WARTIME expansion of military establishments and industrial plants is changing the industrial and agricultural economy of the Wasatch Front area in Utah. The cost of these defense programs is about equal to the assessed valuation of all the property of the state. Agricultural lands have been withdrawn from cultivation for military, industrial, and housing uses. This transfer of land from agriculture to war and industrial uses has not only reduced the agricultural production in this area, but has forced a considerable number of farmers to make a complete change in their farming operations.

The increase in employment opportunities has resulted in the expansion of population in the intermountain trade area, particularly in the Ogden, Salt Lake, and Provo sections. High wages and increased opportunities for employment have resulted in transferring large numbers of rural people from agriculture in Utah to industrial pursuits. Although this expansion in industrial activities and population in the state has brought increased opportunities in the way of new markets and employment, many new economic and social problems have, and will result. Agriculture in this area is now trying to adjust itself to the new war situation.

With such a rapid expansion in Utah defense areas, it is evident that industry and agriculture will be faced with many post-war problems when hostilities cease. Post-war adjustments in the defense areas will be necessary, and are likely to be more acute than in other areas where war programs have made fewer changes.

A study of the post-war situation for agriculture for the Wasatch Front has been assigned to the staff of the Utah Agricultural Experiment Station, and the investigations have been under way for about three months. A report on the findings will be issued as a part of the analysis of the industrial and agricultural post-war program.

The Utah Station is cooperating on these studies with the Utah State Industrial Commission, National Planning Board, the University of Utah, and other state and federal agencies. The departments of the Station assigned to conduct this study are: agronomy and soils, irrigation and drainage, range management, and agricultural economics.

The primary objectives of these investigations are to study the opportunities for development, and the stabilization of agriculture on the Wasatch Front and other parts of Utah during the war and post-war periods. This will include an analysis of the use of agricultural resources and facilities, and the changes and adjustments needed for a post-war agricultural program, together with the line of action necessary to bring about the needed adjustments for better use of resources, and the building of new facilities for post-war agricultural programs.

The eight counties included in the Wasatch Front area (Box Elder, Weber, Davis, Salt Lake, Utah, Morgan, Summit, Wasatch) contain about eight million acres of land of which 591,000 acres are used for crop production, and 6½ million acres for grazing. Of the 591,000 acres of cropland, 363,000 acres are irrigated. About 12,000 acres of cropland have been taken directly out of production by war establishments. In addition, a considerable area has been taken, and probably more will be taken, for industrial and residential uses. For this area, exclusive of Box Elder County, it is doubtful that new developments during the post-war period will much more than off-set the cropland taken out of production by war, industry, and new industrial and residential sites.
Most of the available irrigation water of the state is concentrated in the northern part. The greater part of the irrigated lands in this area is fully supplied with water. Additional irrigation water is needed to provide a supplemental water supply to some lands now under irrigation, and a complete supply for new lands that may be brought under cultivation. With an average annual discharge of water into the Great Salt Lake of 1,300,000 acres feet from the Bear and Weber Rivers, there is water available for further irrigation development in this section.

According to the Utah State Tax Commission, the total assessed value of all taxable property in Utah in 1942 was $603,356,797. Of this total, 77 percent or $464,717,774 was in the eight Wasatch Front counties. There is assessed in this area 90 percent of the mines, 70 percent of the utilities, and 54 percent of the farm lands. The industrial and residential development resulting from defense programs will undoubtedly increase the assessed valuation in this area, and will thereby result in greater concentration of the assessable wealth of the state than existed in 1942.

It is estimated that the population has increased in this state more than 100,000 and that this increase has largely taken place in these eight counties. There has been a depopulation of some of the counties in the state where people have moved into defense areas for employment. There are about 1,000,000 people in this intermountain trade area, of which at the present time, about one-half are in the Wasatch Front area.

There is an urban population of about 400,000 in Salt Lake, Ogden, Provo, and other nearby towns. The increase in population in the intermountain area and in California provides an outlet for marketing greater quantities of agricultural products on local and nearby markets.

In a preliminary report on this study, Dr. D. S. Jennings and LeMoyne Wilson of the Agronomy Department have surveyed the soils for Salt Lake and Utah Counties. Their investigations in these counties show that 41.8 percent of the land is arable or suitable for crop production, 51.6 percent non-arable, and 6.6 percent was listed in a miscellaneous class. Of the total area surveyed, only 12.5 percent was rated as class 1 land and 13 percent as class 2. Rather a large acreage was classified as class 4 which is defined as being unsuitable for arable agriculture.

Recent investigations in Weber County by Professor R. J. Evans of the Agronomy Department show that class 4 lands can be made into permanent pastures with considerable increase in productivity, by the seeding of grasses adapted to these soils. Evans and Jennings estimate that there are 25,000 acres of such land in Salt Lake and Utah Counties and that there is a proportionately large acreage in other counties on the Wasatch Front.

Dr. O. W. Israelsen and his staff of the Irrigation Division have been studying the present irrigation water supply, distribution, requirements for additional water, the possible sources and development for the needed water, and the areas where this additional water might be applied. Dr. Israelsen summarizes the post-war program for irrigation and drainage needs as follows: "... the most important post-war irrigation and drainage needs include the following: improved organization for the smaller related irrigation companies, reduction of canal seepage and conveyance losses, more extended use of pipe lines for water conveyance, improved methods and higher efficiencies of application of water to the farms, development and greater use of water exchange agreements in order to facilitate more extended use of ground water supplies, further construction of surface reservoirs, and more intelligent use of ground water reservoirs."

Dr. L. A. Stoddart and his assistant, C. W. Cook, of the Range Division, have analyzed the productivity and use of the range lands in the northern counties included in the study. Their preliminary report on range shows the grazing capacity and the interrelation of range and irrigated land for economical livestock production. Specific recommendations on proper use and a post-war program of development and improvement of range lands in this area were made by the authors. They report that both the amount and the quality of range forage can be increased by good range management and by the artificial seeding of improved plants. As a post-war program for this area, the Range Division recommends a program of extensive range and watershed improvement, reorganization of use of some of the range lands, and better controlled wild life, with some reduction in numbers.

The study of the Agricultural Economics Department includes an analysis of the productivity of the area, the location with respect to markets, population and its effect on agriculture, economic activities other than agriculture and their relation to agriculture, land ownership and pattern, types of farming, and of the use of agricultural resources.

Concerning a program for future utilization of agricultural resources, a number of factors are listed as being associated with needs for adjustments. The most far-reaching recommendation made was a reduction in the number of farms from the present number of 12,000 to about 10,000, this number to be made up of 8,000 full-time farms, and 2,000 part-time and subsistence farms. In the opinion of the authors, not only should the number of farms in the area be reduced, but they should be increased in size, and reorganized by blocking up various pieces of land into one contiguous unit, thereby improving the farm layout.

It is also suggested that since employment is available in this area that it would be desirable for the part-time farmer to decide either to become a full-time farm operator, or to obtain a job and reduce the size of his part-time farm unit to a subsistence farm. Such a farm could be satisfactorily operated in connection with his employment in industry.

Each phase of this study will be discussed in greater detail in future issues of Farm and Home Science.

The Authors

Dee A. Broadbent and W. P. Thomas, both members of the Department of Agricultural Economics, were joint authors of the article on the farm labor situation in Utah in the March issue. George T. Blanch, another member of the Department of Agricultural Economics, and Dr. Thomas have made an intensive study of the economic adjustments that will be necessary for Utah agriculture to make in the post-war period. A more detailed discussion by these men on this problem will appear in a later issue.

Carl Frischknecht, extension poultryman, has charge of the National Poultry Improvement Program in Utah. He wrote an earlier article for this publication on factors affecting profits in the poultry enterprise.

Dr. O. W. Israelsen has made a special study of irrigation companies in Utah, and the conclusions drawn in his article in this issue are based on an intimate knowledge of the situation.

Arvil L. Stark, research associate professor of horticulture and extension horticulturist, has just returned from the Western Regional Research Laboratory at Albany, California, where he took a special two-week course in dehydration methods for fruits and vegetables.

George F. Knowlton is known throughout the state for his work on insect control. He has written numerous scientific and popular articles on various insect control problems. C. J. Sorenson has made a detailed study of the lygus bug and its effects on alfalfa seed production and has published a Station bulletin on this subject.

Farm and Home Science
PROPER CARE OF EGGS AFTER THEY GET INTO HOMES IMPORTANT IN MAINTENANCE OF QUALITY

Study Shows Hydrator in Refrigerator Best Place in Home to Keep Eggs

By CARL FRISCHKNECHT

ONE way to increase the food supply in this country is to eliminate the waste and spoilage which occurs between the time food is produced and the time it is consumed. This is especially true of eggs because they are perishable, and they deteriorate rapidly in quality and value whenever they are not cared for properly. It is not only wasteful but un patriotic to permit such wholesome, protective food products as eggs to deteriorate in quality. This is especially important when the nation is at war.

The most critical and important test for quality is made by the consumer at the time eggs are broken for use. Eggs that are not good in quality at this time are usually discarded by the housewife. But this is not all that happens when eggs of poor quality are broken. Some one else, usually the person from whom the eggs were obtained, is severely criticized, when as a matter of fact, the conditions under which the eggs were held by the consumer himself are responsible for the loss in quality which has occurred. Every person, then, who has anything to do with eggs, regardless of whether he is a producer, a wholesaler, a retailer or a consumer, should provide facilities and adopt practices that will result in the least amount of deterioration while the eggs are in his possession.

Many of the physical and chemical properties of eggs have been carefully scrutinized in the laboratory by scientists. Studies which have been made indicate that egg meats contain considerable water, that the shells in which they are enclosed are porous, and that eggs must be held in a place that is cool, fairly moist and free from objectionable odors in order to prevent evaporation and preserve the "freshness" and original flavor.

A great deal of experimental and educational work has been conducted to determine the kind of chickens to raise, the quality and amount of feed to feed, management procedures, equipment, and facilities which poultrymen must have in order to produce and market high quality eggs at a profit. The conditions and facilities which must be provided by the wholesaler and retailer for handling eggs in the channels of trade have also been studied. Only a small amount of research and educational work, however, has been done to indicate the manner and the conditions under which eggs should be handled and cared for by the consumer.

A preliminary study in which the local branch of the Utah Poultry Producers’ Association cooperated was conducted in Cache County during the week of August 3-10, 1942. The purpose of the study was to obtain information concerning the most desirable place to keep eggs in the home. A total of 20 dozen "A" and 20 dozen "B" grade eggs were candled and selected for this study by an experienced commercial egg-grader from the Utah Poultry Producers’ Association. All of the eggs used had clean, sound, normal shells. The difference between the "A" and "B" grade eggs used was that the "A" grade eggs had air cells that were regular and 1/4-inch or less in depth while the "B" grade eggs had air cells which showed movement not in excess of 1/2-inch and 3/8-inch or less in depth. The yolks in the "A" grade eggs were fairly well centered with outlines only moderately defined, slightly mobile and free from visible germ development, and other defects or blemishes, while the outlines of the yolks in the "B" grade eggs were well defined, mobile and showed slightly visible germ development and other definite but not serious defects. The white or albumen in the "A" grade eggs were firm and clear while it was only reasonably firm and clear in the "B" grade eggs. No egg weighing less than 2 ounces was selected in either grade.

Ten lots of six "A" and six "B" grade eggs were numbered from 1 to 6 and from 7 to 12, respectively, weighed and placed together in four different positions in each of the ten homes. A cardboard carton containing six "A" and six "B" grade eggs was placed on the bottom of the refrigerator in a closed cardboard carton similar to the one observed in the picture. A fourth dozen eggs containing a like number of "A" and "B" grade eggs was also placed in the refrigerator in a hydrator which was tightly covered. The housewives were asked to keep their refrigerators set at the same speed during the week. Every day at the same time during this period, each lot of eggs in these four positions in each of the ten homes was weighed and each egg in each lot was candled by the same candler to determine its quality and grade. The net weight of each half-dozen eggs and the grade of each of the forty-eight eggs in each home were recorded each day.

Results Obtained

A marked change in grade occurred in all of the eggs during the seven-day period regardless of the home, the grade, or the position in the home in which they were placed. None of the "A" and "B" grade eggs remained in its respective grade at the end of the period. One hundred and twenty (50 percent) of the original "A" grade eggs in all of the homes were in the "B" (Continued on page 4)
State Legislature Makes Special Appropriation to Station

Because of the problems confronting Utah farmers created by an expanded wartime agricultural program, and in response to urgent requests from various agricultural interests in the state, the 25th Utah Legislature, in addition to the regular appropriation for Station maintenance for the biennium, appropriated $75,000 for special research.

This fund will be used for the investigation of pressing problems confronting Utah agriculture for which money has not been available heretofore, or at least not in amounts sufficient to make vigorous attacks on the problems. Work to be undertaken will include the establishment of a laboratory in the central or southern part of the state for the diagnosis and investigation of livestock and poultry diseases; enlarging the program in animal husbandry research; continuance of weed-control investigations; enlarging of the horticultural and tomato-disease-investigation programs; studying the causes of honeybee losses, and for the production of disease-free seed, particularly of potatoes, cereals and biennial vegetable crops.

Proper Care of Eggs (Continued from page 3)

Table 1. Deterioration of “A” grade eggs in the refrigerator at the end of 7-day period

<table>
<thead>
<tr>
<th>Position in refrigerator</th>
<th>“B” grade</th>
<th>“C” grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Loose</td>
<td>192.3</td>
<td>192.3</td>
</tr>
<tr>
<td>In carton</td>
<td>192.3</td>
<td>192.3</td>
</tr>
<tr>
<td>In hydrator</td>
<td>192.3</td>
<td>192.3</td>
</tr>
</tbody>
</table>

The loss in weight of eggs was not great. The “A” grade eggs weighed 192.3 grams more at the beginning and 196.6 grams more at the end of the period than the “B” grade eggs. The total loss in weight of the 20 dozen “A” grade eggs was only 240.7 grams compared with a loss of 245 grams in the 20 dozen “B” grade eggs in all of the homes for the seven-day period. While the “A” grade eggs lost slightly less weight than the “B” grade, the loss in weight in both grades of eggs was noticeably less in the lots of eggs that were placed in the refrigerators. Of the eggs in the refrigerator, those in the hydrator showed the least amount of loss.

Loss of Eggs in Value

The prices of different grades of eggs in Logan during this study were as follows:

- “A” grade: 41 cents per dozen
- “B” grade: 37 cents per dozen
- “C” grade: 35 cents per dozen
- “Rots”: 9 cents per dozen

On the basis of these prices the 20 dozen “A” grade eggs, worth $8.20 at the beginning, were worth only $7.15 at the end; and the “B” grade eggs, worth $7.40 at the beginning, were worth only $6.89 at the end of the study. In other words, the “A” grade eggs used were worth $1.05 (12.8 percent) less, while the “B” grade were worth $0.51 (6.8 percent) less at the end than they were at the beginning of the study.

While a loss in value of this amount of money does not appear to be great, the loss on a carload containing 600 cases of such eggs of “A” grade would amount to $944.64, and on a carload of "B" grade eggs, $452.88.

Conclusion

While it is unwise to make definite conclusions from preliminary tests of this kind, the results obtained to date indicate that marked changes occur in eggs after they reach the consumer. The data assembled to date suggest:

1. That the consumer as well as the producer and the distributor is partly responsible for the loss in quality which occurs in eggs between the time they are laid and the time they are broken for use.

2. That eggs may become unfit for human consumption in a short period of time when held under improper conditions in the homes of consumers.

3. That the refrigerator in the home is a better place to keep a small quantity of eggs than the cupboard.

4. That eggs in a hydrator inside the refrigerator lose less moisture and maintain better quality than eggs in the refrigerator in open containers or in covered cardboard cartons.

5. That “A” grade eggs decrease in quality and value faster than other grades of eggs when held under similar conditions.

6. That the care of eggs in the home of consumers should receive further study.

Mrs. Almeda P. Brown, research associate professor of home economics, has been made acting dean of the School of Home Economics while Dean Christine B. Clayton is away on sabbatical leave.
During the past 50 years, great progress has been made toward the solution of some community problems in Utah agriculture, such, for example, as that in cooperative selling and buying. In methods, organization, and procedure for diverting water from Utah streams and in conveying and delivering it to farmers, however, Utah is in substantially the same position as it was a half century or more ago.

Utah Irrigation Companies
Utah irrigation companies are private and voluntary organizations which have the responsibility of handling a limited and valuable resource. They may be incorporated or they may be only groups of irrigators operating their ditch together for the good of the group without having legal status, that is, without incorporation. These companies are non-profit organizations whose stockholders obtain their dividends in the form of services rendered by the company in the diversion, conveyance, and delivery of water. One of their functions is the construction of irrigation works including dams, diversion weirs, head gates, canals, flumes, spillways, wasteways, escapes, measuring weirs, and delivery gates. Another function is the operation of these works to the best interests of the company stockholders. This includes the diversion and conveyance of water to the farms of the stockholders, and the delivery of the water available to the company in the proper time and the correct proportion.

Each stockholder in an irrigation company has a right to the use of part of the state's water supply. Even though water rights are usually recorded in the company name, it is basic and fundamental that the rights rest on use, and that without the stockholder-irrigators to use the water, company water rights would soon lapse. The company, therefore, representing each and all of its stockholders, is obligated to protect, to preserve, and to perpetuate these highly-valued water rights.

Size of Irrigation Companies
There are no legal restrictions as to the size of irrigation companies. The word "size" may denote the number of acres supplied water by the company, and it may denote also the number of stockholders. The largest company in Utah irrigates approximately 50,000 acres; the smallest less than 100 acres. It is not intended to imply that large size is always advantageous, although where physical conditions are favorable, no doubt there are many advantages enjoyed by large companies.

Out of a total of 26 irrigation companies recently studied in Salt Lake County, only one has a net irrigated area of less than 100 acres and 13 have areas of more than 1000 acres each. Of the latter companies, 3 have net irrigated areas of more than 5000 acres each, and 1 of the 3 irrigates more than 10,000 acres. Seven of these 26 companies divert water directly from Utah Lake and Jordan River, 6 of which convey water to lands west of the river. One of the latter 6 irrigates less than 500 acres, another only 1000 acres, and another less than 200 acres, whereas one of the six irrigates nearly 11,000 acres. All of these companies together irrigate only 25,400 acres.

Utah has more than 700 companies for irrigation of about 1,200,000 acres of land. The average area irrigated by one company, therefore, is less than 2000 acres.

Consolidation of Irrigation Companies Aids Water Conservation

Companies Which May Consolidate
Of course, all companies in Utah cannot consolidate into one company, but companies which are operating under the following conditions may consolidate to advantage:

1. A common source of water supply
2. Overlapping of irrigated areas
3. Areas too small for economical operation by one company
4. Parallel canals and ditches
5. Excessive seepage losses from the higher canals causing preventable flow of water from high lands of one company to lower lands of another
6. Clearly defined water rights of somewhat the same class
7. Freedom from debts or flexibility of the debt structure so that net values of stock in each company can be arrived at and the consolidated company assume all obligations of the constituent smaller companies.

Advantages in the Consolidation of Related Companies
Consolidation of related companies will make it practical to attain the following advantages:

1. More economical handling of company business
2. Needed greater flexibility
3. Greater activity in the collection and use of irrigation data of value to the community, and better preservation of valuable irrigation records
4. Greatly increased capacity to command the services of men well trained in irrigation science and engineering, and thus to make better use of a body of reliable irrigation information
5. Greater financial capacity to obtain funds needed for increased water supplies and for irrigation system improvements.

1. Economy — Consolidation of related irrigation companies promises economical returns both in direct saving of water and of money. Thus far there are only a few consolidated companies in Utah; therefore, specific and reliable comparisons of money saving are meager. The President of the Daniels Irrigation Company, after nine years of operation following consolidation, esti-

(Continued on page 10)
**Storing Victory C**

**Variety of**

**By ARVIL L. STARK**

The home food supply program is one of great importance to every family in America. In addition to production, a substantial part of this program is the preservation and storage of vegetables at home. With decided limitations on the supply of pressure cookers available for preservation in the canned form, the problems of fresh storage at home will face most families this coming winter. The necessity of having a substantial supply of food on hand at the beginning of winter has been emphasized by the rationing program, and every rural family can demonstrate its patriotism by producing and storing its own winter food needs.

**Growing Vegetables for Storage**

Most people do not think of winter storage when they are planning and planting their gardens. In many instances after the summer garden is harvested, there is nothing left for winter storage except carrots, potatoes, and cabbage. In a well-planned garden in Utah, there are as many as 13 kinds of vegetables that may be grown for winter storage in fresh form. Some of these like cabbage, celery, onions, parsnips, potatoes, pumpkins, rutabaga, salisify and squash are planted in the usual manner and harvested at maturity in autumn. Other crops such as carrots, beets, turnips and winter radishes must be planted in midsummer for best storage quality. If planted in spring, these crops become overmature and are tough and woody in texture. For most parts of the state, mid to late July is the best season for planting; but at higher, colder elevations, the plantings must be made earlier if the vegetables are to mature before frost.

In addition to those vegetables mentioned above, there are tomatoes and lettuce that can be added to the list for short-time keeping in fall. Broccoli may be harvested from the garden long after light frosts occur in autumn, and cauliflower has been stored in many instances until after Thanksgiving.

**Proper Harvesting is Important**

Proper harvesting is important for successful vegetable storage. In most localities in Utah, the storage season begins just after the first few light killing frosts, usually in early October. Some crops survive frost without serious damage, but squash and pumpkins are injured by severe cold and must be harvested soon after the vines are killed. Root crops may be harvested somewhat later.

Careful handling of all vegetables prevents cuts and bruises, entrance points for rot and decay. All broken, cut or bruised vegetables should be set aside and used before decay sets in. Allowing the surface of the vegetables to dry thoroughly before putting in storage will heal many small cuts. Leaving one-fourth to one-half inch of the tops on the crown of root crops such as beets, carrots, rutabagas, and turnips avoids breaking the skin and prolongs the storage life. Stems should be left on pumpkins and squash. Cabbage, celery and lettuce are best stored with roots attached. Onions for storage are harvested when thoroughly mature and when most of the tops have died. Pull and pile them in wind-rows for thorough drying.

**Two Kinds of Storage Necessary**

Two kinds of storage that is needed is a dry cool place for such crops as squash, pumpkins, onions, sweet potatoes, and green ripe tomatoes. The temperature of this place should range between 40° and 60° F. The air must be definitely dry. With these two storage places, many vegetables can be stored at home until spring, if care is exercised in handling the produce and the management of the storage is satisfactory.

**Storage Requirements for Vegetables**

Parsnips, horseradish and salisify are perhaps the easiest of all vegetable crops to store. These can be left in the ground where grown and dug when needed during winter and spring. A light covering of straw or leaves before the ground is frozen makes digging easier during winter, or part of the crop may be dug in autumn and part left in the ground. Other root crops such as turnips, beets, carrots and rutabagas are sometimes stored successfully in the ground. In some soils and in severe winters, the loss in these crops, however, is often heavy; therefore, this type of storage is not generally recommended.

Best storage for root crops such as beets, turnips, rutabagas, carrots and winter radishes is in mound, pit or cellar types which are discussed later, or they may be stored in a basement or above-ground type satisfactorily. These crops require a moist atmosphere and a cold temperature of 32° to 40° F.
for best results. Under proper storage conditions, these crops can be expected to keep for four to six months in a sound condition. Tight containers or sand are used to prevent evaporation in some instances. To prevent wilting, it is best not to expose the roots directly to the open air where moisture may escape too freely.

Cabbage and Chinese cabbage are successfully stored in trenches ranging from one to five feet in width and eight to ten inches deep. Three to four inches of straw are put in the bottom of the trench to keep the heads clean. The cabbages with all the leaves attached are then placed roots up and covered with three to six inches of straw and enough soil to hold the straw down. Where temperatures become extremely low without a good covering of snow, more straw and soil should be piled on to prevent freezing. Cabbage may also be stored successfully on shelves in the root cellar or pit, but its strong odor sometimes contaminates other products in the same room.

Celery is usually stored with the roots attached and planted in moist soil. To prevent wilting, the soil around the roots must be kept moist. Wet the trench thoroughly before planting the celery in fall. The bunches are packed together in a trench wide enough for two to three bunches and deep enough to accommodate the full length of the stocks with four inches above for air spaces. Boards are used to cover the trench and straw for insulation and ventilation is thrown over the boards. Placing soil on the straw keeps it in place and keeps the water out.

Potatoes can be stored with root crops or kept by themselves. Best temperature for potatoes is between 37° to 40° F. In colder temperature the potatoes become too sweet, and in warmer temperatures the storage life is shortened and sprouting occurs. A dark, moist, well-ventilated storage is necessary for potatoes.

Squash and pumpkins prefer a relatively dry atmosphere and cool but not cold temperature. Around 50° F. is the best storage temperature for these products. A dry cellar or well-insulated barn or shed is ideal. Under proper conditions, well matured squash and pumpkins properly handled and stored will keep until late spring. To avoid decay, each individual should be placed on the floor or on shelves, only one layer deep, to allow air to circulate around each one completely. Storing in deep piles encourages decay. Handle carefully and eat bruised and immature specimens first.

Onions must be thoroughly dried before storage begins. Slatted crates or open-mesh sacks are satisfactory containers for onions which must be kept in a cool, dry, well-ventilated atmosphere. Because of their strong odor, they should be stored by themselves. Attics or well-insulated sheds are satisfactory for onion storage, providing freezing does not occur and the temperature ranges between 40° and 60° F.

Head lettuce can be stored from two to four weeks in a cool, moist place, such as a root cellar or pit.

Green tomatoes are usually stored on the vines which are pulled just before the first frost in autumn and hung roots up in a room about 40° to 50° F. They may be picked green ripe and wrapped individually in paper. Only the green-ripe fruits will mature properly.

When popcorn reaches the best popping stage, it should be shelled in water-tight containers and sealed. Fruit jars are satisfactory for this purpose. If the corn becomes too dry to pop, the addition of one tablespoonful of water to each quart of corn before sealing in the jars will improve popping quality.

Dried peas and beans are usually kept in a cool, dry place after a heat treatment of six hours from 120° to 145° to kill weevil.

Winter pears and apples require a cool, (32° F) moist, well-ventilated atmosphere such as that used for potatoes or root crops. There is some evidence that apples stored with root crops are inclined to absorb the flavor of the root crops. It is best to wrap apples in waxed paper if stored under these conditions. Winter pears require the same storage conditions as apples.

Under home conditions, it may be necessary to store the root crops, potatoes, apples and pears in the same place. Squash, pumpkins, green tomatoes and sweet potatoes have storage requirements enough alike that they may be stored in the same place, but not with the root crops.

**Kinds of Storages**

Outside of storage in the ground where grown, as in the case of parsnips, the most simple type of vegetable storage is the mound type. This type is suitable for storage of all root crops, potatoes and cabbage, and can be constructed in any garden. It consists of a shallow trench eight to twelve inches deep and not over five feet wide. Vegetables are piled in a cone-shaped pile and covered with straw. Soil is placed over the straw which is allowed to...
emerge through the top of the mound for ventilation until cold weather begins. As colder weather comes, more soil is added to the mound to prevent freezing. Where rodents are troublesome, cover the vegetables with quarter-inch wire. In this type of storage it is difficult to remove the crop in winter or when wet and muddy.

The pit type of storage is common in Utah, but like the mound type it is inconvenient to remove the vegetables in winter. This type is suitable for all root crops, potatoes, cabbage, and fall head lettuce. It consists of an excavation two and one-half to three feet deep and four to eight feet square, over which is constructed a covering containing an entrance large enough for access to the pit. A screen door over the entrance in early fall will allow for ventilation and keep rodents from the vegetables. As winter approaches, the entrance should be closed with an insulated door. Where rodents are bothersome, it may be necessary to line the storage with quarter-inch mesh wire to protect the vegetables.

The cellar or bank-type storage is an enlargement of the pit storage and is suitable for all vegetables and canned products. It is the most common type of vegetable storage in Utah. It consists of a hole in the ground two and one-half to six feet deep by about eight feet wide and fourteen feet long. The walls and roof are usually constructed of cedar poles or sawed logs over which is placed cedar chips or straw about two feet deep. The straw is held in place by a layer of soil from one to two feet deep. A ventilator in the roof at least one foot in diameter is necessary for this type of storage. This is left open in fall and on mild winter days and closed during cold weather. The dirt floor usually supplies sufficient moisture for the root crops. Shelves along the walls are often used for storage of canned fruits and vegetables and bins below the shelves are for the fresh products. Where the floor of the storage is dry in autumn, it should be wet thoroughly a few days before the vegetables are introduced. (See illustration)

Above-ground storage is suitable for most vegetables and canned products. In many places it is constructed of native lumber and lime-treated sawdust. The walls and ceiling must be at least six inches thick where dry sawdust or dry screened cinders are used. If powdered gypsum, rock wool, wood fibers, or similar materials having high insulation values, are used, walls and ceilings four inches thick are sufficient. The door requires the same insulation as the walls. A ventilator in the ceiling 8 to 12 inches in diameter is desirable. Most storages of this type have concrete floors over which a false floor of lumber can be placed to allow for adding water to the storage room. This type of storage is sometimes placed to join the back screened porch for convenience in winter. Shelves along the walls for canned goods and bins on the floor for fresh crops make for convenience in storing. (See illustration)

Basement-type storage usually consists of an insulated room in the basement of the house. Where the furnace is in the basement, the room must be well insulated on all walls and ceiling as well as the door to maintain cool temperatures in storage. An outside window or ventilator is also essential to this type of storage. A portable false floor over the concrete will allow for cleaning and the addition of several gallons of water each week to keep the air moist. Root crops can be stored in bins, and canned products along the walls of the storage. Sand or leaves on top of the root crops helps to prevent wilting. For city homes, this type of storage is most convenient and is satisfactory where well managed. (See illustration)

Management of Storages

No matter how well a storage is built, results will be unsatisfactory unless it is handled properly.

The storage space should be thoroughly cleaned before the produce is introduced in autumn. Decayed produce and other waste materials should be removed before they accumulate. Occasional sorting of stored vegetables to eliminate those in poor condition is essential for best results.

It is important to have the storage cold when the vegetables are harvested. In autumn when nights are cool, the ventilators and doors should be opened to allow cold air to circulate through the storage. Closing the openings during the heat of the day will maintain a cool temperature inside. During winter, the vents are opened on warm days to change air in the storage and to prevent excess moisture from accumulating on the ceiling and walls.

Where dirt floors are present, the moisture in the soil usually keeps the humidity high enough to prevent wilting of the vegetables. On concrete floors the air can be kept moist by adding water to a layer of sand or peat moss and salt that is spread on the concrete. A false floor of inch lumber laid over two-inch cross pieces, embedded in the sand, provides a dry surface on which to walk and pile the vegetables. The addition of water in a concrete storage room is necessary to prevent wilting of the vegetables. The evaporation surface from small pans and buckets is not large enough to supply this need.

With proper storage conditions and well-matured produce, it is possible to have fresh vegetables all winter long from your own garden.
Increased Prices and Rates of Production Influence Profits of Sheep Ranches

By Dee A. Broadbent

During the past three years profits in the sheep industry of southwestern Utah have shown considerable improvement. A study by the Department of Agricultural Economics of 60 sheep outfits in the Cedar City and Utah Dixie areas shows that there has been an average increase in profits of $2.50 per breeding ewe from 1939 to 1941. The analysis of identical ranches for the three-year period showed a profit of $1.34 in 1939, $2.01 in 1940, and $3.85 in 1941.

This improvement in profits is a result of increased production per unit, decreased death losses, and a more favorable market for lambs and wool. Weather and range conditions were more favorable in the last two years in which the study was made, particularly for the operators who range sheep on the Arizona Strip.

There was a consistently large increase in the number of lambs produced per 100 ewes during the three-year period. The number increased from 69 lambs per 100 ewes in 1937, to 77 lambs in 1940, and 83 lambs per 100 ewes in 1941. The corresponding docking count was 73, 82, and 87 for the three years. The increase in lamb weight was from 66 to 73 pounds per lamb.

The weight of fleeces was dependent upon general weather and range conditions, and averaged 8.7 pounds in 1939, 10.7 pounds in 1940, and 9.5 pounds in 1941. The year 1940 was one of the most favorable wool years in the history of the state. Fleeces weighed less in 1941 than in 1940, but they were still almost a pound heavier than in 1939.

Wool producers benefited by the rising prices for both lambs and wool. Lamb prices were about the same in 1939 and in 1940, but in 1941 they increased $2.25 per hundred weight. Wool prices increased for each year of the study, and increased 11 cents per pound during the three-year period.

The value of the fleece was $2.11 in 1939, $3.07 in 1940, and $3.27 in 1941. The increase in price of wool per pound from 1940 to 1941 was more than enough to compensate for the decrease in the weight of the fleece.

Better management practices and more favorable range conditions made it possible for producers to reduce the death loss of both the stock sheep and the lambs. This reduction was from 10.1 to 8.4 percent for stock sheep, and from 7.7 to 5.4 percent for the lambs.

Costs of operation were increasing throughout the period considered. The increased costs were a result of increased wages and prices paid by producers for other items entering into the cost picture. The total costs of operation increased from $4.71 per breeding ewe in 1939, to $5.69 in 1940, and $6.00 per ewe in 1941. This increase of $1.29 per head is small when compared with the increase in receipts of $3.80 per ewe. Almost half of the increase in costs of operation can be attributed to the increased cost of labor and camp supplies. Machinery, equipment, improvement costs, and feed and lease costs also increased appreciably during these years. These data are typical of what might be expected in the production of agricultural commodities in a period of rising prices. Expenses also increase, but seldom as rapidly as receipts. This, of course, results in an increase in profits during periods of rising prices. But it would be well to keep in mind that during periods of falling prices the value of the product decreases much more rapidly than the costs of operation. Those operators who use these increased earnings to reduce indebtedness, improve the quality of their breeding stock and grazing resources, and round out their unit will be in a much better position to withstand the coming period when economic relationships are less favorable than they are now.

During each of the years, there was considerable variation in the success of the individual ranches. Even in the most favorable year, 1941, some of the outfits barely made expenses, while others were making profits exceeding $6 per ewe. In general, prices, weather conditions, and physical factors are common to all the operators in this small

Table 1 Relationship of some factors influencing profits on sheep ranches in southwestern Utah, 1941

<table>
<thead>
<tr>
<th>Item</th>
<th>Least profitable ranches</th>
<th>Most profitable ranches</th>
</tr>
</thead>
<tbody>
<tr>
<td>Investment per ewe</td>
<td>25.02</td>
<td>24.02</td>
</tr>
<tr>
<td>Receipts per ewe</td>
<td>8.80</td>
<td>11.72</td>
</tr>
<tr>
<td>Expenses per ewe</td>
<td>6.20</td>
<td>6.12</td>
</tr>
<tr>
<td>Profit per ewe</td>
<td>2.60</td>
<td>5.60</td>
</tr>
<tr>
<td>Profit per sheep enterprise</td>
<td>3,618.00</td>
<td>4,602.00</td>
</tr>
<tr>
<td>Average number of ewes</td>
<td>1,394</td>
<td>822</td>
</tr>
<tr>
<td>Lambs per 100 ewes at market time</td>
<td>73</td>
<td>94</td>
</tr>
<tr>
<td>Average lamb weight (pounds)</td>
<td>70</td>
<td>77</td>
</tr>
<tr>
<td>Pounds wool per fleece (pounds)</td>
<td>9.3</td>
<td>10.3</td>
</tr>
<tr>
<td>Death loss of lambs (percent)</td>
<td>6.7</td>
<td>2.8</td>
</tr>
</tbody>
</table>

Adequate summer and winter range are both essential to profitable sheep ranching.
area, so the more important factors influencing returns are those more or less within the control of the individual operator. In other words, success in the enterprise is the reward for sound management and the adoption of better production and marketing practices, rather than a result of those factors which are not within the control of the operator.

In table 1 a few comparisons are shown to give the relationship some of the more important factors bear to profitable operation. The most profitable ranches, based on the profit per head, were smaller by more than 500 ewes per ranch; yet the total profit from the enterprise was almost $1,000 per ranch more than the larger, less profitable ranches. The difference between these two groups is primarily one of production, which reflects itself in receipts. The expense per head was practically the same for both groups. The possibilities of increasing the output per head are seldom appreciated by many of the livestock producers in this state. The more profitable ranches were producing 21 more lambs per 100 ewes, than the smaller; yet the total profit from the enterprise was almost $450 per family for the nine-year period.

There are ten irrigation companies diverting and using water from the Logan River. As a result of careful study of present costs and probable costs after consolidation of these companies, it has been found that consolidation would assure large savings annually. The Logan River companies now have ten times as many presidents and secretaries as are needed and probably not less than five times as many company directors as would be necessary if the water were handled by one company.

The Logan River condition is by no means unique. Many similar examples could be cited. In Sevier County, fifteen companies which use Sevier River water might be replaced by one; in Millard County, four companies of relatively large size might well consolidate if and when the financial conditions which favor consolidation are attained; in Salt Lake County there are more than forty irrigation units—surely, a much larger number than is needed; and in Uintah County, one company could easily do the work now done by five. Saving of money by reducing the number of administrative officials and eliminating duplication is an attractive feature of consolidation, but this is of relatively far less importance than the possible saving of water through improved facilities and methods of conveyance and distribution. The Utah State Planning Board, in a study of evaporation and conveyance losses from reservoirs and canals in Utah, found alarming losses in conveyance on the smaller canals—losses as high as 30 percent per mile. In every case reported, where percentage losses were measured with different amounts of water in the same canal, the percentage loss decreased as the flow increased.

Almost invariably the consolidated company can use larger canals and ditches than can smaller companies, thereby reducing conveyance and delivery losses.

2. Flexibility —To obtain the greatest return from the water supplies of any community, there must be reasonable flexibility within the irrigation company. To illustrate, in several Utah valleys the low-lying lands become water-logged and crops ruined by a seasonal rise of the ground water at about the same time of year that the higher lands "burn" because of lack of water. A well-managed large company can prevent both extremes by holding some of the canal water on the higher lands and providing both drainage and irrigation for the lower lands by diverting water from sloughs and ponds and by using low-lift pumping plants. Where each small company, or each individual, on a stream has a court-decree water right, flexibility is largely lacking even though it is essential to making the best use of all the water supplies.

Providing necessary flexibility by efficient management of consolidated companies need not jeopardize or restrict the rights of the individual irrigator. On the other hand, the larger company can better protect individual rights against outside interests because of greater strength, and it can supply more water to each stockholder by coordination of all needs and elimination or reduction of wastes.

3. Irrigation Experience —Large irrigation companies improve their practices and methods on the basis of facts accumulated from year to year. They measure the amounts of water lost in conveyance, the places where excess losses occurs, the amounts delivered to the several subdivisions of the irrigation system, the amounts of water received from the different sources of supply, and the conditions that tend to increase the efficiency of their practices. Neither individual irrigators nor small irrigation companies can afford the time or the equipment for collecting and recording data concerning their irrigation practices; nor can they, as a rule, keep long-time records which are of value as a basis for improvement.

4. Irrigation Services and Science—Irrigation is the basic foundation of agriculture in arid regions. There is a science of irrigation as well as a large body of organized knowledge about irrigation both in its engineering aspects and in its agricultural aspects.

The small irrigation company can make only a limited application of the science of irrigation to its practices. But the large company, with distinct advantage to the individuals in the company, can employ men who are trained in the engineering and the scientific aspects of irrigation and who can assist all irrigators in the use of this science and thus profit by application of the tested knowledge of the day to an extent that each irrigator unassisted cannot hope for.

Some irrigators are reluctant to believe that the employment of trained men in the management of irrigation projects gives promise of more economic operation. They might well dispel this reluctance by examining the procedure and the successes of the employment of trained men on large irrigation projects and in other industries, such, for example, as the power industry. The advantages of training and experience in the management of our industrial affairs should be clear to all who will examine the progress that is thus made possible.

5. Financial Capacity —Many Utah irrigation companies need more water during late summer; nearly all need some improvements in their irrigation works and structures. Only a few have the cash needed for increasing their water supplies and for improving their irrigation systems; nearly all must borrow the money required. Usually the larger, stronger companies have decided advantages when it is necessary to borrow funds either from private or from public agencies. More favorable terms and lower interest rates usually can be obtained by the large company.
Size of Companies Limited

The advantages of consolidation of irrigation companies are limited by the physical conditions in the particular community. Utah can never hope to have very large irrigation enterprises, such, for example, as some of those in the Snake River Valley, Idaho. The largest canal in Utah has a capacity of less than 1000 second-feet and supplies an irrigated area of 50,000 acres, whereas the Twin Falls South Side Canal in Idaho has a capacity of 3600 second-feet and supplies water for 200,000 acres.

India has still larger canals. Several of its irrigation canals have a capacity of 10,000 second-feet, which is more than 20 times the capacity of most canals in Utah. The main canal of an irrigation project recently developed in India has a bed width of 250 feet, a water depth of 16 feet, and a capacity of 10,000 second-feet.

Obstacles Which Retard Consolidation

There are at least five major obstacles which retard consolidation, namely: (1) water-users' fears, (2) lack of confidence, (3) local prejudices, (4) unequal indebtedness of different companies, and (5) unequal values of water rights and company stocks.

1. Many irrigators in communities where consolidation would be helpful fear inability to protect and to perpetuate water rights as they are now established. They are fearful that it would be impractical to establish a fair basis for the several different classes of water rights and stock in the companies and that it might be impossible to improve the service under the proposed new organization.

2. Lack of confidence, to be sure, is closely related to entertainment of fear. When it is possible to remove fear from the minds of water-users, it will not be difficult to establish confidence.

3. Local prejudices are extremely difficult to suppress. Needless to stress this fact, it is mentioned only to clarify a belief which has been developed through many years' contact with irrigators.

4. To equalize debts so that all participants in a consolidation scheme will be fairly dealt with, and will not be called on to assume financial liability for some of the weaker units, is probably one of the most difficult of the obstacles to overcome. Considerable time may be required to do this in some localities, but where physical conditions are distinctly favorable, the debt situation should not be permitted to become an insurmountable barrier. Indeed, if all other aspects of consolidation are favorable, there is urgent need for reducing debts of the existing irrigation companies to a minimum so that it will be practical to consolidate.

5. The establishment of relative values of water rights and stock shares is not an insurmountable task, but in most cases it will require the assistance of disinterested public agencies.

Progress Toward Consolidation

For a number of years the Utah Agricultural Experiment Station, in cooperation with the Irrigation Division of the U. S. Department of Agriculture, maintained a research project dealing with consolidation of irrigation companies. Under the able leadership of L. M. Winsor, now engineer for the Government of Iran making important improvements in that country's irrigation projects, substantial progress was made toward consolidation of Utah irrigation companies. More recently the Soil Conservation Service has developed an interest in consolidation of irrigation companies. Major progress has been made in the Parowan Valley. The following resume of irrigation company consolidation work there was prepared by John A. Maier, engineer of the Soil Conservation Service.

Consolidation in Parowan Valley

The Paragonah Canal Company and the Red Creek Reservoir & Canal Company, two irrigation companies operating in Parowan Valley and using water from a common source, Red Creek, have felt that a consolidation would effect both savings of water and of money. The two companies now irrigate 1425 acres. By pooling their resources, about 2900 acres of land could be irrigated with the 7500 acre-feet of water available each year. Two years ago the Soil Conservation Service, at the request of the companies, started an investigation of the two irrigation systems, and a report covering all the phases of operation, organization, water rights, canal systems, holdings, and financial status was recently completed. This report was discussed with the boards of directors of both companies, who decided to bring the subject of consolidation before the respective stockholders. On February 2, 1943, the Paragonah Canal Company voted in favor of consolidation by a majority of 384 to 25. On February 24, the Red Creek Reservoir & Canal Company voted for consolidation by a majority of 1164 to 120.

The stockholders of both irrigation companies requested their boards of directors to formulate plans for establishing relative values of irrigation company shares of stock, and for development of legal transfers of stock essential to complete the consolidation. After several weeks of study, the boards met on April 10, 1943, with their attorney and representatives of the Soil Conservation Service and the Utah Agricultural Experiment Station. Following full discussion, the boards approved a plan providing that stockholders in the new consolidated irrigation company will own but one class of stock which will entitle them to natural stream flow and to stored water. This plan, when approved by the stockholders, will no doubt result in substantial savings of time, water, and funds, and will greatly improve irrigation conditions for all of the stockholders.

NEW PUBLICATIONS

Bul. 306. Agricultural research in Utah. Biennial report of the Agricultural Experiment Station, 1940-42.

This report contains a summary of the progress and accomplishments on the various projects under investigation by the Experiment Station during the biennium. It also lists active projects, cooperative agreements with federal and state agencies, publications issued and staff members.


Information given in this bulletin indicates that it is desirable to select for the smoother-bodied types of Rambouillet sheep. While doing this, careful attention should be given to fleece yields and other important characters. There is evidence that skin folds are inherited, but the rate of progress from the wrinkled to the smooth type will not be rapid, even with careful selection.


This publication outlines methods for the identification and control of mastitis in dairy herds. Tests that can be used by farmers to identify infected cows are explained in detail.

Cir. 119. Poison ivy, by Bassett Magazine.

This circular presents a description of the poison ivy plant, explains its poisonous properties, and suggests means for its eradication.

Any of 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.
LYGUS bugs, particularly the two species Lygus hesperus Knight and L. elisus Van Duzee, are common pests of many crops plants in Utah. They have become well known because of their blasting of buds and blossoms on alfalfa, greatly reducing alfalfa seed production in many parts of the west. They are less generally recognized as pests of other crops, many of which are attacked with varying frequency and severity.

In 1925, Utah produced 26 million pounds of alfalfa seed on 69,000 of the 495,000 acres of alfalfa. This was a seed yield of 382 pounds per acre. In addition to the seed produced that year, these 69,000 acres also produced approximately 64,400 tons of hay. The average yield of alfalfa seed in the state during the period from 1920 to 1939, dropped to 108 pounds per acre on 32,700 acres. For the three-year period, 1940 to 1942, the average seed yield was only 94 pounds per acre on 37,000 acres harvested for seed. This is but 24.61 percent of the state-record yield which occurred in 1925. Investigations at the Utah Agricultural Experiment Station have revealed that lygus-bug injury has been an important factor in this seed reduction.

In Utah, alfalfa is probably the most important cultivated host plant of the two above-named lygus bugs. Each year lygus populations of various intensity attack this crop. Each time cutting occurs, most of the adult lygus bugs leave the fields for a week or two to feed upon other acceptable plants, gradually returning to the alfalfa as the new growth develops.

During June of 1941, it was observed that high lygus populations were common on alfalfa. After this crop was cut, heavy movements of lygus bugs, more commonly L. hesperus, were observed to infest fields of growing peas. Daily observations of such fields showed the lygus population usually to remain high on the peas for only a few days, followed by a reduction to but moderate numbers, usually within a week or less.

On July 8, 1942, an examination of young sugar beets at Delta, Utah, and at nearby towns showed a lygus population of from 2 to 25 per beet, with Lygus elisus greatly outnumbering L. hesperus. Several farmers thought that these bugs were causing the death of many of the young beets. It was found that the high lygus population was causing some damage, but it was secondary to that caused by a severe local outbreak of the sugar beet crown borer, Hulstia undulatella Clemens, which was attacking most of the small beets, both thinned and un-thinned, in the Delta area.

Both species of lygus commonly attack potato plants. Heavy populations encountered on potatoes at Flowell, Farmington, Spanish Fork and Plain City caused wilting of the foliage. Possibly a toxaemia, caused by an insect toxin injected into the plant during lygus-bug feeding, may have been largely responsible for this condition. Lygus nymphs usually were found to be more abundant on potatoes than on peas, but less abundant than on alfalfa.

The peach crop in several orchards at Moab during recent years has suffered severe “cat-facing” which resulted in substantial financial loss. An examination of one large orchard during the 1942 harvest revealed practically 100 percent “cat-faced” peaches on trees adjacent to a field of alfalfa, with the injury decreasing as the distance from the alfalfa increased. Injury along a roadway at one side of the field was less severe and “cat-facing” more quickly diminished. The abundance of lygus bugs on weeds and alfalfa suggested, at least by implication, that the injury may have been caused by lygus bugs feeding on or laying eggs in the fruit, probably during the critical early-growth period. The related tarnished plant bug, Lygus pratensis (L.), which is much less common in Utah than the two above-named species, has frequently been blamed for causing “cat-facing” of peaches, apples and other fruits in various areas of the country.

Lygus bugs also feed on clovers, sugar beets, strawberries, raspberries, dewberries, blackberries, beans; in fact, on a large variety of truck-crop and field and garden plants, as well as upon many kinds of shrubs, trees, flowers and weeds.

**Control:** Lygus bugs are extremely difficult to control. No insecticide now known has given practical control at a cost that was not prohibitive for general field use. Of 12 insecticides which were thought to afford the greatest promise, only pyrethrum dust (dry pyrocide), was found by Utah Agricultural Experiment Station workers, to give effective control in seed alfalfa when applied every 4 or 5 days. After this length of time, treated alfalfa became reinfested from nearby untreated fields.

In view of the present inadequacy of insecticides for lygus-bug control, it seems that cultural methods will have to be used to give what measure of relief is possible by such means. Chief among these measures, the following might be mentioned: (1) During the fall season eliminate from fields, orchards and gardens, ditch banks, fence lines, etc., all crop refuse, weeds, and other litter which provide protection for the overwintering adult lygus. (2) Keep growing crop plants in a healthy, vigorous condition by early planting, supplying adequate fertility, proper culture, and irrigation water. (3) All alfalfa growers in a district should cooperate in a program of uniform cutting, so that every alfalfa field will be cut as near the same time as possible. If this is done, the favorite food supply of the bugs will be eliminated, unhatched eggs still in the alfalfa stems will be killed and most of the young bugs (nymphs), which have not yet developed wings and hence cannot fly away to other food plants, will be destroyed. The hay should be removed as quickly as possible after cutting, and immediately thereafter fields should be thoroughly dragged with a good net-wire or barbed-wire drag that will cut off all leaves and stems from the alfalfa crowns, leaving the young bugs without food and exposed to the fatal hot sunshine on the bare, dry ground. Alfalfa fields should be left dry for at least two or three days before being irrigated again. (4) Ditch banks, fence lines, roadways, etc., should be kept clean during summer and fall by pasturing or periodic cutting. (5) Clean culture in orchards will do much toward reducing the lygus population. (6) Where possible it is advisable to cut alfalfa before sugar beet seed fields come into blossom, or after the seed has passed the dough stage, in order to reduce damage to this seed crop. Lygus feeding on young developing seed balls seriously reduces germination and sometimes reduces yields of sugar beet seed.

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