One of the aims in sustained yield is to keep the forest growing at its most rapid rate. Since natural regeneration, and planting as well, establishes young stands with more trees per acre than are needed in the final crop, the surplus must be re-

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Left, below, the Cloquet Experimental Forest plays host to sawmill operators interested in latest developments. Right, Raymond Jensen measures the amount of annual growth in a stand of young jack pine.



# Farm Family Living Costs RISING



GEORGE A. POND

**W**HAT DOES it cost a farm family to live? What are the important items in the family budget? How much of this living is furnished by the farm and how much represents cash purchases? How much home-raised milk, eggs, and meat do farm families consume? How do farm family budgets vary with income levels or with size of family?

The answers to questions like these not only are a matter of considerable human interest but they may also prove quite useful. In planning the farm budget, allowance must first be made for living expenses—they must be met before there is anything available for improvements, savings, interest, and debt payments, or even for the operating expenses of the farm.

The records of the Southeastern Min-

nesota Farm Management Service supply the answers to some of the questions raised above. These records cover approximately 100 farm families each year for a period of 16 years, 1931 to 1946. These families kept complete records both of cash expenditures for personal and family living and of the quantities of farm-raised produce consumed in the home. An itemized list of expenditures by four-year periods is shown in table 1.

Over the 16-year period these farmers were spending \$100 a month for family living in addition to the housing, food, and fuel furnished by the farm. The cash outlay for living increased from \$80 per month in 1931 to \$170 per month in 1946. Like anyone else, the farmer increases his personal expenditures as his income increases, but at a less rapid rate. While

net farm income trebled from 1931-1934 to 1943-1946, the family living expense doubled. Every item in the family budget increased over the 16-year period but the rate of increase varied widely. Part of this increase was due to rising prices of the items purchased and part to an increasing standard of living.

Expenditures for furniture and household equipment decreased during the period of wartime scarcity. Lower automobile expense during the war reflects wartime travel restrictions and the lack of new cars available for purchase. Life insurance premiums changed but little. The largest proportionate increases were in such items as medical care and health insurance and in gifts and subscriptions to church and welfare organizations. Necessities come first in periods of low income but when more funds are available the farmer increases his field of spending.

Table 1. Personal and Household Expenses of Farm Families, 1931-1946

Item	1931-34	1935-38	1939-42	1943-46	Average 1931-46
Food .....	\$ 224	\$ 283	\$ 325	\$ 445	\$ 320
Operating expense .....	70	113	117	161	117
Furnishings and equipment .....	28	83	113	104	82
Clothing .....	93	122	147	217	143
Personal care and spending .....	42	47	53	64	51
Education, recreation, and development .....	55	72	67	92	71
Medical care and health insurance .....	42	70	94	138	86
Church, welfare, and gifts .....	43	51	90	193	95
Personal share, auto expense .....	76	78	146	81	95
Personal share, electricity and gas engine .....	22	24	38	44	32
Life insurance .....	92	94	100	102	97
Total expenditures .....	\$ 787	\$1,038	\$1,290	\$1,749	\$1,191
Net farm income* .....	\$1,180	\$1,788	\$2,083	\$3,629	\$2,170

\* Net farm income is obtained by subtracting the cash farm expenses from the gross cash income of the farm. It represents the amount available for household and personal expenses, debt payments, and savings.

## Food Is Largest Expense

Food is the largest item in the cash budget of the farm family, even though a substantial part of the food for the family is raised on the farm. The average value of the farm-raised food consumed by these families annually was \$274 at farm prices. This was divided as follows: dairy products \$81; eggs \$42; meat \$94; and fruits and vegetables \$57. If these had been purchased at the prevailing retail prices, they would have cost approximately twice their farm value. If compared on the basis of retail prices the farm family raises close to two-thirds of the food it consumes, in terms of value.

The economy of home-raised food is one of the advantages of farm life and is an important factor in keeping the family table supplied with plenty of good, nutritious food.

Some idea of the kind and quantity of foods supplied by the farm is indicated in table 2. These are shown on a per person (adult equivalent) basis in order to make the comparisons more significant. The data for the farm families in southeastern Minnesota are divided into those for the relatively low-income years of the Thirties and those for the higher income period of the Forties. Figures for a similar group of farm families in southwestern Minnesota are also shown for the latter period. There is surprisingly little variation in the average consumption of these items per person from year to year and between the two sections of the state. Unfortunately there was no record of the kind and quality of farm-raised fruits and vegetables used by these families. The milk consumed as whole milk, cream, and butterfat is shown in this table in terms of the amount of whole milk involved. All of the milk and cream used on these farms, as well as all of the eggs, were produced on the farms. On the other hand, most of the butter was purchased and is included in the food item in table 1.

#### Pork Is Favorite Meat

Some meat, fruits, and vegetables in addition to what was supplied by the farm were purchased. Of the farm-raised meat used by the family, 56 per cent was pork, 30 per cent beef and veal, 13 per cent poultry (mostly chicken), and 1 per cent mutton and lamb. Pork has always made up the bulk of the farmer's meat supply. This is partly due to the lighter carcass and the greater ease in preserving it until it can be used. With the coming of cold-storage lockers and deep-freeze units in recent years, beef consumption has risen rapidly. Poultry plays a minor role in the farm meat supply, notwithstanding the ideas of the "city cousins," who think of fried chicken as a staple article of farm diet around which all meals are built.

Table 2. Quantities of Farm-Raised Produce Used Per Person (Adult Equivalent\*) by Farm Families

Item	South-eastern Minnesota		South-western Minnesota
	1931-49	1940-46	1940-46
Whole milk (quarts)	631	541	590
Eggs (number)	520	618	569
Meat (pounds)	186	183	201

\* Members of the farm family are reduced to an "adult equivalent" on the basis of the following scales: man, 1.0; woman, 0.8; boy, 13-18, 0.9; girl, 13-18, 0.8; child under 7 years, 0.4; child 7-12, 0.6.

The farm also supplies some fuel. An average of seven cords of wood per family, valued at \$33, was cut on the farm. No expense for housing is available from these records but each family had the use of the farmhouse. Such expenses on the house as taxes, insurance, upkeep, and the like are included in the farm expenses and no allocation of the share chargeable to housing is available. If all the contributions to family living supplied by the farm were valued at the usual retail rates in urban localities it would appear that they come close to equaling direct cash living expense.

The relationship of level of income to family living expenditures is indicated in table 3. The farms included in this study were larger and better managed than the average farm of the communities in which they were located. Doubtless their average incomes were also materially higher and supported a higher level of family spending. However, there is sufficient range in incomes among the different farms within any given year and also in the average level from year to year to indicate the effect of size of family in-

Table 3. Relationship of Personal and Household Expenditures to Net Farm Income, 1940-1946

Item	NET INCOME GROUP		
	Lowest one-third	Middle one-third	Highest one-third
Food	\$ 377	\$ 381	\$ 445
Operating expense	142	148	161
Furnishings and equipment	40	109	142
Clothing	164	190	229
Personal care and spending	51	55	73
Education, recreation, and development	63	77	115
Medical care and health insurance	98	115	152
Church, welfare, and gifts	104	139	226
Personal share, automobile	85	112	151
Personal share, electricity and gas engine	35	43	49
Life insurance	123	163	185
Total expense	\$1,372	\$1,532	\$1,928
Expense per adult equivalent	444	479	536
Total net farm income	\$1,552	\$2,767	\$4,834

come on family expenditures. It has already been pointed out that as income increases from year to year family expenditures increase, but at a much slower rate. This same type of relationship is shown among farmers at different income levels within a given year. The families in the upper third in incomes had more than three times as much income available, but their personal and household expendi-

tures were less than 50 per cent higher than those of the families in the low-income group. On a per person basis the difference is even less. The high-income group spend only about one-fifth more per person. Although the families with larger incomes spend somewhat more for living, the general pattern of expenditures is much the same, regardless of income levels.

#### Large Families Have Advantage

Personal living expenses on a per person (man equivalent) basis are 77 per cent higher in the case of small families than in the case of large families. This is indicated in table 4. The

Table 4. Relationship of Size of Family to Personal and Household Expenditures Per Person (Adult Equivalent), 1940-1946

Item	SIZE OF FAMILY GROUP		
	Smallest one-third	Middle one-third	Upper one-third
Average number persons per family (adult equivalent)	2.1	3.2	4.6
	Cash expenditures per person		
Food	\$ 170	\$124	\$ 98
Operating expense	78	45	31
Furnishings and equipment	56	34	23
Clothing	70	63	51
Personal care and spending	23	19	15
Education, recreation, and development	37	25	23
Medical care and health insurance	59	40	29
Church, welfare, and gifts	69	56	31
Personal share, automobile	52	37	26
Personal share, electricity and gas engine	20	19	10
Life insurance	52	54	41
Totals	\$ 673	\$510	\$360
Net farm income per person	\$1,308	\$905	\$768

total net income of the larger families is greater than that of the small families, but on a per person basis it is less. Approximately the same proportion of the net income is used for family living in each size of family group. Some items of expenditure, such as operating expense, furnishings and equipment, church, welfare and gifts, automobile expense, life insurance, and the like, are made largely on a family basis and are, therefore, much higher on a per person basis in small families.

On the other hand, such items as food and clothing per person might be expected to be fairly constant regardless of the size of the family. Part of

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# MINNESOTA DRAINAGE LAWS

P. W. MANSON

**T**HE LEGAL PRINCIPLES involved in drainage activity are based on the common law which protects and justifies the individual in improvement of his property so long as such activities do not encroach upon the rights and privileges of others.

## Private Rights in Drainage

It is a well-recognized principle of law that any owner of private property may make any changes or improvements in his property that do not in any way encroach upon the property, rights, and privileges of his fellow man or of the community in which he lives. In its application to drainage, this principle involves the ownership and control of all bodies of surface water, both temporary and permanent, within the limits of a given farm that are too small to serve as a public conveyor of materials or produce from one part of the community to another. The private owner may enclose and protect such waters at his discretion. He also may drain them off his lands through his neighbor's land, provided he does not, without legally established permission or agreement, turn water into or through natural depressions entering onto or crossing the neighbor's land that would not naturally so flow at flood stages. He may improve natural drains and watercourses upon his own property so long as in so doing he does not cause unusual flood or other damage to his neighbor. He may bring the mouth of a tile drain or a surface ditch on his own land close up to his neighbor's line so long as it results in no unnatural flow and flood across that line that will give his neighbor cause for legal action for damages.

## Public Rights in Drainage

Every state with an agricultural drainage problem has a drainage code. This code provides that groups of men whose lands adjoin have a right to proper artificial drainage for their lands and those of the district in general, regardless of individual or group opposition. The legal procedure, which is definitely specified, is that the district, to promote general welfare, may condemn private property or authorize relatively minor damages, if the owner of the property is suitably paid for the land or for the damage.

## The Minnesota Drainage Code

This article summarizes the Minnesota laws on the organization and

*Owing to a succession of seasons with normal to heavy rainfall, plus relatively high prices for farm products, Minnesota farmers are displaying a tremendous upsurge of interest in farm drainage. Since many Minnesota farms lack natural drainage outlets, drainage districts must be formed to guarantee the construction and maintenance of artificial channels.*

maintenance of drainage districts—however, it does not cover the whole drainage legislation, and should not be taken as the final word of the law. The passages in quotation marks have been copied from the 1947 law concerning the Division of Water Resources and Engineering.

The new law eliminates the township and the state ditch. The remaining county and judicial ditch laws have parallel provisions and their organization is similar.

## The Petition

The petition is the first legal step in the initiation of a drainage proceeding.

**"A petition therefore shall be filed with the county auditor, if for a drainage system entirely within one county, or with the clerk of the district court, if for a drainage system within two or more counties. Such petition shall be signed by not less than a majority of the resident owners of the land described in the petition or by the owners of at least 51 per cent of the area of such land. The lands described in the petition shall be those over which the proposed ditch passes or upon which the improvement is located, and the petition shall set forth the description of such lands and shall set forth the necessity for the ditch or improvement, and that the same will be of public benefit and utility and will promote the public health, with the description of the starting point, the general course, and terminus or location of the same. The petition shall state that the petitioners will pay all costs and expenses which may be incurred in**

case the proceedings are dismissed or for any reason no contract for the construction thereof is let."

**"After a petition has been filed, no petitioner may withdraw therefrom except with the written consent of all other petitioners filed with the auditor or clerk."**

## Petitioner's Bond

**"Upon the filing of a petition and before any action is taken thereon, one or more of the petitioners shall make and file a bond payable, in case of a county drainage system, to the county, and in case of a judicial drainage system, to the counties named in the petition, in the sum of not less than \$2,000.00."**

This is to insure expense money if proceedings are dismissed. In case the \$2,000 bond is insufficient, the court or board shall require an additional bond. Expenses incurred prior to the establishment of the drainage proceedings shall not exceed the penalty named in the bond.

## Dismissal

**"In any proceeding, all the petitioners may dismiss the same at any time prior to the making of the order establishing the improvement, upon payment of all lawful costs, charges, expenses, and fees in the proceeding."**

## Engineer

**"Upon the filing of the petition and bond, the board or court shall, within thirty days thereafter, by order appoint an engineer to make a preliminary survey. . ."**

The engineer appointed shall within ten days thereafter take and subscribe an oath to perform his duties faithfully. The engineer must give a bond fixed by the board or court for not less than \$5,000. The law definitely stipulates the engineer's duties. All records are public property. The engineer shall file the preliminary survey data with the auditor or clerk. The auditor shall transmit one copy to the director of the Division of Water Resources and Engineering. Upon request the director shall report to the board or court giving his opinion as to the engineer's report.

### Preliminary Hearing

"Upon the filing of the report of the engineer, the auditor shall promptly notify the board, or the clerk shall promptly notify the judge, thereof, and the auditor, or the clerk with the approval of the judge, shall by order fix a time for the hearing thereon, not more than 30 days after the date of such order. Not less than 10 days before the time of hearing, the auditor or clerk shall give notice by mail of the time and place of hearing to the petitioners and owners of the lands and properties, and corporations, public or private, likely to be affected by the proposed improvement as shown by the engineer's report."

The engineer shall attend the hearing. All parties interested may appear and be heard. The report, if any, of the director of the Division of Water Resources and Engineering shall be read.

### Final Survey

"If the board or court shall be satisfied that the proposed improvement as outlined in the petition or as modified and recommended by the engineer is feasible, that there is necessity therefore, that it will be of public benefit and promote the public health, and that the outlet is adequate, the board or court shall so find and by such order shall designate the changes that shall be made in the proposed improvement from that outlined in the petition."

The order is then filed. The board or court shall then instruct the engineer to proceed to make a detailed survey according to the specifications of the drainage law. The engineer's report, based on his completed final survey, is filed with the auditor or clerk where the proceedings are pending. The auditor or clerk will forward a copy of the report to the director of Water Resources and Engineering. Within 15 days of the receipt thereof the director will make his report thereon to the board or court. Such a report is advisory only.

### Viewers

Following the order for a detailed survey, the board or court shall make an order appointing as viewers three disinterested resident freeholders of the county or counties affected. The viewers, with or without the engineer, shall view all lands and properties to be benefited or damaged by the project.

The viewers shall file their report with the auditor or clerk.

### Final Hearing

"Promptly after the filing of the viewers' report and the director's report, the auditor, or the clerk with the approval of the judge, shall fix a time and place for hearing on the petition and the engineer's and viewers' reports. The hearing shall not be less than 25 days nor more than 50 days from the date of notice thereof."

At this hearing, the board or court shall hear and consider the testimony presented by all interested parties relative to the petition for the drainage system.

"If it shall appear that the benefits are not more than the total cost, including damages awarded, or that the proposed system will not be of public benefit and utility, or that the same is not practicable, the board or court shall so find and the petition shall be dismissed."

"If the board or court shall find that the engineer's and viewers' reports have been made and all other proceedings in the matter had in accordance with law, that the estimated benefits are greater than the total estimated cost, including damages, that the damages and benefits have been duly determined, that the proposed drainage system will be of public utility and benefit, and will promote the public health, that the proposed system is practicable, and that such reports as made or amended are complete, just and correct, then the board or court shall by order containing such findings, establish the drainage improvement as reported or amended, and adopt and confirm the viewers' report as made or amended."

### Distribution of Cost

The court shall make an order determining the percentage of the cost of the system to be paid by the counties.

### Letting of Contract

After the expiration of 30 days following the filing of the order establishing a drainage system, procedure is set up for letting the job of construction. It is during this 30-day period that ap-

peals are made involving the question of damages and benefits. The type of bond, contract, plans and specifications, materials, appeals, inspection, payment, etc., are specifically designated by law.

### Final Hearing

Upon the completion of any contract, the engineer shall report that fact in detail to the board or court. The auditor or clerk will then give due notice of the final hearing to owners of all property affected. If it appears at the hearing that the contract has been completed in accordance with the plans and specifications, the board or court shall direct payment of the balance.

### Payments

"The amount that each tract and property will be liable for, as shown by the lien statement, and the interest thereon, shall be and remain a first and paramount lien thereon until fully paid; and shall take precedence of all mortgages, charges, encumbrances, and other liens."

Liens filed against property shall be payable to the treasurer of the county, as follows:

"One-tenth of the principal on or before November 1 subsequent to the filing of the lien in the office of the register of deeds, and one-tenth on or before the first day of November of each year thereafter until the whole thereof is paid."

"If the board or court in its discretion so orders, then payment of such liens shall be made to the county treasurer, as follows:

"One-fifteenth of the principal on or before five years from November 1st subsequent to the filing of the lien in the office of the register of deeds, and one-fifteenth on or before the first day of November of each year thereafter until the whole amount of the principal is paid."

The principle lien shall bear interest at a rate not to exceed 5 per cent per annum from the date of the filing of the lien statement. The installment and interest amount shall be collected in the same manner as real-estate taxes for that year on the property in question are collected. All provisions of law relating to the collection of real-estate taxes, so far as applicable, are adopted for the purpose of enforcing payment. In case of default, no penalty shall be added to any such installment of principal and interest but each defaulted

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## WORLD PROBLEMS

(Continued from page 1)

Great Britain, therefore, is facing the difficult problem of trying to expand production for exports at the same time she is trying to meet current and accumulated shortages at home. In addition she finds the obligations involved in carrying her share of the occupation of Germany a decided drain on resources. The loan granted by the United States has helped Great Britain meet this situation during the past year, but she is now rapidly approaching a condition where available resources are giving out and it is becoming necessary for her to curtail purchases in the United States.

As already indicated, the dollar shortage results from a lack of sufficient goods and services for export to us in payment for the goods bought here. The United States is being called upon to meet this problem in the short run by additional emergency loans or grants. While these are made in terms of money, they represent a sharing of our supplies with others. This sharing rests in part on humanitarian grounds. Beyond that, however, it recognizes the important stake that we have in restoring order out of chaos in a war-torn world.

Relief grants or loans for such a purpose can be only temporary in nature. Ways and means of restoring productive activity the world over must be found. One of the principal features of the Marshall plan now under discussion is that of getting the European nations to develop programs of restoring production. Any assistance we may provide over the next several years should contribute to a solution of existing difficulties rather than be merely in the form of current relief.

Prospects are that the interests of the United States in the rest of the world in the years which lie ahead will include finding ways of making effective investment of capital abroad to help other nations restore and improve upon their productive activities. Any such investments will go from our shores in the form of goods, not dollars. Such investments will take into account the fact that the world is an economic unit and that our levels of living are determined in no small measure by the way the rest of the world functions.

Future trade policies of this and other nations will be very important. If the United States is to invest capital abroad, it will get its returns mainly in goods and services. A reasonable willingness to accept imports is part of a program of foreign investment. A considerable volume of international trade on a reasonably free basis is

necessary for the development and maintenance of higher levels of living here and elsewhere. Efforts now in progress to develop a world trade organization are designed to serve this end.

Economic and political stability are highly essential to effective world cooperation and permanent peace. Stable relationships are needed among the monetary systems of the different countries if trade is to flow actively. It is important that ways of avoiding extreme fluctuations in business activity be developed. This is particularly true of the United States because of the violent swings in our business cycles in the past. Other nations hesitate to become too dependent upon us for fear that we may again experience a serious depression during which we may shut our doors to the entry of goods from abroad.

Depressions need to be avoided as far as possible because they lead away from world cooperation towards economic nationalism. Political stability likewise is necessary if trade is to be carried on actively. Such stability also is essential to international cooperation and successful agreements to maintain peace.

The United States is the world's leading power today. The policies and activities of our country will play a leading part in deciding what the world program in the years ahead may be. Every American citizen has an interest in obtaining the best possible understanding of the world situation and the inevitable bearing it has on his welfare. This understanding is necessary if he is to lend his support to those government activities and policies which will serve his best long-run interests.

## DRAINAGE

(Continued from page 13)

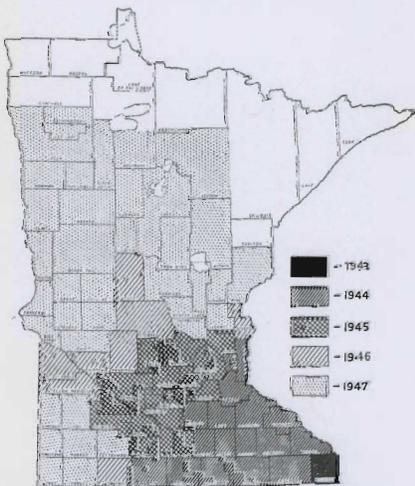
payment, principal and interest, shall draw interest from the date of default until paid at 6 per cent per annum.

### Maintenance and Repair

The county board is responsible for ditch maintenance. The board shall cause state, judicial, and county ditches to be annually inspected. The expense of repair is limited and controlled by law. Work estimated to cost less than \$1,000 may be done without advertising. The county board is limited in the expenditure of money for repair and maintenance on one ditch system in any one calendar year to a sum not greater than 10 per cent of the cost of construction, except under special petition. A petition from any party or corporation interested or affected by drainage system will cause the board or court to examine the ditch in question and make a report. The board or court may order a hearing on the petition before appointing the engineer. If owners of not less than 26 per cent of the area originally assessed sign the petition, then the board or court shall order the repairs and the letting of contract as specified, if the cost of repairs will not exceed the total benefits.

If the assessments for repair cost do not exceed 50 per cent of the original cost of the ditch, the annual installments for payment shall not exceed 5, but if such assessment exceeds 50 per cent of the original cost, the board may order such assessment paid over a period not to exceed 10 annual installments. The county board may accumulate drainage funds for drainage maintenance not to exceed 10 per cent of the original cost of the ditch system.

## THE CORN-BORER MENACE



Spread of the corn borer in Minnesota from 1943-1947.

Less than 10 counties in Minnesota are now free of the European corn borer. Since it was first found in Houston County in the southeastern tip of Minnesota in 1943, the borer has spread rapidly to 77 other counties, reports T. A. Aamodt, State Entomologist.

Control is a community program, but the individual farmer can do much to help control the borer. All infested material must be covered thoroughly by clean plowing so that later cultivation will not bring the borer moth to the surface next spring. Average plowing is usually not clean enough for control. There are special 16- and 18-inch plows adapted to clean plowing. Some plows can be equipped with a rolling coultter, jointer and chain, or covering wires so to turn under trash completely.

There are several other control measures, but clean cultural practices are especially important in the spring and fall.

# CLOQUET EXPERIMENTAL FOREST . . . .

(Continued from page 9)

moved. Nature will, of course, take care of this, but it is a slow process and often means a decrease in growth rate. If the excess trees can be removed at the proper time, the growth rate will be maintained and the yield will be increased through the utilization of trees which would otherwise go to waste.

Fundamental studies have been made to determine just what changes are made in growing conditions by thinning. Other fundamental studies are being made to determine just when and how the root growth, as well as the top growth, of the tree takes place.

One of the major problems being studied now is the effect of the source of seed in jack pine. Collections of seed have been made over the tree's entire range from the Atlantic Coast in Maine as far west as Saskatchewan in Canada, and from southern Minnesota to almost the northern limits of the tree's range. The growth and the form of the planted trees are being closely studied to determine their behavior. Trees produced from seed collected in 140 different places are being studied.

## Methods of Controlling Brush

One of the difficult problems foresters face is the return to productivity of many areas now completely covered with hazel and alder brush. It is impossible to plant these areas without first controlling the brush. Two methods are being tried at the Cloquet Station with promise of success.

The first method is mechanical and involves the elimination of the brush by disking with an Athens fire-line plow. This has proved very successful but somewhat expensive. It is interesting to note that this system points the way to a rather inexpensive land-clearing and pasture-improvement technique.

The second method being tried is the spraying of large areas with 2,4-D and other herbicides. While the work has not yet advanced far enough to permit drawing conclusions, the outlook is favorable. Here again the work can lead to the development of a method to improve pastures in the north country.

## Study of Practical Problems

Practical problems are not neglected. At present there is a lot of interest in the new power saws for felling and bucking timber. Many woodlot owners are anxious to try them. In a detailed time study on a cutting operation such as a northern woodlot owner might make, it was found that the bow saw

was a much more efficient tool, even though the difference in investment was not considered.

Numerous other projects are carried on by other divisions of the University at the station. The Division of Forestry under Dr. Frank H. Kaufert carries on an extensive project in fencepost treatment. The Division of Agricultural Engineering is testing the life of untreated posts. The Division of Entomology and Economic Zoology is studying the effect of wild life on the forest, and the effect of forestry on wild life, as well as the effect of insects on tree form and survival. The Soils Division is cooperating in studying the effect of fertilizers on planted trees and forest stands.

The educational values of the station have not been neglected. The senior students spend the spring quarter at the station in practical field work. Several short courses have been held for small sawmill operators to acquaint them with the newest and best practices. From time to time general field days have been held for foresters and farmers.

What can the farmer or the timber owner learn from the station? Farmers and lumbermen alike can learn that while it takes years to mature a forest crop, any piece of forest land can yield an annual harvest. They can learn how best to harvest the stands so that nature can renew them, and what they should do to keep the stands growing at their maximum rate. Above all, they can learn that forestry is possible and that it pays.

## FARM LIVING COSTS

(Continued from page 11)

the higher cost per person in the smaller families is due to the fact that the total personal and household expense is divided by the number of persons in the family (adult equivalent). On most farms some hired help boards with the family and shares in some of the items listed, particularly food and operating expense. Hired help makes up 30 per cent of the number of persons in the small family group but

Table 5. Relation of Amounts of Farm-Raised Foods Per Person (Adult Equivalent) to Size of Family, 1940-1946

Item	SIZE OF FAMILY GROUP		
	Smallest one-third	Middle one-third	Upper one-third
Whole milk (quarts)	597	537	523
Eggs (number)	716	640	557
Meat, dressed weight (pounds)	202	197	163
Potatoes (pounds)	318	324	300

only 8 per cent of the large family group. This accounts for some of the increased cost per person in the small families, but not for all of it.

The amount of farm-raised foods per person is also less in the larger families, even with the hired help boarding with the farm family. This is indicated in table 5. Apparently there is more efficient use of the items of family living in the large families or else their standard of living is somewhat lower.

## Different from Old Days

It is a far call from the family living costs as shown here and those of farm families in the early days of subsistence farming. The writer has seen a number of records of living expenditures of pioneer families in the days of early settlement in this state. Most of these showed an annual cash outlay per family of \$100 or less, often much less. In addition to producing their own meat, eggs, dairy products, fruit, and vegetables, they ground their farm-raised grains for flour and meal. They made their own clothes. Often the farm flock supplied wool that was carded and spun into yarn for home use. Soap was made on the farm. Much of the furniture and equipment was made at home. Candles were made of farm-produced tallow. Travel in the "horse and buggy days" was restricted to what the farm horses could supply. Outside amusement and recreation was limited.

As the commercialization of agriculture has progressed, the farmer has found that he can use his time more effectively producing for the market rather than for family use. With the proceeds from the sales of his crops and livestock he can buy many of the things he needs in the home more economically than he can produce them himself. As his income has increased his standard of living has risen. He now enjoys many comforts and conveniences the pioneer never dreamed of. This is all to the good and as it should be. We must, however, remember that this improved standard of living involves more cash outlay, even though farm-raised products still contribute substantially to family living.

Figures such as presented here are particularly useful in planning the financial setup of a farm. Farming is still a family business. Farm and family funds are kept in the same purse and the family is likely to be given first priority when these funds are limited. A knowledge of how much is needed for family living and an allowance for it in planning the financial setup of the farm business will do much to avoid financial difficulties. This is especially important in a business with such widely varying annual incomes as farming.

# MINNESOTA FARM AND HOME SCIENCE

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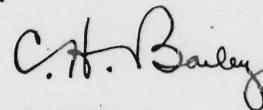
**I**N a state such as Minnesota, the range of interests represented in its agricultural industry is wide and diverse. In certain areas, for example, the success and prosperity of the farmers appears to depend upon good crops of potatoes, or of rutabagas, or of navy beans, as the case may be. In other areas economical swine production or market milk dominates the thinking. Every agricultural commodity presents its individual problems; the mechanics of the preparation and tillage of the soil, protection against pests and disease, breeding of improved stock or seed, and marketing of the product confront each producer.

It is the function of the agricultural experiment station to serve these diverse agricultural interests as completely and effectively as its means permit. This requires, however, that an individual investigator sometimes must divide his time and energies between a considerable number of interests. It also implies that numerous individual commodity or regional research stations cannot always be provided from the limited means at hand. If that were to be attempted, the technical staff would either be spread too thin, with inadequate or unbalanced personnel at each such station, or the central station staff would be on the move continuously amongst the satellite stations, and thus be unable to concentrate on specific problems to a degree that would make for productive returns.

Mention has been made of balanced personnel in an experiment station. If it "takes nine tailors to make a man," it may require a like number of scientists to develop sound, economical new practices for agriculture. The soils specialist, the engineer who understands farm mechanics, the plant or animal breeder, specialists on diseases and pest control, nutritionists, technologists concerned with processing the raw material, and marketing specialists or economists—all are not uncommonly involved in a program of study designed to alter and improve substantially an agricultural practice. The omission of any one of them may introduce a weakness in the sequence that subsequently results in inadequacies in the final program.

Likewise, in such a sequence, time must be available and personnel must be found to grapple with some of its fundamentals. While an industry is concerned, to be sure, with "practical" results, it not uncommonly happens that an elucidation of fundamental physical and biological principles will lay the most practical and immediate basis for the solution of the next problem that presents itself. The acceleration, in time, that results in this wise, is ample justification for the practice. Don't scorn or overlook the scientist who seemingly, at the moment, is not engaged in the solution of a purely practical problem. He may be preparing himself to answer pressing questions that will present themselves in the early future, and for which he may provide prompt and immediate answers.

Thus the agricultural experiment station must be organized like a well-balanced team. Its activities must cover not only the physical and biological sciences in their relations to the agricultural industries, but the social sciences as well. Thus it may find itself in a position not only to aid in stabilizing and improving the volume and quality of farm production, but also to contribute to the general satisfactions of farm living in terms of profits, comforts of living, and the general organization of the community.



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