Scarcity of Labor the Most Serious Problem Confronting Agriculture in Attaining 1943 Production Goals

Peak Labor Requirements Will Be in June and Will Be More Acute in Northern Utah Counties

By DEE A. BROADBENT and W. PRESTON THOMAS

UTAH has been assigned definite agricultural production goals for 1943. Increased acreages of many crops have been allotted, together with an increase in the production of most livestock and livestock products. These foods are needed for our armed forces, for civilian consumption, and for maximum assistance to our allies through the lend-lease programs.

The goals for Utah and the nation as a whole represent an increase in production over that obtained in 1942, the most productive year in our nation’s history. This increased production over last year’s high yields is requested even though there will be increasingly serious shortages of machinery, fertilizer, spray materials, and above all, of skilled and unskilled agricultural labor.

If the farmers of this state reach the 1943 war goals, it will require more than 326,000 months of work expended in productive effort on Utah farms (table 1). This does not allow for other needed farm labor, which would not be engaged directly in the production of agricultural products; such as: care of machinery, work stock, improvements and repair of improvements, and irrigation systems. These non-productive activities are nonetheless essential.

Labor required for livestock production in Utah will be slightly more than half of the total. Field crops, which include peas, tomatoes, beets, potatoes, dry beans, cereals, and hay will require about 40 percent of the labor; fruit and truck crops about 5 percent each. The acreage of fruits and truck crops, reported here, however, include only the major crops.

While the labor required for fruits and truck crops is not large compared with the total state requirements, it does create a serious problem in those counties where they are important. A large percentage of the labor used for these crops must be hired, because of the seasonal nature of these crops. Particularly in harvest time the demand for hired labor is heavy. Another situation that will make the production of these crops serious in respect to labor is the location of the areas in which they are grown. Over 80 percent of this labor will be required in the counties of Utah, Box Elder, Weber, Davis, and Salt Lake, where war industries have absorbed most available mature labor.

The peak labor load in the state will be in June (table 1 and figure 1). May, June, July, August, September, and October will all require 10 percent or more of the total labor, while in November, December, January, and February, 5 percent or less of the labor will be required.

The peak demand for livestock labor will come in April and May for the extra help required in lambing and shearing sheep. Demand for labor for

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THE DEPARTMENT OF BACTERIOLOGY AND BIOCHEMISTRY

The contributions of this department to agricultural knowledge are twofold: 
(1) Those dealing with the laws governing permanent soil fertility, and (2) those dealing with the composition of the plants grown upon the soil.

The maintenance of a fertile soil while at the same time harvesting large crops from it is founded on three fundamentals: (1) The texture and structure of the soil should be of such a nature that they will hold the fertility and yield it in crops as desired. The farmer cannot change the texture of his soil but the structure can be readily changed by cultural and manorial methods. In some of the experiments conducted at the Utah Station, $30 worth of plant nutrients was completely lost from the soil in one year, while under proper cultural and irrigation practices tested, there was no loss of plant food. (2) The amount of plant food is determined by the native fertility which the soil contains, plus the plant food added to it from time to time. The plant foods which must be guarded are nitrogen, phosphorus and potassium. The speed with which these disappear depends upon the cultural methods used and the crop grown. If the farmer raises a legume on the soil and sells it, he is depleting his soil, but if he feeds the legume and returns the manure, he may increase the nitrogen in his soil. This is done by the nitrogen-fixing bacteria which live in the nodules on the roots of the leguminous plants. (3) The tiny microbe is the biological factor determining the speed with which soil fertility can be withdrawn. The bacteria prepare the nitrogen, phosphorus, potassium and other food elements. If they are properly handled, they will prepare sufficient for a bumper crop, but if they are starved, as is the case where the soil is depleted of its organic matter and no more added, they cease work and the crop yield is reduced accordingly.

The soil fertility not only determines the quantity of a crop produced, but also the composition of that crop. Research has demonstrated that one wheat grown on one soil under definite conditions may have only one-fourth the food value of another wheat grown on another soil under different conditions. Hence it may be concluded that the quantity and quality of a given crop depend upon the soil on which it is grown.

Dr. Kenneth R. Stevens, research associate professor, has been connected with the Station since 1931. His research has been primarily on problems in soil fertility and the influence of organic matter in soil productivity.

Since 1937, Lewis W. Jones, research assistant professor, has been a member of the department. Mr. Jones' research has dealt with the influence of factors affecting the activities of beneficial micro-organisms in the soil, particularly the alkali salts, and organic matter and its vitamin-like constituents.
Disease-Free Foundation Potato Seed Stock to Be Produced at the Experiment Station

By B. L. Richards

Potato plants for tuber indexing growing in the greenhouse

Sets are planted in the greenhouse and given a number identical with that given the tuber which is placed in cold storage

PRODUCTION of reliable potato seed involves the elimination of certain destructive internal parasites—parasites which inhabit the tissues of the potato tuber and which are transmitted from year to year through the set used for seed. These parasites are essentially of a virus nature, of which there are some 16 or 18 that affect the potato in North America. Six of these viruses are prominent in Utah and are primarily responsible for the degeneration of the potato seed stock throughout the western part of the United States. Of late years bacterial ring rot, also caused by a tuber transmitted parasite, has become a threatening problem and has given special concern to seed producers throughout both the United States and Canada. The diseases caused by these various parasites result annually in seriously decreased yields and frequently in extensive losses to the individual grower. These losses can be prevented only by planting quality seed free from the parasites.

In the fight to eliminate these diseases, various field practices have been employed; however, with the most vigorous field roguing methods, Utah growers have failed utterly to produce quality disease-free potatoes from year to year in any selected seed stock. Growers have been forced to import improved seed from outside areas usually every second or third year. Even second year seed has frequently proved unreliable and although much progress has been made in the improvement of seed stock in the state and in subsequent yields in commercial crops, such methods as are now employed in seed production in Utah are unreliable, costly, and frequently discouraging.

With the demand for increased production and with guaranteed higher prices, the waste induced through the use of disease-transmitting seed tubers becomes a more critical, if not a definite war emergency situation, and one requiring the cooperative efforts of all agencies capable of rendering service in the solution of the potato seed problem. At the request of potato growers and of the Crop Improvement Association, the Utah Agricultural Experiment Station has initiated a program for the production of foundation disease-free seed potato stock. This service, commenced this year, will parallel the seed services now rendered by the Station with wheat, oats and barley and as further proposed for all types of farm and garden seed, for which there is immediate need for improvement. The production of disease-free potato seed, however, is a far more difficult task than is involved for these other crops.

As early as 1929, the Utah, Oregon and Montana experiment stations, in cooperation with the United States Department of Agriculture, established the fact that in the arid West, where virus diseases are spread rapidly, foundation virus disease-free seed could be reliably produced only through the use of tuber indexing, field tuber unit roguing, and by further multiplication under isolated conditions. These cooperative studies indicated further that in the multiplication of tuber-indexed seed, field roguing is a job demanding training, and that in general few growers are equipped with proper location and with soil types necessary to insure success. Practical experience of growers and the continued

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FARM AND HOME SCIENCE

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More detailed information on the subjects discussed here can often be found in Station bulletins and circulars or may be had through correspondence.

A War Bond Program for Farmers

W. I. Myers, consultant of the U. S. Treasury, and head of the Department of Agricultural Economics of Cornell University, recommends the following program for farmers:

1. PRODUCE THE MAXIMUM OF ESSENTIAL FOODS. There is critical need for all you can produce. Food production is of equal importance with the production of planes, guns and ships. Develop and maintain an efficient farm business. Use necessary credit for intensive operation by keeping debts at lowest point that permits efficiency.

2. GET YOUR DEBTS IN SHAPE BY REDUCING EXCESSIVE DEBTS TO A SAFE BASIS. There is no conflict between the reduction of debts and the War Bond program. Income paid on debts does not compete with the war effort and hence does not contribute to inflation. Pay off emergency second mortgages as rapidly as possible. Reduce production loans to a conservative level.

3. INVEST IN WAR BONDS TO HELP WIN THE WAR AND TO BUILD YOUR FINANCIAL RESERVE. A financial reserve will be valuable for postwar purchasing to cover present depreciation on farm equipment. There is greater security in protecting a good farm than in enlarging holdings beyond the size necessary for efficiency. Refrigerators, water systems or other home equipment are not available now. Invest the cost of these desired improvements in War Bonds to enable you to purchase them when peace comes. Invest all you can in War Bonds as a general financial reserve for unfavorable years that may come later.

4. WAR BONDS ARE THE BEST FORM OF FINANCIAL RESERVE EVER OFFERED TO YOU. They are not transferable, but the investment will be repaid if needed. You will have time after sixty days from purchase. If left to maturity, in ten years, you get back $4.00 for every $3.00 put in.

Patriotism and self-interest combine to make an investment in War Bonds the best financial reserve for you. Your money helps finance the war. By postponing unnecessary spending you speed production of planes and munitions to win the war. The gradual expenditure of your reserve after the war will provide jobs for returning men of the armed forces and thus help stabilize business in the readjustment period.

FOUNDATION POTATO SEED

(Continued from page 3)

efforts of the State Department of Agriculture and the Utah Crop Improvement Association over the past 10 years confirm these early experimental results and have thus culminated in the demand for the more concerted attack on this difficult problem.

The specific procedure in freeing seed from virus parasites consists in planting a set from each tuber in the greenhouse and allowing the resultant plant to grow to a height of 6 to 8 inches. The remaining portion of the tuber with a number identical with that given the set (see figures) is held in cold storage until the disease content of the set is determined through examination of the resulting plant. If the plant from the set is found free from virus diseases, the indexed tuber will be held for planting the following spring. If it is found diseased, the entire remaining portion of the tuber will be discarded. While tuber indexing is in general reliable, conditions occur under which the index plant may not express the disease content of the tuber. As a supplementary aid in complete removal, sets from the selected tubers are planted in the field so that the resulting plants may be examined as a unit. If any plant of a tuber unit shows disease, all plants grown from that tuber are removed from the field and destroyed.

From this resulting crop, the best disease-free hills will be selected for greenhouse indexing the following winter and spring. The remaining portion of the crop will be sold to selected growers, who, under state supervision, will multiply the seed for certification and general distribution to growers.

Limited quantities of foundation stock are thus successively indexed each year for disease and selected in the field for yield and trueness to type. The quantity available for the field each year, however, is necessarily limited to the amount of greenhouse space available. Again the number of varieties indexed will be limited, possibly to three: Bliss, Russett, and Katahdin. Other varieties may be added only as greenhouse facilities are expanded. This tuber indexing process is costly; however, it has been repeatedly demonstrated that only by such procedures can reliable foundation stock be produced. The method is employed at present by a few other states, notably Maine and Nebraska, who are on their way to a successful solution of their potato seed problems. It is planned by the Station and associated workers ultimate-

The Authors

D. A. Broadbent, raised on a livestock ranch at Heber, completed work for the Master's degree at the University of Illinois, and is now a member of the Department of Agricultural Economics.

W. P. Thompson, head of the Department of Agricultural Economics, is a member of a special committee appointed by the governor to study the labor situation in Utah.

D. W. Thacher is a native of Utah, was county agent in Weber County, and has been at the college since 1926.

B. L. Richards has been head of the Department of Botany and Plant Pathology at the Station since 1925, and has charge of the potato tuber indexing work. Dr. Richards is also working on virus disease of stone fruits, particularly the peach.

Bliss H. Crandall has been newly appointed to the Station staff. He was a former student of the College and has been on the teaching and research staff at Iowa State College the past three years where he completed special studies in plant breeding.

Rollo W. Woodward, assistant agronomist, Division of Cereal Crops and Disease, U. S. Bureau of Plant Industry, stationed at Logan, has done outstanding work in cereal breeding. He developed Velvon barley and Uton oats and has done some field pathology.

Byron Alder, head of the Poultry Department at Logan, is well known throughout the state as an authority on poultry problems, and has contributed to the development of the present poultry industry of the state.

A. C. Esplin is well known throughout the state as an authority on sheep and wool. He was raised in southern Utah, was county agent of Iron County and taught at the Branch Agricultural College. He now is extension animal husbandman as well as being a member of the Experiment Station staff.

George Q. Bangerter, head of the Dairy Experimental Farm and an authority on pasture management. He works cooperatively with the U. S. Bureau of Dairy Industry and the Experiment Station.

L. A. Stoddart, head of the Department of Range Management and acting dean of the School of Forestry, has written a number of articles on range management which have appeared in several publications of this publication. He came to the college in 1935 from the Soil Conservation Service.

F. V. Owen is geneticist in the Division of Sugar Plant Investigations, U. S. Bureau of Plant Industry, and is in charge of the U. S. Sugar Plant Field Laboratory in Salt Lake City. Albert Murphy is junior pathologist at the Twin Falls, Idaho, station of the same division.

F. B. Wann has spent a number of years in an intensive study of chlorosis in Utah. He has written a number of publications on this subject.

W. Israelson has been working on irrigation problems in Utah since 1916. He is a native Utahan, a graduate of the College and of the University of California. He is now research associate professor of irrigation at the Station.

C. W. Lauritzen, a graduate of Utah State, returned here in 1941, as associate soil technologist for the Soil Conservation Service. The Soil Conservation Service is cooperating with the Station on a number of research projects on soil and water conservation.

The problem is to provide the foundation seed production program on a definite commercial basis, under the management of the Utah Crop Improvement Association with limited Station supervision.
The Story of Hybrid Corn

When Grown for Silage, Corn Has Important Place in Utah Agriculture

By BLISS H. CRANDALL and ROLLO W. WOODWARD

CORN cannot be expected to compete with the small grains as a grain crop in the Intermountain Area because of the high productivity of small grains under irrigation and the ease with which they can be grown and harvested. However, when corn is grown for silage, few other crops will produce as many feed units per acre. Utah now grows about 30,000 acres of corn each year, the value of which, in supplementing the limited supplies of hay and grain, can not be overemphasized.

Corn is a normally cross-pollinated plant; that is, the kernels on an ear are usually fertilized by pollen from nearby plants. Until the development of hybrid corn, plant breeders were able to contribute little to the yielding ability of the adapted strains the Indians were growing when America was discovered.

The scientific basis of modern corn improvement had its beginning just before World War I, with genetic studies on the effects of inbreeding in corn. Since then many investigators have contributed their ideas and results of research until today the methods for utilizing hybrid vigor in corn are well established. The discovery of these methods may well stand out as the major agricultural accomplishment of our generation. The basic principles found in this research are already influencing not only the improvement of other crops, but animals as well.

The first step in modern corn improvement is the development of inbred lines. This is accomplished by self-pollinating desirable plants for several generations. During this inbreeding process, many plant abnormalities and weaknesses become evident, and plants exhibiting them are discarded. There is also a pronounced reduction in vigor which accompanies inbreeding, so much so that all inbred lines are inferior in yielding ability to their parent varieties.

The real goal for inbreeding is to develop lines that will breed true. From a practical standpoint, this is accomplished after six or seven generations of selfing.

Because of the low vigor of inbred lines, they are useless as such for corn production. Their value lies in their use as parents of hybrids. The next step in the development of hybrid corn, then, is testing inbred lines to determine which ones best combine to give the highest yields. When a good combination is found, the seed supply of the parents is increased and the combination made over and over again to take advantage of the increased yield.

The simplest method of utilizing inbred lines is to combine two of them in a single cross. This method will give the highest yield of the most uniform crop, but because the parents are inbred plants, the seed yields are low and the cost of production is high. The single cross seed is also irregular in shape and size and difficult to plant by machine, especially when a constant number of kernels per hill is desired. Another method and the one commonly used is to make a double cross, which is a combination of two single crosses. This method is likely to produce a hybrid which will be slightly inferior to single crosses in yielding ability and uniformity, but the seed cost will be low and the quality high.

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LIGHTING OF POULTRY HOUSES UNECONOMICAL FOR HENS OVER ONE YEAR OF AGE

Fertility and Hatchability of Eggs Reduced and Egg Production Not Increased by This Practice

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THE appeal to the farmers of America to increase egg production this year to aid in supplying the home front, our armed forces, and our allies with this important food product, along with the fact that egg prices will undoubtedly continue to be favorable, should cause every poultry raiser to manage his laying flock to get the highest possible egg production from every hen.

Most poultry raisers are familiar with the fact that the use of electric lights during the short winter days does increase average egg production rather markedly in a flock of pullets. Some are also aware of the fact that this increase in winter egg production does not necessarily result in much, if any, increase in average egg production for the year. Information on the effects of the use of lights on older hens, and on the hatchability of the eggs produced during the following spring months, and also on the subsequent livability of the chicks hatched is not so generally known.

To get information on these problems, the Poultry Department of the Station mated 12 pens of S. C. White Leghorn hens varying in age from one to eight years. Eighteen hens and one male were placed in each pen, and hens of different ages were well distributed through all the pens. The grain and mash feeds were the same in all pens as well as the housing conditions and all factors of management, except that in 6 pens electric lights were used from about 4:15 a. m. until daylight from October 10 to April 21. Electric water warmers were also used throughout the study.

A summary of the data obtained on the fertility and hatchability of the eggs set and the livability of the chicks hatched is given in table 1. Most of the hens in both groups had been laying well during September, and all the eggs produced in October and most of the November eggs were from hens that had not molted at the end of the previous year's production. The birds in lighted pens gave a marked increase in egg production during December, January and February, followed by a gradual slump during the late summer period.

All 12 pens in this study were mated for special pedigree breeding and hatching. A summary of the data obtained on the fertility and hatchability of the eggs set and the livability of the chicks hatched is given in table 1. None of the eggs were incubated before February 1 and after April 10.

Since the use of lights and warming the water during the short winter days from October to April did not increase the total yearly egg production, there would be little advantage obtained from this practice in increasing the supply of eggs for the year with year-old or older hens.

The marked decrease in the percentage of fertile eggs along with the slight decrease in hatchability of the eggs incubated from the hens in the lighted pens would make it a rather unprofitable practice from the point of view of the breeder or hatchery.

Table 1. Average egg production per hen by months in lighted and unlighted pens

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</thead>
<tbody>
<tr>
<td>No lights</td>
<td>4.8</td>
<td>2.1</td>
<td>2.7</td>
<td>3.0</td>
<td>12.1</td>
<td>20.2</td>
<td>21.7</td>
<td>22.2</td>
<td>19.5</td>
<td>19.2</td>
<td>16.9</td>
<td>9.3</td>
<td>153.7</td>
<td></td>
</tr>
<tr>
<td>Lights</td>
<td>3.4</td>
<td>3.6</td>
<td>11.0</td>
<td>14.0</td>
<td>15.2</td>
<td>20.8</td>
<td>20.4</td>
<td>18.3</td>
<td>17.3</td>
<td>14.0</td>
<td>12.9</td>
<td>3.5</td>
<td>154.5</td>
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</tbody>
</table>

By Byron Alder

Table 2. Fertility and hatchability of eggs set and livability of chicks hatched from lighted and unlighted breeding pens

<table>
<thead>
<tr>
<th>Pens with</th>
<th>Avg. eggs produced</th>
<th>Total eggs incubated</th>
<th>Eggs incubated fertile</th>
<th>Chickens hatched</th>
<th>Hatchability of all eggs hatched</th>
<th>Mortality</th>
</tr>
</thead>
<tbody>
<tr>
<td>No lights</td>
<td>153.7</td>
<td>2,366</td>
<td>11.6</td>
<td>74.0</td>
<td>1,547</td>
<td>65.4</td>
</tr>
<tr>
<td>Lights</td>
<td>154.5</td>
<td>2,185</td>
<td>24.6</td>
<td>70.9</td>
<td>1,168</td>
<td>53.5</td>
</tr>
</tbody>
</table>

There is considerable evidence available from other studies showing that there is little advantage in providing warm water for either chicks or laying hens as compared with cold or even ice water. The advantage of keeping the water from freezing and thus having it available to the hens each morning when the light comes on could hardly justify the increased cost when measured by the increase in egg production or net return from this study.

The data obtained indicate that the use of lights for old hens is not as profitable as when lights are used for pullets to increase egg production in October and November when the price of eggs is usually at the peak. Egg prices in January and February are usually little, if any, higher than the average for August and September.

Charles W. Riggs, a graduate in veterinary science from Colorado State College, has been added to the staff to replace Wayne Bims, who was called into military service. Mr. Riggs received his undergraduate training at the University of California and has taught school in Texas.

Dr. Ralph W. Phillips, former head of the Animal Husbandry Department of the Utah Station and now senior geneticist, U. S. Bureau of Animal Industry, has left for China where he will be consultant to the Chinese government on problems of animal breeding.

Word has been received from D. W. Pittman, research associate professor of soils, that he will remain another year in Iran, where he has spent the past two years working for the Department of Agriculture. L. W. Winsor, a former staff member, is working with Professor Pittman in Iran.

Mrs. Pittman landed in New York on January 27 after a harrowing four-month trip by boat. She came via India, Ceylon, South Africa, through the Straits of Magellan, up the west coast of South America, and through the Panama Canal to Cuba, and then to New York. She will remain for some time in New York before returning to Logan.

Farm and Home Science
WOOL scouring is a process of separating grease, dirt, and vegetable matter from the wool fiber. It is surprising to many users of wool fabrics to learn that wool shorn from sheep in the form of fleeces usually carries more waste matter than fiber. When this fact is made known, the first thought is to scour wool before shipping to distant mills. The wool textile industry is centered in New England, and 60 to 70 percent of the sheep are west of the Missouri River, in the eleven western states and Texas. This requires the freight and other expense of transporting approximately 150,000,000 pounds of waste material two to three thousand miles each year. The waste of freight is important, especially in war time; but to correct it calls for the introduction of manufacturing of wool in the west, rather than the simple scouring of wool to reduce freight, because the scouring is a step in the manufacture. Wool is not only graded, but sorted for various textile purposes before scouring. Scoured wool is bulky and freight rates are about double those of grease wool. These problems are more important in making desirable wool textiles than the freight haul of grease and dirt.

However, the scouring of small composite samples from each flock for the purpose of arriving at a yield seems to be the only fair method of determining the grease price. The yield varies so much that estimates are difficult to make, even by experienced wool men. It is impossible to get yields from manufacturers because clips are not scoured separately, but sorted and blended before scouring. The sampling of wool for yields is similar to sampling other agricultural commodities for price determination. The samples must be drawn according to tested methods, scoured, and conditioned to get uniform results.

The results of scouring tests at the Utah Agricultural Experiment Station indicate that wide variations exist in the yields of clean wool in Utah's wool clips. Estimated average shrinkage figures for the state are useful only to indicate the approximate shrinkages of wools coming from the state, and do not provide a fair basis for the sale of wool by individual owners. The buyer's estimate of the shrinkage that is made merely from an examination of the grease wool cannot be expected to give a true picture of the clip. An error of 5 percent on a clip of 40,000 pounds of wool means an error of 2,000 pounds of clean wool. If the error is against the grower and if clean wool is worth 95 cents a pound, this means a loss of $1900, or many times the cost of taking and scouring samples.

If the price of wool is based on estimates that approximate the shrinkage figure that is believed to be typical of the area, the grower who is producing high-shrinkage wools receives an unfairly high price for his clip, while the grower who is producing low-shrinkage wools is penalized. Because wool has generally been bought on this basis, many growers have continued to breed sheep with high shrinking wools, and have not used management practices that would decrease the shrinkage of their wool. Such buying practices, and the resulting breeding and management practices, are undesirable from the standpoint of both the producer and the wool trade.

These practices can only be changed by adoption of tests of shrinkage which give both the producer and the buyer a reasonably accurate determination of the yield of clean wool. With this information, and with knowledge of staple length and grade, a fair price for the clip can be arrived at that is based on a test rather than a guess.

Sufficient evidence is now available to indicate that the scouring of a carefully selected composite sample gives a reasonably accurate determination of the yield of clean wool, and this method is adapted to wide use throughout the range country. The small errors involved in the method will fall on the buyer's side as frequently as on the side of the grower. Use of this method makes possible the testing of a large number of herds at a minimum cost.

After the grower knows the yield of clean wool of his clip, he can easily determine the price he should have for the grease wool. For example, if scoured wool of a certain grade is quoted at 95 cents on the Boston market, and the clip will yield 41 percent clean wool, the

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The clippings show the different amounts of green herbage harvested from the unfertilized and the fertilized areas of one of the pastures on September 28 just before the herd was turned in to graze for the fifth time. The unfertilized area produced at the rate of 340 pounds of green herbage per acre compared to 962 pounds for the fertilized area. The increased carrying capacity of well-managed pastures late in the year is an important factor in holding milk production at a high level.

An abundance of green herbage approximately 5 inches high on August 1. At this time of year most Utah pastures are barren and furnish little or no feed.

Fertilized pastures recover at a rapid rate. The first picture shows the condition of the pasture after it had been grazed off by the dairy herd May 14. The second and third pictures show the rate of recovery in the unfertilized and fertilized area, respectively, on June 18, thirty-five days later. The mass of the herbage has attained a height of less than 3 inches where the sward received no fertilizer. During the same period the herbage recovered to a height averaging more than 6 inches in the fertilized area.

STUDIES have been underway at the Dairy Experimental Farm for a number of years to determine how much milk and butterfat production can be increased by the application of manure and treble superphosphate to pastures that are grazed by dairy cattle.

The four four-acre pastures used in this study were grazed in rotation for four years to determine the carrying capacity when no fertilizers were applied. Between March 27 and April 6, 1942, these pastures were fertilized with manure and treble superphosphate. The manure was taken directly from the yards and contained a high percentage of the liquid portion, and was applied at the average rate of 6.8 tons per acre. Treble superphosphate was broadcast at the rate of 200 pounds per acre.

In order to get a measure of the increased herbage production resulting from the fertilizers, four small areas were set out in each pasture, to which no fertilizer was applied. Just before the cows were turned into each pasture to graze, four 1/100-acre strips were clipped from the unfertilized area and four similar clippings from the fertilized area of each pasture for comparison.

The increased forage production as shown by clippings resulting from the application of manure and treble superphosphate is shown for the four pastures in table 1.

During the first grazing period, even though the fertilizers had been on the pasture only 33 to 37 days before the grazing, the fertilized area produced 27.3 percent more green forage per acre than when no fertilizer was applied. For the second, third, fourth, and fifth grazing periods, forage production from the fertilized area of the pasture increased 107.9, 116.8, 101.6, and 187.2 percent, respectively, for the different grazing periods, over the unfertilized area. Except for the period, August 19 to September 27, there was a gradual percentage increase in the amount of forage produced on the fertilized pasture as compared to the area receiving no fertilizer, or a seasonal increase of 95.7 percent.

Data were also kept on the production of the cows grazed in the pastures. The production per acre in 1941 was 4,805 pounds of milk, containing 160 pounds of butterfat, as compared to 8,376 pounds of milk, containing 279 pounds of butterfat, for the grazing season of 1942, after the pastures had been manured and phosphated.
During the time the cows were grazing the pastures, there was an increase in body weight. On the untreated pastures in 1941, this amounted to 92 pounds per acre. On the fertilized pastures in 1942, the gain was 202 pounds.

During both years the cows were fed supplementary feeds in addition to pasture. The first year an average of 193 pounds of alfalfa hay and 791 pounds of grain were fed as supplementary feed per acre, compared to 862 pounds of alfalfa hay and 1,456 pounds of grain in 1942.

With butterfat having a value of 55 cents per pound, the total butterfat produced per acre for the two years, 160 and 279 pounds, respectively, would have a gross value of $88 and $153.43. Charging the cost of the supplementary feeds at the rate of $8 per ton for alfalfa hay and $1.10 per hundred for grain, during 1941, $10.26 worth of supplementary feed was fed, as compared to $19.47 worth in 1942. The reason more supplementary feeds were fed the second year was because the cows grazed the pasture for a longer time and were producing at a slightly higher rate.

Subtracting the value of the supplementary feed, we find the gross value per acre for butterfat produced to be $77.74 for the summer of 1941 as compared to $133.98 for 1942. This difference of $56.24 cannot be credited entirely to the fertilizers applied the second year because during the second year the herd was producing at a higher level. However, this calculation does show the high returns per acre that can be attained from pastures when properly managed and fertilized.

The above clippings were made July 3, 1942, just before the cows were turned into the pasture for the third grazing. Note the increased forage production right up to the line of the unfertilized area at the right. The clippings from the unfertilized area yielded at the rate of 1,270 pounds per acre compared to 3,610 pounds of green herbage from the fertilized area.
DURING war periods all too frequently the conservation of land has been forgotten in an attempt to increase production during the emergency. Now, as never before, Utah's ranges are called upon to furnish meat and wool in large quantities. It is important during this period to produce all that these lands can produce, but also it is important that the ranges suffer no permanent injury from effort to attain high production. What, then, is the key to maximum production?

Production is influenced by livestock numbers and by the quality of the animals. Quality is always important, for a good animal not only brings higher market prices, but, also, is more efficient in the use of the forage consumed. Utah ranchers should take immediate steps to dispose of slow breeders and non-producing and scruffy animals. Such action not only benefits the rancher but also the nation.

The number of livestock which a given range can accommodate is limited by the forage produced. In many intermountain areas, increasing numbers beyond the capacity of the land will give a temporary increase in meat and wool production, since the additional animals can subsist on what forage normally is left as a reserve. This increased production results from increased numbers, alone, for many experiments have shown conclusively that the yield from each animal, both meat and wool, is decreased. The increased production, further, is always temporary, for, if excess stocking continues, the range suffers more or less permanent injury, and production will drop far below that of conservatively used ranges. Overstocking brings about forage plant changes and soil erosion which reduce long-time production and lower land values. This is not what the government expects of Utah ranchers. The government wants range management which will give the highest production over a long-time period, and this involves management that will not result in misuse of the range.

One of the finest examples in Utah of what can be done by common sense management of a range is the land belonging to the Ekker brothers west of Eureka on the northern edge of the Sevier desert. This is typical dry range similar to thousands of acres of sagebrush and juniper land used for winter and spring-fall grazing in Utah.

The Ekker brothers own 1,280 acres of this land upon which they winter 250 head of fine Hereford cattle. The animals enter this range in the late fall, about the first of November. They remain until about the first of April. All the cattle receive alfalfa hay during stormy periods when the snow becomes too deep for grazing. They are never kept on the range after the first of April, but, rather, are finished at the ranch on hay. The pastures are beginning growth at that time and the ground is thawing. In this period, the range is easily damaged, and great care is taken to avoid grazing, which would injure it.

Analysis of the Ekker range shows it to have a forage density of 33 percent. The forage is chiefly grass, about 60 percent bunch wheatgrass (Agropyron spicatum), 15 percent bluegrass (Poa secunda), and 5 percent bromegrass (Bromus tectorum). The remainder is largely sagebrush (Artemisia tridentata), bitterbrush (Purshia tridentata), and mixed flowering herbs. It appears from observation of the range that the grass, stimulated by present careful grazing, is crowding out the sagebrush, much of which is dying (note dead plants in photographs).

The success of the Ekker brothers is attributable to protection of the range during the growing season by a regular hay feeding program. Grazing is deferred in the fall until the grass is mature and has formed seed. The presence of an abundant supply of hay for emergency winter periods keeps the animals well fed and also relieves the range of a material part of the burden of supporting the animals. The presence of abundant supplemental feed enables them to remove the cattle from the range when the forage is fully used; hence, over-grazing is avoided.

Adjacent ranges which have not been protected are not nearly so productive, grass being almost totally absent. Whereas, these outside ranges require from four to ten acres to maintain a cow for a month, the Ekker range has been yielding about a cow-month of grazing for each two acres. Further, outside ranges are eroding and decreasing in value. The Ekker range is a much more valuable range than before controlled use was begun. Even more important, this range is not eroding and, under such practical conservation, will maintain its high production. It is range land like this that helps to win the war. Such land is a monument to the wisdom of its owners.
INCREASED FINANCIAL SUPPORT NEEDED FOR RESEARCH

By R. H. WALKER

INCREASED financial support for the Agricultural Experiment Station has been requested of the State Legislature in order that its services might be extended to more farm people of the state, and that experiments might be conducted on certain agricultural problems that have not been investigated heretofore because of insufficient funds. Certain farm groups have recognized the value of agricultural research and the accomplishments and progress that have been made on many agricultural problems. Hence they have requested that the Experiment Station undertake additional investigations which it is believed will result in improvement to agriculture and to the general well being of the entire state.

For example, the progress made in the development of disease resistant plants has been recognized as a most important contribution to the welfare and permanence of the agricultural industry of the state. Improved varieties of small grain resistant to smuts and rusts are now being grown on practically every farm of the state. Sugar beet varieties resistant to curly top, a virus disease carried by the white fly, have been developed through plant breeding in U. S. Department of Agriculture laboratories. The same virus disease, curly top, that affects the sugar beet also affects tomatoes and is sometimes known as western yellow blight. The manner in which the disease affects the tomato plant and its seriousness to growers and canners has been described in earlier issues of this publication. It is significant, however, that in years of heavy infestation of the white fly, the disease becomes so widespread and devastating in its attack that a large proportion of the entire commercial crop of tomatoes may be destroyed. In such years the loss to the growers amounts to many hundreds of thousands of dollars, and the loss to the canners and others connected with the tomato industry is equally as large.

The fact that it was possible by plant breeding to develop varieties of sugar beets resistant to this disease lends confidence that the same thing can be done for tomatoes. For the past few years, a breeding program has been in progress for this purpose. Resistant wild tomatoes from South America have been crossed with the good quality commercial tomatoes. Already promising results are beginning to appear. Thousands of crosses and combinations must be made, however, and the more promising ones selected and crossed again with other superior plants. This type of work is time-consuming, and probably will need to go on for a number of years before the ultimate objective is realized. It can be speeded up, however, by expanding the program and by prosecuting the work more intensively. This is being urged by the canning crop growers of the state and also by those who are in the canning business.

It is particularly urgent at this time that every possible effort be put into this work, owing to the great need for increased production of tomatoes. Tomatoes have been designated, along with peas, beans and potatoes, as strategic war crops for Utah, and farmers are being urged to increase their production of these crops as much as possible. It would be extremely fortunate if, at this time, disease-resistant varieties of tomatoes were available for planting so the growers and the canners would have protection against the ravages of such diseases as curly top.

Other problems of equal importance to the welfare of agriculture in this state and which need immediate and vigorous investigation are poultry diseases; diseases of range sheep; improvement of the breeding stock of range sheep through culling of the breeding herd, based at least in part on wool grading and scouring; the development of improved fruit varieties that are hardy to our climate and suited for shipping, and for canning and freezing preservation; testing the adaptability of vegetable varieties for seed production in Utah; the production of foundation seed stock of disease-resistant varieties of potatoes, small grains, alfalfa and vegetable crops; the testing of the performance record of range beef sires through feeding trials on the offspring; the determination of the fertility requirements and the proper methods of management of important soil types in the state; determination of the nutritive value of Utah grown fruits and vegetables, together with an investigation of the vitamin levels of various groups of individuals and their requirements for vitamins; the part played by the several factors or steps involved in the management and operation of a farm enterprise in determining the success or failure of the enterprise; and the development of information that will point the way for the more efficient and profitable marketing of Utah farm products.

The biggest element of risk and of loss in the poultry business is that of disease. Death losses in the laying flocks of the state average each year 25 percent or more over large areas, and in individual flocks the loss is often even greater. Likewise the turkey producers have sustained tremendous losses of poult s from diseases that have been difficult to diagnose and treat. Vigorous investigation of these diseases and the development of methods for their treatment and control are being urged by the poultrymen of the state. To do this it will be necessary to establish a branch laboratory of the veterinary clinic in the central or southern part of the state in order that the veterinarian assigned to the work will be in close proximity to those areas where the poultry and turkey enterprises are developed on an intensive scale. Studies of breeding stocks and also of the sanitary conditions under which the birds are kept will become a part of this investigation, as well as a study of the nature, cause and methods of control of the diseases involved.

Investigations conducted thus far indicate that a sound culling program with range sheep must be based upon the grading of the fleece and a knowledge of the weight of fleece produced by each individual of the breeding flock. In small herds where this program has been in operation in years past, it has been possible to increase materially the average weight of fleece per ewe. In one flock the average fleece weight has been increased over two and one-half pounds. If the average for all the sheep of the state were to be increased by one pound, and this goal may be within the realm of practicability, at the present price of wool this would amount to a million-dollar increase in the annual value of the wool crop of Utah. Knowledge of the content of clean wool in the clip would also be of material value to the producer in selling his wool. This information would be a product of the grading and scouring studies on the breeding herd. These and other investigations of sheep losses by disease are being urged by sheep and wool growers of the state.

Space will not permit a detailed explanation of the studies to be made on all the problems listed above. In each case, however, they are of great importance to the farm and livestock people. (Continued on page 15)
LABOR SCARCITY
(Continued from page 1)

Field crops will reach a peak in June and will remain relatively at a constant level until October. The winter labor requirement for field crops is negligible. Over 50 percent of the labor in truck crops will be required in the two months of August and September. The peak for fruit will occur in June and July and a minor peak in September.

Table 2. Labor requirements to meet war goals by counties, 1943

<table>
<thead>
<tr>
<th>County</th>
<th>Farm labor requirements for field crops, livestock</th>
<th>man months</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beaver</td>
<td>4,876</td>
<td></td>
</tr>
<tr>
<td>Box Elder</td>
<td>29,289</td>
<td></td>
</tr>
<tr>
<td>Cache</td>
<td>30,406</td>
<td></td>
</tr>
<tr>
<td>Carbon</td>
<td>4,718</td>
<td></td>
</tr>
<tr>
<td>Daggett</td>
<td>1,067</td>
<td></td>
</tr>
<tr>
<td>Davis</td>
<td>13,842</td>
<td></td>
</tr>
<tr>
<td>Duchesne</td>
<td>14,127</td>
<td></td>
</tr>
<tr>
<td>Emery</td>
<td>7,726</td>
<td></td>
</tr>
<tr>
<td>Garfield</td>
<td>6,627</td>
<td></td>
</tr>
<tr>
<td>Grand</td>
<td>3,241</td>
<td></td>
</tr>
<tr>
<td>Iron</td>
<td>8,865</td>
<td></td>
</tr>
<tr>
<td>Juab</td>
<td>5,096</td>
<td></td>
</tr>
<tr>
<td>Kane</td>
<td>2,669</td>
<td></td>
</tr>
<tr>
<td>Millard</td>
<td>13,994</td>
<td></td>
</tr>
<tr>
<td>Morgan</td>
<td>3,170</td>
<td></td>
</tr>
<tr>
<td>Piute</td>
<td>3,311</td>
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</tr>
<tr>
<td>Rich</td>
<td>6,817</td>
<td></td>
</tr>
<tr>
<td>Salt Lake</td>
<td>20,467</td>
<td></td>
</tr>
<tr>
<td>San Juan</td>
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<tr>
<td>Sanpete</td>
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<tr>
<td>Summit</td>
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<tr>
<td>Tooele</td>
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</tr>
<tr>
<td>Uintah</td>
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<td></td>
</tr>
<tr>
<td>Utah</td>
<td>34,138</td>
<td></td>
</tr>
<tr>
<td>Wasatch</td>
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<td>Washington</td>
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<td></td>
</tr>
<tr>
<td>Wayne</td>
<td>3,924</td>
<td></td>
</tr>
<tr>
<td>Weber</td>
<td>17,848</td>
<td></td>
</tr>
</tbody>
</table>

1 Totals do not include truck crops and other minor crops for which no county goals are available.

For those agricultural products where war goals or acreages were allocated to individual counties, the labor requirements are shown by counties in Table 2. Truck crops were not shown on a county basis, yet it should be mentioned that these crops tend to be concentrated in the counties of Utah, Salt Lake, Davis, Weber, and Box Elder. There is a concentration of labor in those areas that must compete for labor with the war industries.

Utah, Box Elder, and Cache Counties all will require 30,000 or more man months of labor during the coming year. The requirements in one-third of the counties will be less than 6,000 man months of labor. There is considerable variation in the proportion of the labor required for livestock and crops in the state, depending on the type of farming engaged in in the counties. Utah County will require over 45 percent of the total state labor requirement for fruit.

This report is not an attempt to cover all the labor problems of the state, but only to give a picture of the distribution of labor requirements by kinds of agricultural products, by months, and an approximation of the total labor requirements by counties and for the state. The more important crops and livestock tend to so complement each other that a fair balance of labor can be maintained throughout the year in general. The labor peaks for livestock on diversified farms tend to come at periods when crop requirements are not at their heaviest. Harvesting of the tomatoes, peas, beets, and potatoes fortunately come at different periods of the year, but they do coincide with heavy demand periods for the grains and cereals. The production of fruits and truck crops, while not requiring such large quantities of labor in total, will continue to be a problem of major consequence because they are so highly seasonal and are so dependent upon hired labor.

Utah farmers have been given the responsibility of producing the greatest harvest in the state's history. Scarcity of agricultural labor is the major problem confronting them in this task.

HYBRID CORN
(Continued from page 5)

Most inbred lines that are being used today have been produced by state experiment stations or the United States Department of Agriculture; some few have been produced by private seed corn companies. Commercial hybrid seed corn is usually produced in isolated fields by planting two to four female rows between single rows of the male parent. When the tassels begin to show on the female rows, they are jerked out before any pollen is shed. This insures that each seed produced on the detasseled plants has been pollinated with pollen from male plants. The seed from the detasseled rows is, therefore, hybrid seed. The method of producing seed of single and double crosses is shown in the diagram.

The fact that adapted hybrids are more drought-resistant, more resistant to lodging, and yield higher than open-pollinated varieties makes them popular. In 1942 about 41 million acres or 45 percent of the 91 million acres of corn grown in the United States was planted with hybrid seed, compared with approximately 1 percent in 1936. Of the 33 million acres in twelve corn belt states, 38 million acres or 72 percent were planted with hybrid seed. It is doubtful if any other agricultural discovery has been so quickly and completely accepted by farmers. As better adapted hybrids are found, further percentage increases in planting can be expected.

Not all hybrids are good; only a few are superior. The fact that a certain hybrid is well adapted in one area does not mean that it will be adapted in another. This means, then, that a farmer must select a hybrid only after it has proved itself superior in his locality.

For about ten years, hybrids obtained from the corn belt have been tested in Utah. Each year new ones have been added, in the hope that one especially adapted could be found. From the first, some hybrids gave impressive yields, having in addition other highly desirable characters. For several years, U. S. 52 has given high silage yields, usually 10 to 20 percent above those of the better standard varieties. Other hybrids now compare favorably with U. S. 52, but have not significantly outyielded it in carefully conducted tests at Cache, Salt Lake, Duchesne, Emery, and Iron Counties. Results of these tests are now being made available to county agents and others interested.

Hybrid seed corn production is a specialized industry, and a farmer will usually find it more economical to buy his seed, rather than to produce it. It is undesirable to save seed from a hybrid field because in the second generation yields drop from 15 to 25 percent. In buying hybrid seed corn, a farmer should first make sure that the hybrid he is buying is adapted to his locality; and, second, that extreme care has been taken in its production to insure against contamination, which greatly reduces its value. The easiest and often the cheapest way of making sure of the second point is to buy certified seed.

The Experiment Station plans to inaugurate a somewhat extensive corn improvement program in Utah which will involve testing inbred lines and hybrids in several locations to find those combinations best adapted to different localities.

Information concerning the various hybrids will be made available, and foundation seed stocks of desirable combinations sold to seed producers through the Utah Crop Improvement Association.
Progress With Curly-Top-Resistant Varieties of Sugar Beets

CURLY top control in sugar beets by the use of resistant varieties began with the release of the variety U. S. 1. This variety came into widespread use as soon as supplies of seed became available. Approximately 35,000 acres were planted with U. S. 1 in 1934, the first year that seed was available to farmers. In 1935, with increased recognition of its merits and with larger available seed supplies, 102,803 acres were planted with this variety. U. S. 1 had only a moderate degree of curly-top resistance. Nevertheless it revived sugar beet growing in Intermountain areas where the industry was on the verge of being abandoned because of curly top, and it also hastened the establishment of a successful domestic sugar beet seed industry.

The variety U. S. 1 was of even greater importance as a source of breeding material from which better curly-top-resistant varieties could be developed. U. S. 1 was essentially a mixture of about 13 different strains, and there was a wide variation among individual plants, not only in degree of curly-top resistance, but also in many other characters. Because of the fact that it was composed of many different types, U. S. 1 was especially valuable as a source of breeding material. Beginning in 1930 the more promising individual plants from U. S. 1 were selected and propagated. Hybridization between the different components of the variety added vigor and helped to combine desirable characters. Improvements were rapid but there were also disappointments. The tendency to bolt was found to be associated in inheritance with curly-top resistance, and some of the selections had to be discarded because of their undesirable bolting tendency. In general, the sugar content of the U. S. 1 beets was good and this feature was important because it made it possible to place the first emphasis upon other desired characters.

New curly-top-resistant varieties were soon developed. Varieties U. S. 34 and U. S. 12 were grown for a few years but have now been discontinued. The variety A-600, developed by the Amalgamated Sugar Company, was also popular for a few years. The varieties U. S. 22 and U. S. 33 are now the most widely grown curly-top-resistant varieties in the Intermountain States. U. S. 22 is decidedly better in curly-top resistance, but where the disease is not severe, U. S. 33 can be grown to advantage because of its higher sugar percentage.

The variety designated Improved U. S. 22 is now being propagated on a large scale and should be available for commercial use in 1944. Improved U. S. 22 is more highly resistant to curly top than U. S. 22, but is not essentially different in other respects. Extensive data have been obtained on the performance of varieties in cooperation with the Curly Top Resistant Breeding Committee; an organization representing all interested sugar companies. Data from one of these tests conducted under a severe curly-top exposure at Buhl, Idaho, in 1941 may be taken as representative. The planting was made late, May 1, in order to increase the curly-top exposure. The figure gives a picture record, and the yield record was as follows:

<table>
<thead>
<tr>
<th>Variety</th>
<th>Yield (tons per acre)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Old Type</td>
<td>0.7</td>
</tr>
<tr>
<td>U. S. 1</td>
<td>6.3</td>
</tr>
<tr>
<td>U. S. 33</td>
<td>8.4</td>
</tr>
<tr>
<td>U. S. 12</td>
<td>11.3</td>
</tr>
<tr>
<td>U. S. 22</td>
<td>14.3</td>
</tr>
<tr>
<td>Improved U. S. 22</td>
<td>16.6</td>
</tr>
</tbody>
</table>

These data illustrate the striking performance of Improved U. S. 22 under a drastic curly-top exposure, but it should not be inferred that the variety is immune to curly top. Under the severe exposures that have been established in the experimental plots, over 96 percent of the plants in Improved U. S. 22 have shown obvious curly-top symptoms.

The variety Improved U. S. 22 will probably play an extremely important economic role in the nation's sugar production. Like the original curly-top-resistant introduction, U. S. 1, it presents to the plant breeder a highly valuable source of breeding material for further improvement. From selections made among the 4 percent of plants of Im-

Degrees of curly-top resistance demonstrated at Buhl, Idaho under a severe curly-top exposure. Planting made May 1, 1941. Yields in tons per acre with 4-row plots of varieties from left to right were as follows: Old type, 0.7 tons; U. S. 1, 6.3 tons; U. S. 33, 8.4 tons; U. S. 12, 11.3 tons; U. S. 22, 14.3 tons; Improved U. S. 22, 16.6 tons

By F. V. OWEN and ALBERT MURPHY

for March 1943
proved U. S. 22 that did not show curly-top symptoms under the severe curly-top conditions induced in the selection field at Buhl, Idaho, breeders' stocks of new strains with still higher resistance already have been obtained. Moreover, the generally satisfactory curly-top resistance of Improved U. S. 22 now makes possible more emphasis upon breeding for higher sugar percentage, for better root type, and for other desired characters. Intensive efforts along these lines are now being carried on.

Cultural Care and Curly-Top Resistance

To make the most of the inherited resistance of the improved varieties one should not lose sight of the important role played by soil fertility and good cultural care. The resistance of all beet varieties increases rapidly with age and size of plants. Furthermore, curly top does much less damage in cool weather than in hot weather. These facts emphasize the importance of early and timely planting on well prepared seed beds with every attention given to getting the crop off to a vigorous start. In abnormally early season, advance of the customary planting date is advisable. Dry weather also may make it necessary for earlier than normal irrigations. These irrigations may be important not only for providing necessary moisture but also for cooling the soil to provide better temperature relationships for the young plants.

Management of Seed Supplies

Improved varieties of sugar beets must be reproduced carefully to maintain the improvements and to prevent deterioration. To prevent deterioration of the curly-top-resistant varieties, United States Department of Agriculture representatives have grown most of the elite seed supplies and have helped to supervise the production of the stock seed from elites. Commercial seed of curly-top-resistant varieties grown from the stock seed should seldom, if ever, be multiplied a second time. The measures employed to assure dependable foundation material from which to grow commercial seed for use by farmers are conducted as a cooperative effort of the Bureau of Plant Industry and the Curly Top Resistance Breeding Committee, made up of representatives from western beet-sugar companies.

Questions are frequently asked about the possibility of varieties of sugar beets running out when the seed is grown by the American method of overwintering the mother plants in the field. It is true that deterioration may take place in a variety reproduced by the overwintering method if the seed is grown in too warm a climate or the seed fields are neglected. Under such conditions the plants lowest in bolting tendency fail to participate in the seed production, the easier-bolting plants produce the most seed, and consequently the bolting tendency of a variety may be markedly increased in a single generation. When grown in suitable climates, however, and with care taken to provide complete reproduction, there is no reason to expect more deterioration from the overwintering method of seed growing than from the laborious European method of digging the small steckling beets and holding them in silos during the winter.

There are, however, many problems now facing the American sugar-beet seed industry. One problem is to find good farmers adequately equipped in suitable areas for the necessary isolations. A special problem is the matter of volunteer beets. Old seed that is plowed under often germinates 5 or 6 years later when a new variety is grown. These volunteer beets represent a serious source of contamination and they should not be overlooked or ignored.

Wool Scouring

(Continued from page 7)

value of the grease wool in Boston is determined as follows:

\[
\begin{align*}
\text{value of grease wool per pound} &= \$0.95 \times \text{yield of clean wool (in percent)} \\
&= \$0.3895
\end{align*}
\]

A deduction of from 3 to 5 cents per pound should be subtracted from the Boston market price for freight and handling charges to determine Utah prices. If these charges are estimated at 4 cents per pound, the grower should expect to receive approximately 35 cents per pound for this wool.

If the grower is assured a fair price for his clip, on the basis of clean wool, he can change his management practices so as to produce wool of less shrinkage. Early shearing, shearing before trailing to summer ranges, and the development of water on desert ranges to avoid long trails are some practices which will tend to reduce shrinkages.

Wool scouring tests might be made at a central laboratory, or warehouses maintained by the growers could be equipped at a small expense so that the scouring could be done by a warehouse employee. The process is not difficult and can be carried out by any careful worker after he has had a little instruction. Scouring in growers' warehouses has an advantage over a central laboratory in that the growers can see their wool scoured and can compare their clips with others being produced in the vicinity. This practice would also encourage the grower to become acquainted with the grades and other qualities of the wool he is producing.

The results obtained from scouring tests of side samples from individual sheep show that wide variations exist between individuals within a breed in the same flock. These results indicate possibilities for increasing the percentage yield of clean wool by selection of sheep that produce light-shrinking fleeces. Improvement in this direction can be made most rapidly if the producers of rams that are to be used in range herds make use of individual side samples evaluating their breeding animals.

The variations in yields of clean wool are found:

1. Between grades. Fine wool usually yields less than 1/2 blood. 1/2 blood less than 3/6 blood.
2. Variation within a grade. Usually long staple fine wool of 21/2 to 3 inches yields more than short staple wool, and management of the sheep affects the amount of grease and dirt in each fleece, as well as the amount of fiber produced.
3. The age of the sheep influences yields. Lambs' wool yields higher percent fiber than old ewes.
4. Date of shearing affects yields. Early shearing gives a higher percentage fiber. Fleeces shrink more after warm weather and after trailing from winter to summer range.

Considering the number of factors influencing the yield of fiber in each fleece of wool, the wool grower can ill afford to leave this appraisal to the buyer. Sampling to determine the yield is not expensive and can be as useful to the wool grower as the Babcock test is to the dairyman.
IN almost every community in the state there are areas in which many trees and shrubs suffer severely from chlorosis, a nutritional disease caused by lack of iron. Chlorotic plants are readily recognized by their sickly, yellow foliage. Such plants are unable to manufacture sufficient carbohydrates for normal growth, are therefore usually weak in vigor, and frequently suffer severely from winter injury or drought. Aside from the undesirable appearance of chlorotic plants, the fact that such plants may die within a few years after being set out makes them unsatisfactory for planting as ornamentals. Fortunately not all ornamentals are affected by chlorosis so that by proper selection of varieties the home owner may develop satisfactory plantings of green shrubbery, though he may have to omit certain highly desirable varieties.

As a result of several years' observations of the shrubs on the college campus the following lists of varieties of shrubs are offered to serve as guides for home plantings in chlorotic areas. The basis of selection is entirely that of resistance or susceptibility to chlorosis. The varieties in the first list include those which in general have been green and have made good growth on the campus. Selections from this list might therefore be recommended for chlorotic areas. The second list includes those varieties which have been chlorotic on the campus. In general these should be avoided if the planting area is suspected of being chlorotic.

1. Varieties not Chlorotic on Campus

<table>
<thead>
<tr>
<th>Scientific Name</th>
<th>Common Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amorpha fruticosa</td>
<td>False indigo</td>
</tr>
<tr>
<td>Berberis Thunbergii</td>
<td>Japanese barberry</td>
</tr>
<tr>
<td>Berberis vulgaris</td>
<td>Barberry</td>
</tr>
<tr>
<td>Caragana arborescens</td>
<td>Siberian pea tree</td>
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<tr>
<td>Celtis occidentalis</td>
<td>Hackberry</td>
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<tr>
<td>Colutea arborescens</td>
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<tr>
<td>Euonymus europaeus</td>
<td>European burningbush</td>
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<tr>
<td>Forsythia intermedia</td>
<td>Border forsythia</td>
</tr>
<tr>
<td>Forsythia suspensa</td>
<td>Weeping forsythia</td>
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<tr>
<td>Forsythia suspensa Fortunei</td>
<td>Fortune's golden bell</td>
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<tr>
<td>Forsythia viridissima</td>
<td>Green stem forsythia</td>
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<tr>
<td>Ligustrum amurense</td>
<td>Privet (Chinese)</td>
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<tr>
<td>Ligustrum vulgaris</td>
<td>European privet</td>
</tr>
<tr>
<td>Lonicer Maackii</td>
<td>Amur honeysuckle</td>
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<tr>
<td>Lonicer Morowii</td>
<td>Japanese honeysuckle</td>
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<tr>
<td>Lonicer tartarica</td>
<td>Honeysuckle</td>
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<tr>
<td>Prunus triloba</td>
<td>Plum</td>
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<tr>
<td>Rhus cotinus</td>
<td>Smoke tree</td>
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<tr>
<td>Rhus typhina</td>
<td>Staghorn sumac</td>
</tr>
<tr>
<td>Rose (Persian Yellow)</td>
<td>American elder</td>
</tr>
<tr>
<td>Sambucus canadensis</td>
<td>Elder</td>
</tr>
<tr>
<td>Sambucus nigra laceinata</td>
<td>European elder</td>
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<tr>
<td>Sambucus racemosa</td>
<td>Japanese lilac</td>
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<tr>
<td>Syringa japonica</td>
<td>Hungarian lilac</td>
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<td>Syringa josieka</td>
<td>Persian lilac</td>
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<tr>
<td>Syringa vulgaris</td>
<td>Common lilac</td>
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<tr>
<td>Tamarix aestivis</td>
<td>Tamarix</td>
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<tr>
<td>Tamarix gallica</td>
<td>Tamarix</td>
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<tr>
<td>Tamarix indica</td>
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<tr>
<td>Tamarix oedianna</td>
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2. Varieties Chlorotic on Campus

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<thead>
<tr>
<th>Scientific Name</th>
<th>Common Name</th>
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<tbody>
<tr>
<td>Acanthopanus Sjebodianus</td>
<td>Spiny panax</td>
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<tr>
<td>Aralia spinosa</td>
<td>Hercules club</td>
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<tr>
<td>Buddleya Davidii</td>
<td>Butterfly bush</td>
</tr>
<tr>
<td>Cornus alba</td>
<td>Red brier dogwood</td>
</tr>
<tr>
<td>Corylus avellana</td>
<td>Filbert</td>
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<tr>
<td>Cotonetter acautifolia</td>
<td>English hawthorn</td>
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<tr>
<td>Crataegus Oxyacantha</td>
<td>Flowering quince</td>
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<tr>
<td>Cydia japonica</td>
<td>Scotch broom</td>
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<tr>
<td>Cyrtus scoparius</td>
<td>Pride of Rochester</td>
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<tr>
<td>Deutzia scabra</td>
<td>Weigela</td>
</tr>
<tr>
<td>Dierrilla amabilis</td>
<td>Wiegela (pink)</td>
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<tr>
<td>Dierrilla florida</td>
<td>Wiegela</td>
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<tr>
<td>Dierrilla sessilifolia</td>
<td>Winged euonymus</td>
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<tr>
<td>Euonymus alata</td>
<td>Shrubby althea</td>
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<tr>
<td>Hlisicus syriacus</td>
<td>Snowbroom althea</td>
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<tr>
<td>Hlisicus totox albus</td>
<td>Double kerria</td>
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<tr>
<td>Kerria japonica</td>
<td>Mock orange</td>
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<tr>
<td>Paulophalus aurea</td>
<td>Mock orange</td>
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<tr>
<td>Paulophalus coronarius</td>
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<tr>
<td>Paulophalus grandiflora</td>
<td>Mock orange</td>
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<tr>
<td>Paulophalus leoninii</td>
<td>Mock orange</td>
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<tr>
<td>Paulophalus virginialis</td>
<td>Ninebark</td>
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<tr>
<td>Physocarpus opalifolius aurea</td>
<td>Cinefoli</td>
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<td>Potentilla fruticosa</td>
<td>Fire bush</td>
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<td>Pyracantha coccinea var. Ilanderi</td>
<td>Buck thorn</td>
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<tr>
<td>Rhamnus cathartica</td>
<td>Jet bead</td>
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<tr>
<td>Rodothoys Kerkioloides</td>
<td>Smooth sumac</td>
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<tr>
<td>Rhus hirta globosa</td>
<td>Cut leaf sumac</td>
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<tr>
<td>Rhus hirta dissecta</td>
<td>Garland spirea</td>
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<tr>
<td>Spiraea arguta</td>
<td>Van Hout's spirea</td>
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<tr>
<td>Spiraeas Van Houtii</td>
<td>Snowberry</td>
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<tr>
<td>Symphoricarpus albus laevigatus</td>
<td>Coral berry</td>
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<tr>
<td>Symphoricarpus orbiculatus</td>
<td>Wayfaring tree</td>
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<tr>
<td>Viburnum lantana</td>
<td>Snowball</td>
</tr>
<tr>
<td>Viburnum oxyccucus</td>
<td>Snowball</td>
</tr>
</tbody>
</table>

**SUPPORT FOR RESEARCH**

(Continued from page 11)
COOPERATIVE CANAL LINING STUDIES
EXTENDED

The irrigation ditch on the Piute Indian Reservation in Millard County was recently lined with red sandstone held in place with cement. The work of hauling and placing the sandstone was done by Indian laborers.

By O. W. ISRAELSEN and C. W. LAURITZEN

To make more water available for crop production in Utah, the Utah Agricultural Experiment Station, in cooperation with the U. S. Soil Conservation Service, is extending its studies of canal lining to prevent seepage losses.

The major objective in these studies is to find accessible, low-cost materials, and methods suitable for reducing excessive irrigation water conveyance losses. It is today especially important to note that in nearly every irrigated valley of Utah there are large quantities of natural clays, silts, and gravels and rock available for canal lining and that there are no priorities required for the use of any of these materials.

Canals vary greatly in conveyance losses. Some canals lose little water; whereas others lose large quantities. It is, therefore, essential before lining a canal to measure water losses not only in each canal but in the particular section of the canal where losses are considered excessive. The several factors which must be studied before lining an irrigation canal include: availability of suitable materials for lining, probable first cost of lining, annual interest and maintenance costs, and the volume and value of water saved by lining. The volume of water that may be saved by lining is the most tedious and difficult to measure. Moreover, the measure of this water-saving factor requires much time, usually a full irrigation season.

It is planned during 1943 to measure water losses in typical canal sections in many of the more important irrigated areas of the state. Measurements will be made in 8 or 10 counties, depending on the extent of cooperation of irrigation companies. The particular objective for 1943 will be to determine the amounts of water losses and the availability of satisfactory soil materials for canal lining purposes. Results of these studies will be reported to the several interested canal companies in order that appropriate canal lining may be made during the winter 1943-44, and that large quantities of irrigation water may thus be saved for crop production during 1944.

The outlook for these studies is encouraging. In recent conferences in several counties, it was found that many irrigation company officers recognize the seriousness of water losses in their canal systems and are anxious to obtain reliable information concerning the amounts of these losses and practical methods of reducing them.

NEW PUBLICATIONS
Bul. 303. The utilization of irrigable land in the Reservation Area of the Uinta Basin, Utah—George T. Blanch and Clyde E. Stewart.—Department of Agricultural Economics in cooperation with the U. S. Bureau of Agricultural Economics.

This bulletin summarizes and correlates the findings of soils, irrigation water, range and economic studies made by the Station in cooperation with federal agencies. It points out that much of the good land in the area is not now being used because of lack of irrigation water. Water could be made available for the better land by withdrawing the poor soils from cultivation. The bulletin also discusses other adjustments needed in the area to produce a more profitable agriculture.

Bul. 305. The composition of summer range plants in Utah—L. A. Stoddart and J. E. Greaves. Departments of Range Management and Bacteriology and Biochemistry.

The average composition of the flora available to grazing animals on summer range in northern Utah was found to indicate a satisfactory feed, especially in the early season, with the possible exception of the calcium-phosphorus ratio.

These publications may be obtained free by addressing a card to the Utah Agricultural Experiment Station, giving the number and series of the publication desired.