

# Utah Science

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Volume 5 | Number 3

Article 1

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9-1944

## Farm & Home Science Vol. 5 No. 3, September 1944

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### Recommended Citation

(1944) "Farm & Home Science Vol. 5 No. 3, September 1944," *Utah Science*: Vol. 5 : No. 3 , Article 1.  
Available at: <https://digitalcommons.usu.edu/utscience/vol5/iss3/1>

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# FARM & HOME SCIENCE



Published Quarterly  
by the

UTAH AGRICULTURAL EXPERIMENT STATION

Vol. 5

September 1944

No. 3

## Livestock Numbers in Utah

Utah Feed Conditions Favorable for Livestock Production

By DEE A. BROADBENT

**P**RODUCTION of livestock and livestock products in the United States reached new high records in 1942 and 1943. Total livestock numbers in the nation have overtaken feed supplies with the result that there are more livestock than prospective feed supplies in spite of better than average crop yields. However, feed supplies are not seriously out of balance with livestock numbers.

### National Cattle Situation

This situation is particularly true of cattle which are now at record numbers and increasing. On January 1, 1944, cattle numbers stood at 82.2 million head, an increase of three million over a year earlier and eight million more than in 1934, the previous peak. The increase in cattle numbers has been primarily in dairy cows and heifers kept for milk rather than in beef animals (table 1). In 1920, 30 million of the 70 million cattle consisted of dairy females, but in 1944 there were 41 million dairy females out of a total of 82 million head of cattle. For this 24-year period all cattle of the nation increased 12 million head of which 10.5 million was in the dairy females. In Utah, during the same period all cattle decreased 40 thousand head but dairy females increased almost 80 thousand.

The principal increase in cattle since 1920 has taken place in the Central and Southern states. What expansion there was in the Western states was largely restricted to the Plains area rather than the Mountain and Pacific areas.

### National Stock Sheep Situation

Numbers of stock sheep in the nation in 1944 are at about the same level as they were in 1930-1935 and 1940, and

In view of present livestock numbers, range condition and feed stocks in sight, there is no basis for pessimism in the livestock industry in Utah for the coming year. The feed situation is more favorable than in many parts of the nation and range livestock numbers are substantially lower than previous peaks. National numbers of cattle are at new high peaks and increasing. The beef cattle men of this state should be particularly careful at this time not to expand beyond optimum stocking of the range, and they will materially improve their economic position if they follow a vigorous culling program at this time. This will result in improved quality of breeding herds and conversion of culls and surplus stock to cash at favorable prices.

All livestock producers should set up a balance sheet of supplies of feed and livestock feed requirements and make adjustments that will bring feed and livestock in balance and still leave more than normal feed carry-over as insurance to industry in the future.

about eight million higher than they were in 1920 (table 2). The 1944 numbers of stock sheep in the Western states and Utah were at their lowest level in 25 years, but for the same period the numbers in the South Central states had increased from 5.1 to 12.3 million head. The trend in number of stock sheep in the West North Central states has been upward and the trend in the North and South Atlantic states downward.

During the past year there has been considerable publicity given to the livestock situation in the nation. Governmental adjustment programs, based on the national livestock and feed situation, have been formulated for the pur-

pose of bringing livestock and feed supplies back into balance. These livestock programs can be interpreted for Utah only in terms of local conditions and in the last analysis by the situation on individual farms.

### Livestock Numbers in Utah 1867-1944

**Cattle:** There is quite a close correlation between the number of all cattle on Utah farms and the number of beef cattle; however, there has been an almost continual increase in the difference between them. Thus dairy cattle have shown a continued expansion since 1867 and it is expected and recommended by most people in the state that the numbers of dairy animals should continue the same trend. This will mean the replacement of some beef cattle by dairy animals, particularly on small farms and in areas where winter feeding of beef cattle is required.

An examination of the number of beef cattle in Utah reveals that there was a rapid expansion until 1892 at which time less favorable prices for cattle and a full stocking of most accessible ranges led to a decline in numbers. Record high numbers were reached in 1919 and 1920 when there were about 450 thousand head in the state. From that time until 1930 numbers of beef were reduced, and in 1934 because of unusually poor range conditions and shortage of harvested feed a liquidation of 58 thousand head was made during a period of extremely low prices. From 1935 to 1939 a small increase took place, but by no means sufficient to regain the numbers liquidated in 1934. Since 1939 favorable prices and better than average range and feed conditions led to an expansion of numbers and by

(Continued on page 2)

## C. T. Hirst Retires After 34 Years of Service

**P**ROFESSOR Charles Tarry Hirst, research associate professor of chemistry, retired June 30, after 34 years of service to the College and Station. Dr. J. E. Greaves, head of the Department of Bacteriology and Biochemistry, who has worked with Professor Hirst for many years, wrote the following account of him and his work:

Professor C. T. Hirst was born in Paradise, Utah, September 25, 1874. He received his early educational training in the public schools of the state, and his B.S. degree in 1910, and his M.S. degree in 1914 from the Utah State Agricultural College. During 1918-1919 he was a graduate student at the University of California. Here he did work on aminobenzophenone with an old friend, Dr. C. W. Porter. His first teaching was done in the public schools of his native town, Paradise.

He became a member of the Experiment Station staff in 1910. He was instructor in chemistry from 1910-15, assistant professor from 1915-24, and associate professor to 1944. During his association with the college he was continuously connected with chemistry research. It was in this division of the college that he did excellent research work on such subjects as: the milling qualities and the mineral content of Utah wheat, the influence of crop rotation on soil fertility, the loss of plant nutrients from Utah soils, the quantitative determination of minerals, the noxious nitrogen content of sugar beets, and the value of beet tops and crowns.

Professor Hirst was in his chosen field when teaching quantitative chemistry or doing quantitative chemical work. The best quantitative chemists to graduate from Utah State Agricultural College have received their training with Professor Hirst. Professor Hirst



could not and did not tolerate "slipshod" work. "Puddle corrections" were unpardonable. This same high standard was adhered to in his Station work, and analyses reported by Professor Hirst were above question. As the result of this life-time practice he is today one of the most outstanding analytical chemists in the state.

Handball is Professor Hirst's chosen sport and he enjoyed himself immensely and gave his opponent a real workout whenever he went onto the gymnasium floor. In later life he got his exercise in tending his few acres and cows. This he did during those early hours of the morning when most faculty members are sleeping. It is probable that he did this so he could spend these choice hours in companionship with his sons who were with him.

One does not know Professor Hirst who has not become acquainted with his family life and

learned how he has been a father and companion, not only to his own sons and daughters, but also to his orphaned nieces and grandsons. Although his research has been of inestimable value to the state, his great legacy are his sons and daughters who are fast climbing the ladder in their chosen fields—chemistry, engineering, medicine, agriculture, and home economics. Today two of these sons are serving their country with the armed forces.

Some men are old at 50, others at 60, but Professor Hirst is young in body and mind when nearing his three score and ten year mark. It takes a good young man to "keep up with him." We feel sure Professor Hirst on retiring will not "sit by the fire and burn his boots," but will find some productive work from which he will gain pleasure and satisfaction.

### LIVESTOCK NUMBERS

*(Continued from page 1)*

1944 beef cattle on Utah farms were slightly in excess of numbers before the drought of 1934.

Some effort is now being made to encourage cattle from range states into slaughter channels this early fall, but that does not mean that marketings will be materially increased. In the first place, range cattle are not normally in condition to go to slaughter this early, and secondly, the lack of demand

for feeder stock has and will likely continue to cause further holding of cattle from the market. Furthermore, cattle growers anticipate an increased slaughter market outlet for older cattle because of slaughter receptiveness for "grasser" cattle. The demand is for range cattle of heavier weights, 700 to 800 pounds, that can be warmed up, or with 100 days' feed, be put on the market in slaughter condition.

In view of national record number of cattle and a heavy demand for meats

by the government and consumers, this is a good time to cull, not increase, herds. A heavy culling program during the next few years would improve quality of herds and alleviate the potential economic problem in a post-war adjustment period. The long time position of the cattle industry is always weak when numbers are at the top of the cycle. The risk involved in maintaining present cattle numbers in Utah is a market risk rather than a feed risk.

*(Continued on page 18)*

# INCREASED PRODUCTION OF VEGETABLE SEED IN UTAH

This New Crop Offers Additional Cash Income on Many Small Irrigated Farms

By LEONARD H. POLLARD



Dr. H. B. Peterson inspects onion seed in Washington County

THE growing of vegetable seed in Utah is a relatively new enterprise which offers many possibilities as a cash crop. Until the past few years seed growing had been limited to a few growers of certified onion seed. With the increased demand for seed because the war cut off European sources, several seed companies were induced to try producing seed in Utah. The preliminary trials were encouraging and as a result considerable acreages of onion, carrot, and lettuce have been planted in several districts of the state.

This year approximately 50 acres of onion seed is being grown. Approximately two-thirds of the acreage is in Washington County and the remainder in Iron, Utah, Salt Lake, Davis, Box Elder, and Cache Counties. Harvesting has just started in Washington County so the yield can only be estimated. In spite of the fact that earlier estimates placed the yield around 300 to 500 pounds per acre, it is doubtful if the actual yield will be over one-half that amount. This reduction has been apparently caused by damage from thrips and high temperature during the time

when the seed was being formed. Estimates in the other areas are still from 300 to 500 or more pounds per acre, depending on the stand and the way the crop has been grown.

Even though most of the carrot seed trials were quite successful, the production of this crop has not been increased as was expected. This was probably owing to the demand for the vegetable crop in some of the present seed production regions. This year approximately fifty acres of seed are being grown in Box Elder and Cache Counties.

The production of lettuce seed has been increased from a few acres in 1943 to well over 100 acres in 1944. This production has been chiefly confined to Cache, Box Elder, and the Utah County areas.

Three hundred acres of garden bean seed are being grown in Carbon County and in the Uinta Basin. Some of the acreage looks promising at the present time.

Additional acreage of radish, squash, pumpkin, and turnip seed is being grown in some areas on a trial basis. If



The author looking over a field of lettuce seed

the production of these crops is successful more acreage will be planted another year.

In order to help in the developing of vegetable seed production the Vegetable Crops Department of the Utah Station, in cooperation with the U. S. Department of Agriculture, has been conducting experimental trials on onion, carrot, turnip, and beet seed. It is the plan of the experiment to determine what crops can be grown in the different areas and how each should be handled for seed production.

The results so far indicate that carrot seed can be grown successfully in the following counties: Cache, Box Elder, Weber, Davis, Salt Lake, Utah, Sevier, Iron and Washington. Yields of from 600 to 1000 pounds per acre should be obtained.

Onion seed trials have been more limited but from the present results the production of seed should be successful in the same areas as indicated for carrots. However, unless better results are obtained in Washington County than expected at this writing, further production will be discouraged in that county.

The table beet seed trials had to be limited because of interfering with the sugar beet seed industry. The two crops cannot be grown close together because of the possibility of crossing. Consequently, trials were only made in Sevier and Kane Counties where no sugar beet seed was being grown. The results in Kane County have been good, but too

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# FARM AND HOME SCIENCE

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Published Quarterly by the Utah  
Agricultural Experiment Station

Logan, Utah

R. H. WALKER, Director  
GLADYS L. HARRISON, Editor

Address correspondence regarding material appearing in these columns either to the editor or to the author.

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

College series no. 689

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## DETERMINING FACTORS IN THE DEVELOPMENT OF A BALANCED RESEARCH PROGRAM

**G**REAT care must be exercised at all times in the administration of the research program to insure the development of a balanced program and one that will result in the greatest good to the citizens of the state. Many factors come into play in determining what problems will be investigated. Some of these are: the seriousness of the problem and the difficulty of solving it through individual effort; the importance to the agricultural industry; the importance of the particular phase of the agricultural industry affected; the availability of personnel, facilities and funds for doing the work; the feasibility of solving the problem and of accomplishing the desired results; the possibility of obtaining assistance by cooperation with federal, state or private agencies; the interest of staff members in the problem; the possibility of developing new information, a new machine, a new process, or a new crop, as indicated from the acquaintance of staff members with the progress of research in other states or nations; and the general public good that may result from the research.

Even though there may be difficult and unsolved problems related to one phase or enterprise of the agricultural industry, it has not been considered wisdom to center all the research effort on the problems of this one industry. Rather it has been considered important to conduct research on some of the problems related to all the various agricultural enterprises, or as many as is possible, and this at the expense of spreading the effort too thin to accomplish the most good on a problem in a given period of time. For example,

when the honey producers brought their problems to the Station and indicated the seriousness of the bee losses in the state, it did not seem wise to close up all Station research projects for the purpose of concentrating the effort of all the staff members on this one problem. Neither did it seem wise for even the entomologists of the Station to drop all their other activities to study this problem even though it is of great importance. There are many important problems in all the fields of agriculture, and one or more of these should not be given special emphasis at the expense of others.

The total income or total investment in a certain agricultural enterprise is an important factor and one that is always taken into consideration in determining the research program. However, this should not be the only determining factor. One of the largest income-producing enterprises may have few serious problems and need little attention from research. On the other hand, another agricultural industry may be producing very little income because of the serious problems confronting it. Through the development of certain new knowledge this enterprise, which is now of little importance, may be developed into one of the most profitable industries of the state. The alkali soils of the state, for example, are now producing scanty and poor crops. Research on the reclamation of alkali soils and the development of alkali-tolerant crops may serve to increase the productivity of these lands materially and also to extend the land acreage now under cultivation in the state. Experiments in vegetable seed production are now pointing the way for development of a new industry in the state.

The field of activity in which emphasis in research should be placed may vary from year to year. Some problems are of long duration and must be continued over a period of years in order to realize any benefits from the research. In the plant breeding program, for example, the research must be continued until the desired plant characters are produced. This usually requires a period of 8 to 10 years.

Other research problems are of short duration. On some of these considerable effort may need to be expended for a year or two years when work will be completed. The research effort can then be shifted to other problems of importance.

Obviously it is not possible, however,

to make large shifts in emphasis on the research in any short period owing to the character of the research personnel involved. It would neither be economical nor efficient to shift plant breeders into the veterinary laboratory, nor to shift the veterinarians into plant breeding work. Neither is it feasible to drop from the staff specialists in one field to permit employment in other fields for a short period to be followed by other shifts. There is much to be gained by continuity of personnel and a continuing interest and study by specialists in a certain field over a period of years.

Some kinds of research are naturally more costly than others even though the final results to the general welfare may be no greater. For example, some research may require costly equipment in order to make certain technical measurements such as the vitamin content of foods. Other experiments may require greenhouse facilities for growing plants under controlled conditions of heat, light and moisture. Still other experiments may require an extensive outlay of land, barns, livestock, or farm machinery. These factors are important in considering both the desirability and feasibility of undertaking a research project.

Another item of importance is the income to be derived from the products of the investigation. For example, although the poultry and dairy experiments are expensive, yet the income from sale of poultry and dairy products amounts to a considerable portion of the operating costs in some years. On the other hand, other kinds of experiments produce no returns whatsoever. This is not necessarily justification for not conducting experiments of the latter type, neither is it considered wise to lean heavily toward the income producing activities in the research program.

In general, the most important things to consider in determining and keeping balance in the research program, are the seriousness of the problems involved, the difficulty individuals have in overcoming them, the possibility of their solution, and the benefits to be derived from their solution in the way of public good.

Lewis W. Jones, research assistant professor of bacteriology and biochemistry, is spending a year in study at Stanford University.

# New Smut Resistant Wheat Released by Station

New Variety is Resistant to More Smut Races and Has Stiffer Straw than Relief

**A** NEW winter wheat variety, Wasatch, has been officially released for planting by farmers. This new wheat was developed at the Utah Station by D. C. Tingey of the Department of Agronomy and R. W. Woodward of the U. S. Division of Cereal Crops and Diseases. It is a hard red winter wheat of the Turkey Red type resulting from a cross between Ridget and Relief. It has been previously known at the Experiment Station as 122-A and in the Division of Cereal Crops and Diseases by the serial number C. I. 11925. It has now been designed Wasatch, by which name it will be known in the commercial trade.

This wheat is a distinct improvement over the earlier varieties released by the Station and is the most highly resistant of any commercially grown wheat to cereal smuts and especially the dwarf type. It is this quality, along with its stiffer straw, that will make it so highly desirable and popular among the dry land wheat growers of the intermountain area. In addition to being resistant to the dwarf smut, it is also resistant to all but two of the 27 known smut races and these two are not common in this area.

Prior to the release of the smut-resistant variety, Relief, in 1935, Utah Kanred was the most widely grown wheat on the dry land areas of the state. While this variety yields well and has excellent milling and baking qualities, it is not resistant to smut. The average annual loss from smut with this variety was from 30 to 40 percent over the dry land area. Many fields have shown a reduction in yield of 85 to 90 percent owing to this disease.

Dwarf smut of wheat is caused by a fungus organism that lives in the soil. There is no way to treat the wheat to prevent the development of the disease. The only known method of control of the disease is to grow wheat varieties that are resistant. Several years ago, the Utah Agricultural Experiment Sta-

## NEW PUBLICATIONS

**Bul. 313. Canal lining experiments in the Delta Area, Utah, by Orson W. Israelsen and Ronald C. Reeve. Department of Irrigation and Drainage in cooperation with the U. S. Soil Conservation Service. 52 p.**

This bulletin reports data collected in a three-year experimental study of seepage losses from typical canal sections in the Delta Area. It includes analyses of the justifiable cost of lining irrigation canals based on the value of the water saved and on assumed or estimated annual maintenance costs of the lining. With present water values and interest rates and canal lining maintenance costs not greater than 9 percent annually, Delta Area irrigation companies can justify initial lining costs of 9 cents per square foot on some of their canals.

**Bul. 314. Gains made by cattle on summer range in northern Utah, by L. A. Stoddart. Department of Range Management. 32 p.**

This bulletin is a report on livestock gains, factors which affect the gains, and the effect of the gains upon season to graze and season to market livestock. The effect of phosphorus supplements upon blood phosphorus and animal gains is also reported.

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

tion in cooperation with the U. S. Bureau of Plant Industry initiated a plant breeding program to develop new varieties of cereals resistant to smut and superior to the older and more commonly grown varieties. The first improved variety to be developed in this program was Relief. This variety, which is resistant to most forms of covered smut occurring in Utah, was introduced at a time when wheat farmers in central and northern Utah and southern Idaho were incurring heavy losses through the rapid spreading of the covered smut disease. Annual losses were estimated at over one million dollars. The new wheat was well named and was soon

adopted by most of the farmers in the region.

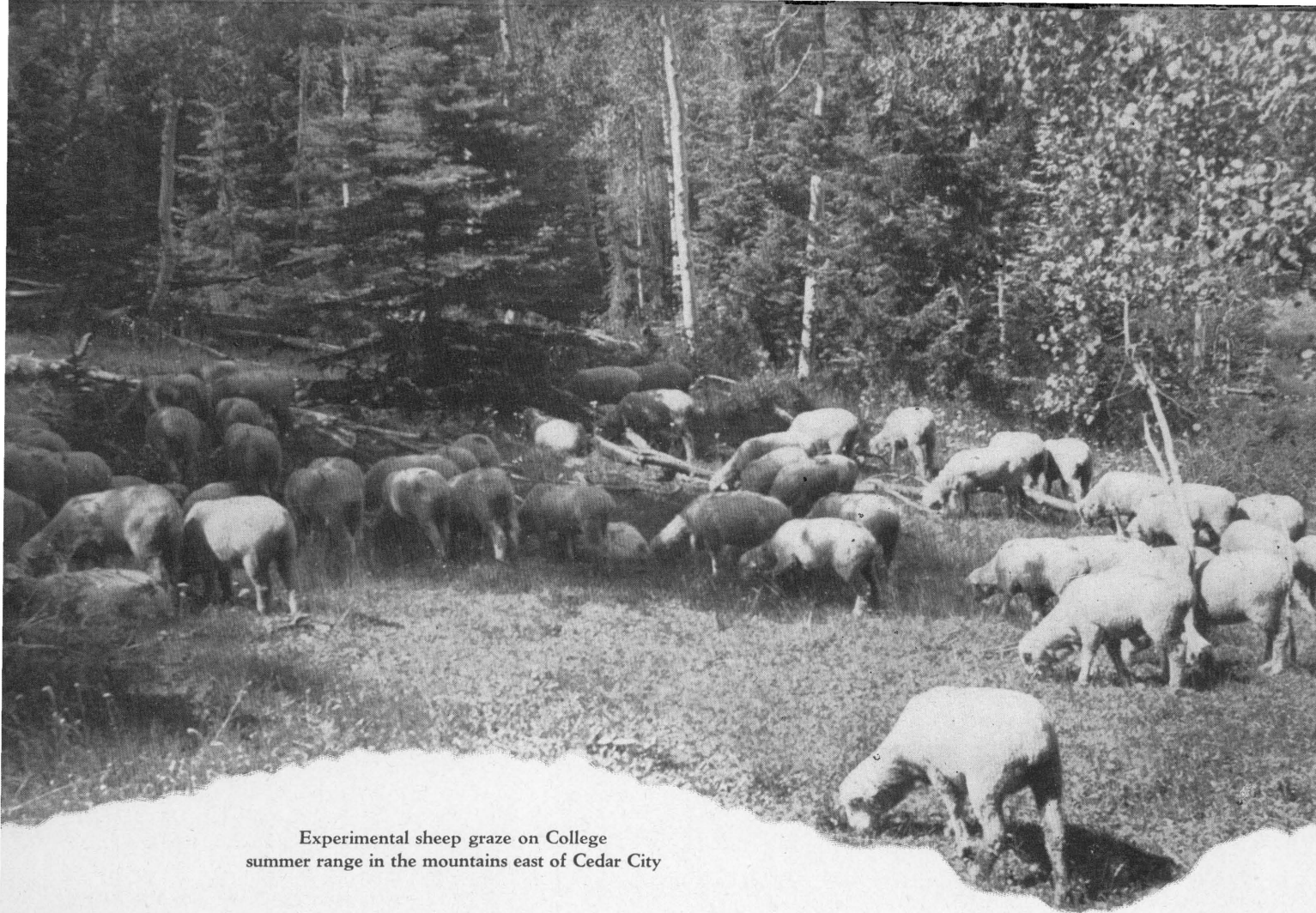
The cereal breeding program was not abandoned when Relief was developed owing to the fact that it was not resistant to all the known races of smut. Two races found in this area may seriously attack Relief. Since then, a second variety known as Cache, which is a hard red wheat similar to Relief but beardless, has been released and is now being grown throughout the area. Its beardlessness makes it easier to maintain pure stands, while Relief becomes contaminated with other bearded varieties and loses its smut resistance.

The new variety, Wasatch, now being released, is a further development of the Experiment Station which is more resistant to smut disease than any other known commercial variety. Its yielding quality in years when there is no smut is no better than Utah Kanred and Relief, but in years when there is considerable smut, this variety should outyield any of the smut susceptible ones owing to its resistance to the disease.

Several wheat growers in Box Elder and Cache Counties have grown some 400 acres of this wheat for seed increase purposes this year. These fields have been inspected by R. W. Woodward of the Bureau of Plant Industry and collaborator at the Utah Station and C. A. Suneson, regional representative of the Bureau of Plant Industry of Davis, California, to see that they were free from other varieties and noxious weeds and in other ways met the certification standards set up by the official state agencies.

Growers of Wasatch for 1943-44 are as follows: Box Elder County—H. L. Richards, Fielding; Laurence Whitney, Tremonton; E. B. Mitchell & Sons, Hansel Valley; T. W. Potter, Collinston; Austin Udy, Garland. Cache County—Alvin T. Clawson, Hyrum; A. J. Clawson, Hyrum; Alphonso Christensen, Newton.





Experimental sheep graze on College summer range in the mountains east of Cedar City

## Station Initiates New Investigations in Sheep Breeding and Management

By R. H. WALKER

**T**HE Utah Station will get first-hand information on the problems of the range sheep operator from the new project work with headquarters at the Branch Agricultural College at Cedar City. This spring the Station purchased an economic unit of approximately 900 grade Rambouillet sheep to begin new studies in range sheep breeding and management. Previous work with sheep has either been done with animals owned by cooperating ranchers or with the small Station herds of purebreds. The herd used in this project will be more nearly similar in number and type to typical herds on the range.

One of the primary objectives of this project is to determine the feasibility of developing a superior flock of range sheep of Rambouillet breeding with smooth body, open face, long staple and producing a high fleece weight of clean wool and a large market lamb. Range ewes of average quality common to the area will be bred to good quality Rambouillet rams.

For purposes of comparison, and also to determine whether or not a sheep somewhat superior to the straight Ram-

bouillet can be developed, a part of the original group of Rambouillet ewes will be bred to good quality white face crossbred rams. It is anticipated that Columbia rams will be used in the initial phases of this study. This breed is receiving considerable interest from some breeders in the state. The Columbia is, in general, the result of breeding select Lincoln rams to Rambouillet ewes, and proceeding from this step by mating the most select first-cross rams to carefully selected first-cross ewes.

There are some indications that the breeding of the cross-bred group should tend toward the Targhee type rather than to the Columbia. The Targhee is about midway between the Columbia and the Rambouillet. This breed is not well known in this state owing to the fact that it is a rather recent development of the U. S. Sheep Experiment Station at Dubois, Idaho.

The foundation of the Targhee was laid by the use of Corriedale, Lincoln, and Rambouillet rams and Corriedale and Rambouillet ewes. Two basic com-

binations were made. Rambouillet rams were bred to Lincoln-Rambouillet first-cross ewes. Rambouillet rams were also bred to ewes that were produced by mating Corriedale rams to Lincoln-Rambouillet first-cross ewes. Rams and ewes from these two combinations of breeding were carefully selected and interbred, and later developed into the Targhee.

In the U. S. Sheep Station flock 80 percent of the Targhees produced  $\frac{1}{2}$  blood wool, and the average weight of clean wool produced was 4.92 pounds or slightly higher than the Rambouillet. The animals of this breed have been described as "glorified Rambouillet."

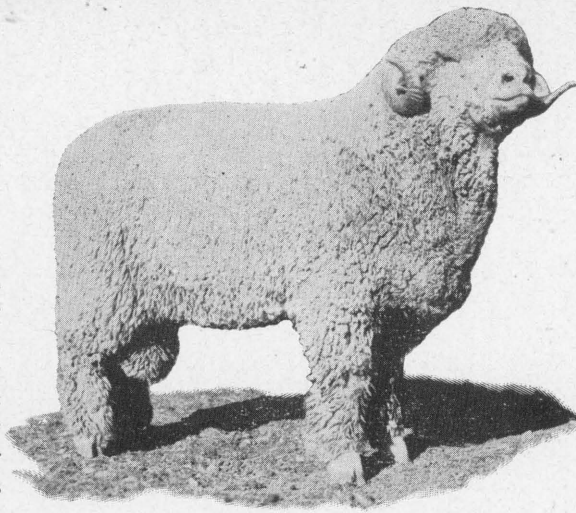
As the program progresses experience will indicate whether or not the breeding in this cross-bred group should lean toward the Columbia or to the Targhee type. The answer to the question of the best direction to go should be one of the principal results of the experiment.

In addition to the breeding program, which is under the direction of Dr. T. Donald Bell, research assistant professor

of animal husbandry, it is planned to place considerable emphasis on the development of spring and fall pastures. This phase of the study will be in charge of C. Wayne Cook, research assistant professor of range management.

The spring and fall seasons are critical periods with most stockmen. These are transition periods when livestock are moving between winter and summer ranges. Feed is usually scarce and it is a time when sheep, particularly, need an abundance of good quality feed. During the fall months the breeding stock need good feed to prepare them properly for the breeding season. In the spring ewes need good feed prior to and after lambing. In the experimental program an effort will be made to determine how the production of crops and pastures on valley farm lands can best fit into the livestock operations and aid in furnishing the necessary feed during spring and fall months. Tests will be made with different kinds of grasses to determine which are best suited for pastures on low value lands where irrigation water is not available. Rye, crested wheatgrass, and other drought-resistant varieties will be tested.

Methods of managing the summer and winter ranges will be studied to determine the capacity to which these ranges may be grazed for economic production and yet to maintain continued productivity at a high level and also to protect the soil against erosion. Over a period of years many experiments will be conducted to determine the extent to which certain vegetative types on the range may be safely utilized. How early and how late the ranges may be safely grazed, the type of herding that may be most desirable, the date of lambing and of marketing lambs, whether or not it is more economical to truck or to ship the stock by rail than to trail, these and many other experiments may be conducted as the work progresses. For the first few years, however, the program will be kept as simple as possible and the



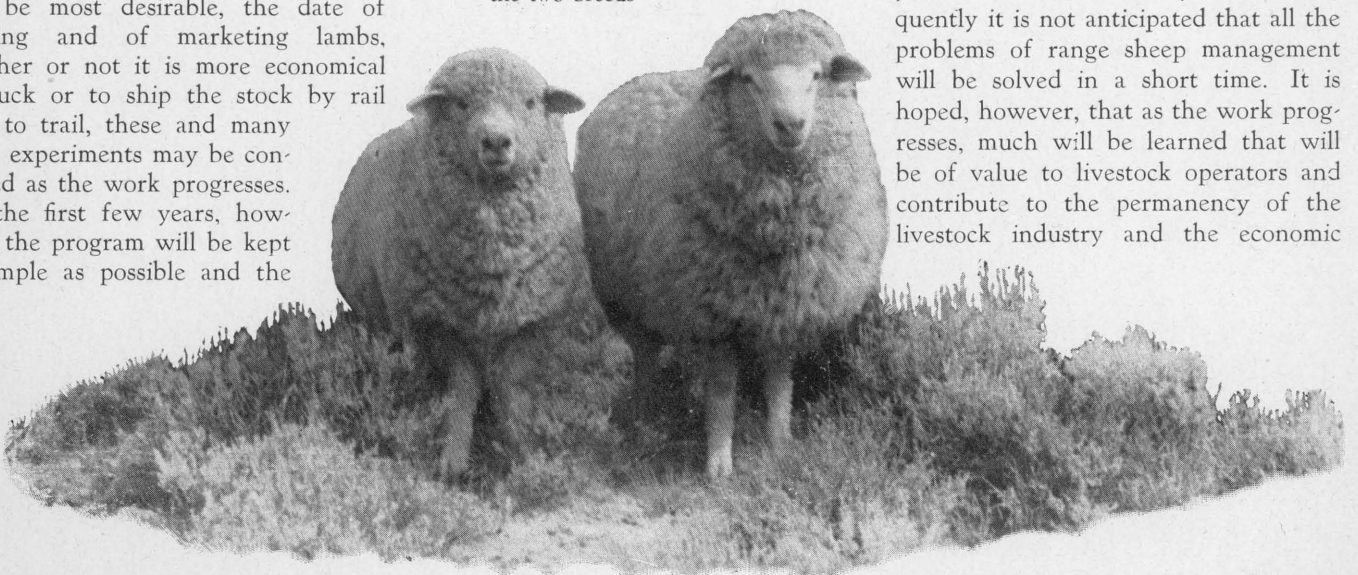
W. S. Hansen C885, sire of open face rams to be used in B.A.C. experimental work

range flock will be operated as nearly on the same basis as is followed by the livestock operators in the local area.

The facilities available for the project include some 2500 acres of summer range land in the mountains 14 miles east of Cedar City which are owned by the College. The College farm of 500 acres located a few miles west of the Branch Agricultural College is also available in part for the spring and fall operations. It is on this land that spring and fall pastures will be developed and where the lambing operations will be conducted.

During the winter months the sheep will be grazed on desert winter range near Modena on lands furnished on a cooperative basis by the U. S. Grazing Service. Certain winter grazing experiments will also be conducted at the Forest Service Desert Experimental Range west of Milford in Millard County. These experiments will be conducted on a cooperative basis with the Intermountain Forest and Range Experiment Station. Cooperative tests on

A Targhee and a Columbia sheep, showing the comparative size of the two breeds



the feeding of phosphate supplements prior to and after the breeding period, and studies on factors affecting the percentage lamb crop have been conducted on this range in years past and will be continued under the new project.

During the progress of the experiment detailed records will be kept on operating costs; productivity of the range, and spring and fall pastures; weight of lambs produced; fleece weights, shrinkage, length and density of fleece; and of other data pertaining both to the sheep and to the range. A wool scouring laboratory will be established at the Branch College to scour wool samples taken from the range flock.

Alma C. Esplin, research professor of animal husbandry, and Dr. L. A. Stoddart, research professor of range management, in the Agricultural Experiment Station, will aid in directing the research on this new range sheep study. Dee A. Broadbent, research assistant professor of agricultural economics, will also assist by making economic analyses of range sheep operations on the project and also with other livestock operators.

The Southern Utah Livestock Association has appointed a research advisory committee to consult with Experiment Station staff members in guiding the program. In addition the program will be planned and conducted on a cooperative basis with the U. S. Grazing Service, the Intermountain Forest and Range Experiment Station and the Western Sheep Breeding Laboratory.

It is expected that the program will be of many years duration. The studies contemplated cannot be completed in a year or even in a few years. Consequently it is not anticipated that all the problems of range sheep management will be solved in a short time. It is hoped, however, that as the work progresses, much will be learned that will be of value to livestock operators and contribute to the permanency of the livestock industry and the economic



# THE PLACE OF PASTURES IN UTAH AGRICULTURE

By A. F. BRACKEN

**P**RODUCTION of pasture forage is one of the best and cheapest ways of growing feed for livestock. The harvesting is done without cost and the animals get the full nutritive benefit of the grass.

In Utah four somewhat different areas may be pastured. (1) The low wet lands with varying amounts of alkali which have no other economic use, unless drained. (2) Bench lands either above the ditch or lands too rough or too rocky to be cultivated. (3) Good high priced cultivated land may be advantageously used provided the animals pastured make a good return and the land is kept fertile enough to give it a relatively high carrying capacity. (4) Land located along the desert margins.

There are large areas of low wet lands in Utah. Almost every valley fringed by cultivated land has wet saline areas occurring in the center or in low places. The native plant growth of these lands is largely made up of salt grass with wire grass and broad leaf growing on the less salty areas. Salt grass is eaten by livestock but it is not highly palatable even when young, and becomes stiff and stemmy when old. Wire grass and the sedges make better feed but certain tame grasses will give a higher yield and are eaten more readily by livestock. The question that naturally arises is, What can be done to convert these lands into better pasture? Without plowing, white Dutch clover, timothy, redtop, and meadow fescue may be sowed in the somewhat less saline areas. In case the land is too salty for white Dutch clover, strawberry clover may be used, provided the soil surface is wet most of the pasture season. These low wet unplowable areas may also be sown with Reed canary grass. If the land can be plowed, however, much quicker and more certain stands of desirable grasses can be obtained by preparing a seedbed. The Utah Agricultural Experiment Station has a demonstration in the Warren section west of Ogden on an area highly impregnated with alkali. The land was plowed and otherwise cultivated to kill the dense stand of salt grass. Several grasses and grass mixtures were seeded. Many of the species failed to survive such extreme conditions, but a few

showed unexpected resistance to the salt. Meadow fescue, smooth brome-grass, Reed canary grass, strawberry clover and sweet clover made favorable growth with meadow fescue showing better results than any other grass. There are over 200,000 acres of this type of land in Utah which can be made into productive pasture.

The bench lands immediately adjacent to communities and farmsteads and rough or rocky areas below the canals are often covered with Russian-thistle, cheatgrass and numerous other weeds. Such plant cover partly protects the soil from erosion and may have some little forage value, but the land could be much better protected and have a marked increase in feed capacity by seeding to desirable tame grasses. The U. S. Forest Service has a grass nursery located above Ephraim on land so rocky that plowing is almost impossible. A number of grass species are being tested. Crested wheatgrass is seeded on the land not utilized for nursery work. This experimental pasture has a carrying capacity varying from ten to twenty times that of the land just over the fence. In addition to crested wheatgrass, rye or bulbous bluegrass might be seeded on such areas. In the Scipio section, rye is used to good advantage. Milk cows, calves, horses, or sheep might profitably be pastured for a month to six weeks in the spring period and a shorter period in fall on land of this type if it supports forage of good composition and high palatability.

The treatment of rocky areas under the ditch depends upon whether the land can be irrigated. If it cannot, the seeding of crested wheatgrass, smooth brome-grass or bulbous bluegrass is suggested. In case the land can be irrigated, smooth brome-grass, orchard grass, white Dutch clover, and sweet clover make good pasture.

Areas which are rough or of broken topography are best utilized as permanent pasture. The plants adapted to these lands depend upon moisture conditions. A mixture of forages made up of Reed canary grass, redtop, meadow fescue and white Dutch and alsike clovers are favored in case the land is wet. For drier area, smooth brome-grass, orchard grass, white Dutch and sweet

clover may be grown with advantage.

Using fertile and valuable cultivated land for pasture is not an uncommon practice. Land having a value of \$200 to \$300 per acre and, in some cases higher, is being pastured to dairy cows in Cache, Box Elder, Weber, Morgan, Salt Lake and Utah Counties, and equally fertile cultivated land, but somewhat lower in price because of location, is being used as pasture in several other counties. Many farmers, who grow grain, sugar beets, peas, and hay, contend that pasture when turned into butterfat will make as high cash return as any field crop. However, in order to make such a return the pasture must have a carrying capacity of two cows or more per acre and the butterfat production per cow must approach 300 pounds a year. On land which is already highly fertile, as a result of previous good cropping practice, and as a result of applying generous amounts of fertilizers, such carrying capacity may be reached the first or second year following seeding. However, if the land is somewhat "run down" it may take four or five years to build the soil up to a point where it will produce high herbage yields. This can be done by applying approximately ten tons of manure on alternate years. Phosphate may help to increase the growth and in case it gives a favorable response, 100 to 150 pounds per acre may be applied each year, preferably in early spring, or 200 pounds in alternate years.

In addition to building up and maintaining the fertility of cultivated land in pasture, other management practices are necessary for highest returns. Practical experience, as well as experimental evidence, shows that to get the best utilization of feed in a pasture the field should be divided into two or more parts. While one is being grazed by the animals the other may be irrigated and allowed to make a certain amount of growth before being used again. In case the grass on certain spots is not readily eaten it may become coarse and thus unpalatable to the animals. Weeds also may be present. Clipping occasionally remedies these conditions. These characteristic spots are often the result of droppings. Harrowing at intervals scatters these accumulations, giving a wider area the benefit of this fertility.

Irrigation as a management practice on fertile lands used for pasture needs careful attention. The amount of water necessary during the season will vary

*(Continued on page 13)*

# MIGRATION: A PROBLEM OF UTAH YOUTH

By JOSEPH A. GEDDES

*This article is based on census figures and on data collected in a study of Utah youth: education, employment, migration. This study was a cooperative undertaking with the U. S. Bureau of Agricultural Economics which was interrupted by the war. Although war conditions have changed employment opportunities, peace time conditions may bring back many of the population problems existent before the war. It was thought that this article might stimulate thought along this line, especially among post-war planning groups.*

THE population of Utah in April 1940 was 550,310. Among these people were 30,826 that had moved into the state during the 5 years preceding. The in-migration rate for this relatively stable pre-war period was 5.7 percent of the 1940 population. For a 10-year period this would mean 11.4 percent, or 1 in 9 of the total population, who were new to the state. The size of the task of absorbing new elements into the culture of the area is thus seen to be a relatively large one. The ability of an existing culture to absorb new superior elements, to reject the inferior, and to sustain the integrity of its own structure is thus an important problem in this state.

Ordinarily farm people do not migrate as much as nonfarm. It is more difficult to leave a farm than a trade, a profession or perhaps even a business. There was more migration in and out of Salt Lake City between 1935-40 (13.5 percent) than for the cities of 100,000 or more in the country as a whole (11.1 percent). But of the Utah rural nonfarm population only 13.1 percent migrated as against 16.5 percent for the United States. Migration among Utah rural farm people was 7.3 percent in contrast to 10.1 percent for the entire country. Utah rural farm people dislike to leave the state and appear to be willing to make real sacrifices to remain.

During the same period (1935-40) the out-migrants from Utah numbered 43,218, which gives an out-migration excess over in-migration of 12,392 or a rate, if maintained, of nearly 25,000 in 10 years. The actual excess of native born Utahns who left the state over in-migrants was 27,819 for the 10-year period, or a little more than the 1935-40 rate.

Another view of the migration process may be had by ascertaining the birth place of present residents of the country. According to the 1940 Census 606,712 people now living in the United States were born in Utah. Of these 433,478 were living in Utah and 173,239 or 28.5 percent were living in other states. Of a total of 515,029 people living in Utah in 1940, 81,557 or 15.8 percent were born in other states. Thus, in the give and take between states there was net loss for the state of 91,688. While there has been a loss during most of this century, it appears to be steadily increasing. Thus in 1930 the out-migration surplus was 63,869, in 1920 it was 20,833 and in 1910 it was only 1,259. Somewhere between 1900 and 1910 the state ceased to be a population debtor state and became a population creditor state.

Utah, once composed of many foreign born, is now a commonwealth of predominantly native born. In 1930 there were 45,989 foreign born whites in the state; in 1940 these had been reduced to 32,298.

## Range of Migration

A slight majority, numbering 36,377, out of a total of 66,661 of Utah youth, 15 years and older, for whom information was procured in the youth study, were still living at home, leaving 30,284 who had left the parental roof. Of the

migrants 14,879, or 49.1 percent, made their homes in the home county near relatives and friends, 6,526 or 21.6 percent settled in other parts of Utah, 2,245 or 7.4 percent moved to adjacent states, 6,634 or 21.9 percent moved to states farther away. Utah thus kept 70.7 percent of her youth. Three in ten of the young people sought greener pastures farther away from home.

## Where Utah Migrants Go

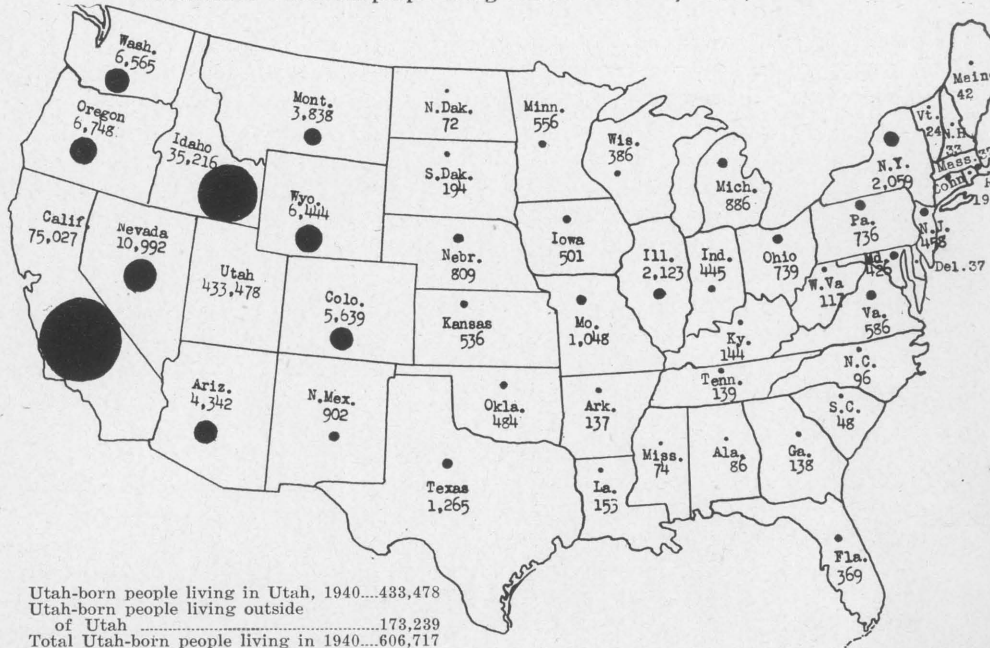
Interest naturally centers in the 29.3 percent of migrating youth who left the state. Where did they go? The 1940 Census gives this information for the 173,239 native born Utahns who now live in other states. California with 75,027 and Idaho with 35,216 received the greatest numbers. Nevada with 10,992, Oregon with 6,748, Washington with 6,565, Wyoming with 6,444, Colorado with 5,639, Arizona with 4,342, Montana with 3,838, Illinois with 2,123, and New York with 2,059 absorb most of the remainder. These along with California and Idaho take about 91.0 percent of the Utah-born migrants. However, only 6 states—Vermont, Iowa, South Dakota, Oklahoma, Idaho and Arizona—did not increase their Utah-born residents between 1930-40. To all other states, natives of Utah went in increasing numbers to live.

## Small Villages are Most Active Sources

The tendency to migrate operates generally in Utah in reverse ratio to size of village, that is the smaller the town

(Continued on page 17)

Residence of Utah-born people living outside of Utah by states, 1940



# AGRICULTURE IN

at 70 cents per pound, there is a gross return of approximately \$4 for each \$1 spent for fertilizer.

A chemical analysis of the forage harvested from the fertilized and the unfertilized areas showed that the forage from the fertilized plots had a phosphorus content of 0.33 percent compared to 0.24 percent for that from unfertilized areas, and a protein content of 17.3 and 15.9 percent, respectively, for the forage from fertilized and unfertilized plots.

Taking into account both the increase in the amount and the increase in the quality of the forage produced, there was 167 percent more phosphorus and 113 percent more protein produced per acre from fertilized than from unfertilized plots.

In a study of the factors involved in the cost of producing nutrients for dairy cows, it was found that it required 13.4 hours to produce an acre of pasture, compared to 27.4 for alfalfa, 88 for corn silage, and 27.3 for barley. The horse hours required were 7.9 for pasture, 23.6 for alfalfa, 71.5 for corn silage, and 31.2 for barley. The total machine hours required per acre were 5.3 for pasture, 12.0 for alfalfa, 37.3 for corn silage, and 14.5 for barley.

The saving in the number of man, horse, and machine hours required to produce an acre of pasture compared to other forage crops in this area, and the increase in production resulting from the proper management of pastures, is significant at this time.

## Fertilizers Increase Yields of Fruit Trees

The application of ammonium sulfate alone and in combination with treble superphosphate has increased yields on experimental peach trees from 170 to 201 bushels per acre. Trees not fertilized produced an average of 308 bushels per acre compared with 478 bushels per acre for trees treated with three pounds of ammonium sulfate each of the four years, and 509 bushels per acre from trees fertilized with three pounds each of ammonium sulfate and treble superphosphate. If all peach trees in the state produced a similar increase in yield as a result of nitrogen-phosphorus fertilization the average annual harvest would jump from 510,000 bushels to

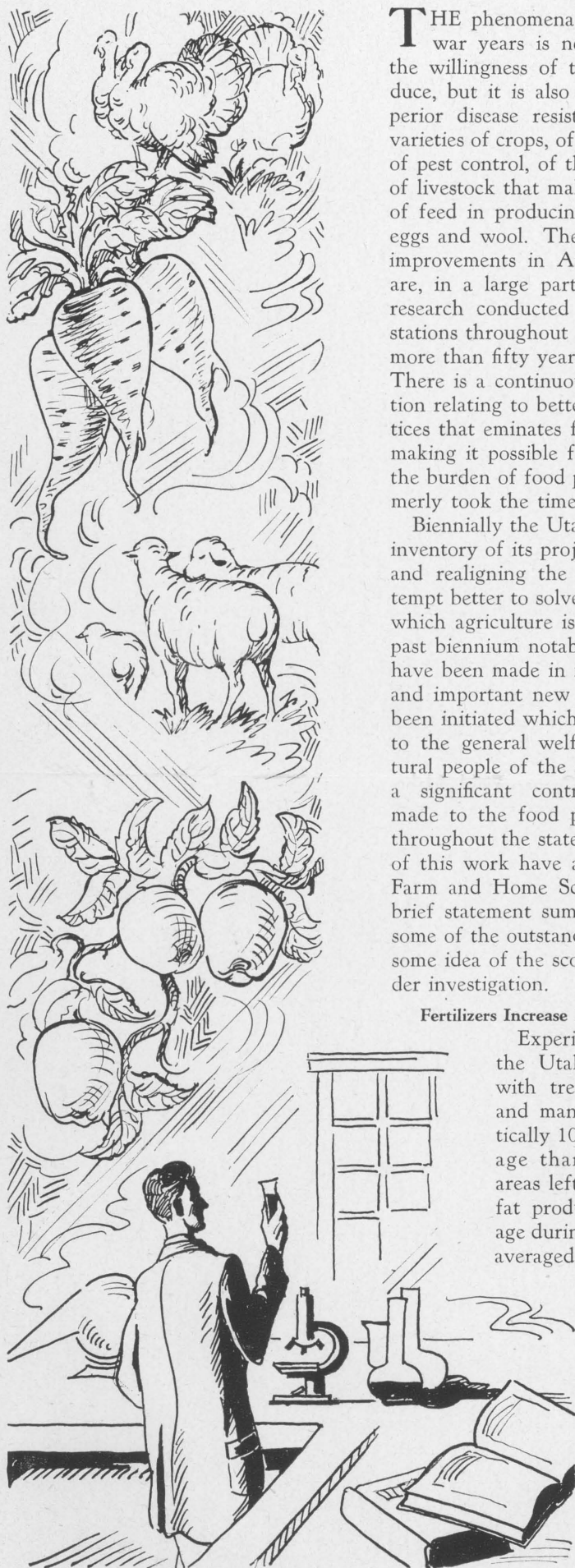
THE phenomenal production of the war years is not only a result of the willingness of the farmers to produce, but it is also a result of the superior disease resistant, high yielding varieties of crops, of the newer methods of pest control, of the improved breeds of livestock that make better utilization of feed in producing more meat, milk, eggs and wool. These and many other improvements in American agriculture are, in a large part, the result of the research conducted in the experiment stations throughout the nation over the more than fifty years of their existence. There is a continuous flow of information relating to better agricultural practices that emanates from them which is making it possible for a few to assume the burden of food production that formerly took the time of the majority.

Biennially the Utah Station makes an inventory of its project work, analyzing and realigning the program in an attempt better to solve the problems with which agriculture is faced. During the past biennium notable accomplishments have been made in many investigations and important new developments have been initiated which will in time reflect to the general welfare of the agricultural people of the state. Furthermore, a significant contribution has been made to the food production program throughout the state. Reports on much of this work have already appeared in *Farm and Home Science*. However, a brief statement summarizing results on some of the outstanding work may give some idea of the scope of problems under investigation.

## Fertilizers Increase Pasture Production

Experimental pastures at the Utah Station fertilized with treble superphosphate and manure produced practically 100 percent more forage than did unfertilized areas left as checks. Butterfat produced from the forage during a two-year period averaged approximately 200 pounds per acre compared with 103 pounds from the unfertilized areas.

If the cost of phosphate is placed at \$3 per hundred pounds, \$2 per ton for manure, and butterfat is valued



# EXPERIMENTATION TIME

816,000 bushels. This represents a 60 percent increase in total production.

### Fertilizers Increase Yields of Sugar Beets and Alfalfa

In fertilizer tests over a twelve-year period yields of sugar beets were increased an average of 42 percent by the addition of treble superphosphate, 72 percent by the addition of manure, and 83 percent by the addition of both manure and treble superphosphate. In other tests treble superphosphate increased alfalfa yields 2.69 tons over the check plots where the average yield was 2.76 tons per acre.

### Fertilizers Increase Phosphorus Content of Plants

Results of fertilizer tests over a fourteen-year period show an increased phosphorus content in crops grown where phosphorus fertilizers or barnyard manure were used. Crops showing increased phosphorus content were potatoes, beets, barley, wheat and alfalfa. The increase was greatest in alfalfa and least in barley.

### Vegetable Seed Production Adapted to Utah Conditions

In order to help meet the increased needs of vegetable seed during the war, the Utah Station has conducted trials in seven regions of the state. Results from these studies show that Utah is well adapted to the production of onion, carrot and turnip seed. The onion seed-to-seed studies have shown that the seed-to-seed method of production is much lower in cost than the regular method of replanting roots. Turnip seed production studies showed the best results were obtained where the seed was drilled August 5 to 10. Earlier sowing resulted in high loss from winter killing. Table beet seed production has not proved successful because the areas suitable for such seed are already producing sugar beet seed.

The experimental work along with trials by private companies has resulted in considerable acreage being planted to onion, carrot, turnip, radish and lettuce seed.

### Canal Lining Conserves Water

In eight experimental canals seepage losses during the season of 1940 ranged from 2.1 to 8.6 percent per mile. Two of these canal sections have since been lined with a layer of clay four inches

or more thick after being compacted, covered with a thin layer of gravel. Water losses from the canals since lining are negligible. A 4000-foot length of canal lining, having a surface area of 128,000 square feet, during the first season saved 4.2 cubic feet per second or 1500 acre-feet of water in a 6-month season, having a value of more than \$2000 or two-fifths of the cost of lining.

Water losses by seepage have been found to range as high as 60 percent, and it is estimated that the average water loss from all canals is approximately 25 percent. This is sufficient water to cover the irrigated lands of the state to a depth of 17 feet. The cost of water saved by canal lining has been found to be less than the cost of storage water in some recently constructed reservoirs.

### Utah Snowmobile

The Utah snowmobile is meeting an urgent need for power driven transportation over snow fields and is attracting considerable attention throughout the nation. Early in its development the Quartermaster Corps of the United States Army requested information pertaining to it. Later, more detailed information was supplied to the commanding officer of Gowan Field, Idaho, who was interested in the development of such a machine for aviation rescue work. More recently requests for information have been received from the Southern California Edison Company of Los Angeles, the National Park Service, Region 4 of San Francisco, and still more recently from the Headquarters Army Air Forces, New York. General specifications and photographs have been supplied in answer to each of these requests.

The Utah snowmobile utilizes a split track principle to insure the elimination of clogging from wet snow, and a guiding runner projecting in front of the machine for steering.

The machine was developed in the shops of the Utah Agricultural Experiment Station from automotive parts. After three years of vigorous trials, it has proved



successful under all conditions of snow and on grades up to 20 percent; and on cross slopes of as much as 30 percent. It works best, however, on mountain roads or trails that are sufficiently wide to accommodate the vehicle. It has a total width of 7 feet.

#### **Vitamin Studies**

In studies of the effect of processing and storage on the vitamin content of vegetables it was found that maturity as indicated by date of harvest did not affect carotene value in peas, but the ascorbic acid values decreased after the third day. Greater variations owing to varietal differences were noted in the carotene content of corn than in the ascorbic acid values. Canning of lima beans resulted in 60 percent loss of ascorbic acid. Approximately one-half of this loss is the result of blanching. The greatest loss of ascorbic acid in the frozen product is also the result of blanching. A small amount of soda used in the cooking liquid did not increase the destruction of ascorbic acid.

#### **Vitamin C Studies on Tomatoes**

Vitamin C studies with tomatoes indicate that tomatoes picked green and allowed to ripen in storage do not lose an appreciable amount of their ascorbic acid for upwards of two weeks. Additions of commercial fertilizers to the soil had little effect on the ascorbic acid content of tomatoes. Tomatoes canned in a hot-water bath may be considered a good source of vitamin C even after sixteen months' storage.

#### **Weed Control Studies**

In studies on weed control, no crops were found which would smother our whitetop or morning glory, but a good pasture mixture would prevent an increase in weed root population. Data confirm the practice of cultivating morning-glory and whitetop 15 days after emergence for most economical and successful eradication.

#### **Chlorosis Studies**

Studies on chlorosis or yellowing of plants show that iron is more easily reduced in samples of soils producing green plants than in soils producing chlorotic plants. Green plant tissues contain more ferrous iron than chlorotic plants, and sap from green plants has greater capacity to reduce ferric iron in vitro than sap from chlorotic plants. Results with both soils and plants point to the significance of oxidation-reduc-

tion potentials in controlling chlorosis. A better understanding of the physiological effects of iron in the plant and of its chemical action in the soil will undoubtedly lead to the development of methods of soil and plant culture which will prevent the abnormal yellowing of plants which decreases their yield materially.

#### **Western "X" Disease Also Affects Cherries**

Studies have shown that the western "X" disease found extensively in the peach orchards of the West also affects both sweet and sour cherries. Inspection and certification of nursery stock and bud work sources to prevent the spread of this disease are being advocated throughout the western states.

#### **Control of Leafhopper Damage to Tomatoes**

Double-hill planting and use of cheesecloth covers will permit profitable tomato production even in seasons of severe beet leafhopper abundance. Spring and fall surveys of beet leafhopper abundance and host plant conditions give the farmer advance information that allows him to increase plantings during years of anticipated leafhopper scarcity and to use double-hill planting or gauze covers when severe injury is anticipated.

#### **Time of Application of Bait Important in Tomato Fruitworm Control**

In studies on the control of the tomato fruitworm it was found that one properly timed application of commercial undiluted calcium arsenate gave control equal to two or three applications less timely. Field surveys of tomato fruitworm eggs may make it possible to determine whether or not tomato fields should be dusted, and aid in the proper timing of applications.

#### **Adequate Phosphorus in Rations of Dairy Cows Prevents Parturient Hemoglobinemia**

In a study of the causes of parturient hemoglobinemia in dairy cows, researchers were able to induce a case of the disease by feeding a phosphorus-deficient ration. Bone meal administered in drenches quickly restored the blood phosphorus level to normal. This, together with other experimental evidence, makes it appear fairly certain that the disease is in some way linked with low phosphorus intake. Thus by providing adequate amounts of this element in the ration the disease may be prevented.

#### **Nurse Crops Not Advisable in Range Seeding**

In range seeding studies it was found that nurse crops such as rye permanently reduce the grass yield. Where moisture is limited, it has been found better to plant the grass without a nurse crop.

#### **Weather Should Determine Time to Market Range Beef Cattle**

In studies to determine the best time to market range cattle, it was found that animal gains in the late season varied greatly from year to year, and while in some years, especially years of low rainfall, it was advantageous to market cattle in August, in others October marketing gave the greatest profit. Small beef steers were found to make more efficient use of summer range than large beef steers, or dairybred heifers or steers.

#### **Turkey Feeding Studies**

Turkey feeding studies have had two far-reaching results for the growers of Utah: (1) that a low protein content (19 percent) ration is just as effective in producing well-fleshed birds as a ration with higher protein content, and can be fed at much lower cost; (2) alfalfa can be used to advantage in the economical feeding of turkeys from seven weeks of age until ready for market. Alfalfa meal of excellent quality is usually available in Utah at a price about half that of most grains. Turkey growers, therefore, are interested in the maximum amount of this feed that can be used as a part of the mash and still produce well-fleshed and well-finished birds. Experimental turkeys were fed mashes containing as much as 25 percent alfalfa meal and showed as good or better finish than those fed only 5 to 10 percent.

#### **Study of Cost of Producing Turkeys**

A study of the cost of producing turkeys in Utah showed that the higher profits were obtained by growers who purchased day-old poults and carried them to market rather than those who purchased started poults. The most important factors influencing costs and profits were size of operation, mortality, source of feed, and most important of all, the cost of feeds fed to turkeys.

#### **Sampling Should Be Used in Determining Price of Wool Clip**

Wool shrinkage studies point out the need for sampling the clips of each grower in order to determine a fair market price for wool.

A typical example of the value of this practice is shown in the case of Archie M. Mellor of Manti, who was offered a price for his 1944 wool clip based on an estimated shrinkage of 65 percent. A sample test of his clip scoured in the Station Laboratory showed a shrinkage of 59 percent. With this information at hand, Mr. Mellor was able to arrange a more favorable price and thereby made an extra return of \$1,000 on his wool clip.

These studies also give convincing evidence to show that breeding stock should be selected for length of staple as well as weight of fleeces.

#### **Additional Agricultural Credit Needed**

A study of farm mortgages shows a need for additional agricultural credit as a result of the recent changes in the state to a more commercial type of agriculture. The study also shows that there is a shift by farmers for their long-time funds from old line mortgage companies and insurance firms to government-created finance agencies. There is also a trend toward an increase in the number of acres mortgaged and in the amount of mortgage debt.

#### **Land Planning Program**

Through a study of land utilization, types of farming and agricultural adjustments, the Utah Station hopes to make possible the development of a program for proper use of the lands and to assist Utah farmers to fit better into a desirable national agricultural program. It is expected that the information pertaining to the proper use of land and the development of sound farm management principles obtained from the analysis of farm operations will assist the local people in planning and directing programs for their economic and social well being. The analysis of farm management survey records should reveal types of farming which are best adapted to the area and the fundamental relationships that exist between efficiency in operation and proper organization to financial success of the farms.

#### **Service Projects**

The Station maintains a number of projects whose purpose is not primarily research, but to perform a service to the farmers of the state. Facilities and resources at its command make the Station better able than other existing agencies to do these types of service. Two of these projects are mentioned here.

The Station maintains veterinary laboratories at Logan and Provo to serve farmers and stockmen of the state in the diagnosis and investigation of livestock and poultry diseases. The Logan Laboratory was opened in 1930 and since that time 699,638 specimens from livestock and poultry have been examined. It is estimated that this service reached over 90 percent of all farmers in the state. This includes blood testing for Bang's disease and pullorum disease. The Provo Laboratory was opened in February 1944 to serve more adequately the central part of the state. It is planned to open another laboratory at Cedar City as soon as personnel and laboratory equipment can be procured.

As another service to the farmers, the Station is producing foundation seed stock of cereals, alfalfa, and other forage crops, potatoes and vegetable seed for distribution through the Utah Crop Improvement Association to growers of certified seed.

### **PLACE OF PASTURES**

*(Continued from page 8)*

from none for the low wet pasture lands to approximately three acre feet on the porous bench soils. Each field presents a problem which can be solved only by observation and experience. Since the pasture season extends over a period from near May 1 to the last of September, water should be applied so as to favor continual growth over this period. Weekly intervals under some conditions are necessary, on other areas ten days between irrigations may be best, while on certain soil types the interval may be extended to two or three weeks.

Grass mixtures adapted to productive cultivated land depend largely on moisture supplies, and, to some extent, on location. For fertile well-drained irrigated land, smooth brome grass, orchard grass, meadow fescue, perennial ryegrass, Kentucky bluegrass, white Dutch clover and alsike clover are suggested. If the land is damp and fertile, redtop, meadow fescue, perennial ryegrass, white Dutch clover, and Kentucky bluegrass make a good mixture. On bench lands with irrigation available, smooth brome grass, orchard grass, Kentucky bluegrass, white Dutch clover, alsike clover, sweet clover and alfalfa have given best results. The reason for planting mixtures rather than single species is that the available root feeding zone is better utilized, a greater variety of forages stimulates greater consumption by

the livestock, a more complete seasonal use of the pasture is possible because of differences in the growth habits of the various forage species, more economical use is made of the water, and a better nutritional balance for the animals is possible.

In making plans for planting a pasture, it is good husbandry to set up a definite rotation of all crops grown on the farm. The combination of grasses and legumes used in a pasture mixture enriches the soil in organic matter and nitrogen. The evidence indicates that the building up of these reserves reaches a maximum equilibrium level in approximately seven to eight years. By plowing a pasture up at the end of a somewhat definite interval the yield of succeeding crops is usually significantly increased. A pasture may be seeded following peas, beets, potatoes or even grains; and the crops which immediately follow a pasture best include corn, potatoes, and, in some cases, small cereals.

The fourth area used as pasture is the spring-fall range which, located along the desert margins, is utilized by both cattle and sheep, but mainly sheep.

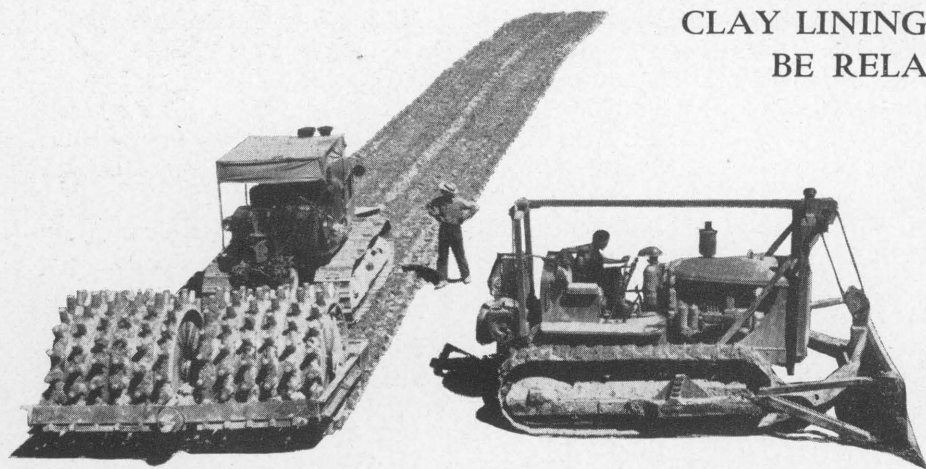
This land has been misused and overgrazed until the carrying capacity has been seriously impaired. The ewe, carrying or supporting a lamb, and shorn of her wool, is driven to these ranges to find less feed, in many cases, than is available at any other season of the year. The comparatively low calf crop, low lambing percentage, low lamb weights, and loss of breeding stock is caused by lack of feed in these spring and fall pastures. There is plenty of evidence, however, that this problem can be solved.

It is estimated that we have in Utah an area of at least 1,000,000 and perhaps 2,000,000 acres of this type of range which is adapted to plowing and seeding. This would be sufficient, if properly managed, to supply the needs of all range livestock for the spring grazing period of six weeks and would add more than \$1,000,000 to the livestock income and stabilize the industry by largely eliminating one of the most serious hazards encountered by livestock growers.

Before seeding this land the brush should be killed with a large one-way disk plow. If rye is seeded it may be broadcast immediately in front of the plow; if crested wheatgrass is used it

*(Continued on page 15)*

## CLAY LINING OF CANALS PROVING TO BE RELATIVELY PERMANENT



Heavy sheep's-foot rollers like this one can be used to advantage by Utah irrigation companies to compact the soil in the beds and banks of their canals and thus reduce seepage losses, save water, protect canal banks, and irrigated lands. (Photo by U. S. Bureau of Reclamation)

### EDITOR'S NOTE

July 1944 measurements of seepage losses on canal sections in the Delta Area that were lined with clay in April and May 1941 show that the bed of the canal was no more permeable after 3½ years of use than immediately after lining. In other words, clay lining of an experimental section of the canal in the Delta Area has eliminated seepage losses through the bottom of the canal.

Because of the high water losses sustained through seepage from Utah canals, irrigation specialists at the Station for some years have been attempting to find accessible, low cost materials and methods suitable for reducing those losses. In 1941 an experimental section of canal in the Delta Area was lined with clay covered with a layer of gravel in an attempt to discover the feasibility of this material. Although tests showed that lining the canal practically elim-

inated seepage, the permanency of this type of lining was not known. However, tests made in April and again in July of this year show that there has been no measurable increase in seepage losses.

UTAH has 9,000 miles of irrigation canals and ditches, of which less than 3 percent are lined. The 8,740 miles of unlined earth canals and ditches sustain seepage losses which in some cases are excessive and wasteful. Seepage losses not only waste water and decrease the productivity of soils by causing waterlogging and alkali accumulation—they also cause settlement of canal banks, breaks in canals, and earth slides with great damages to canals and losses to irrigators.

### Soil Permeabilities

The permeability of earth materials—that is, gravels, sands, loams, and

Recent Measurements Show That No More Water Is Being Lost Through the Bed of a Clay-Lined Canal by Seepage After 3½ Years Than Immediately After Lining

By O. W. ISRAELSEN

clays, herein called "soils"—varies between wide limits. It is not unusual to find coarse sands in which the permeability is 10,000 times that of compact clay. The Irrigation Department of the Experiment Station has found a range in permeabilities of 100,000 to 1 in Box Elder, Cache and Millard County studies.

Soil texture and structure (or compaction) are the two major soil properties that influence permeability to water. Irrigation companies can change the texture, or size of soil particles, and thus decrease permeabilities and seepage losses in the beds and on the sides of irrigation canals, by adding materials such as clays or bentonite. They can increase the compactness of the larger canal beds and banks by the use of heavy equipment such as tractors and sheep's-foot rollers frequently at much less cost than adding clays.

### Measuring Canal Seepage Losses

In long canal sections—one mile or more—where seepage losses are excessive, they can be measured with a fair degree of accuracy with current meters. For short sections of canals or for canals lined with clay or bentonite, current

This canal bank is badly cracked as a result of seepage from the canal. The bank may fail at any time (Photo by C. W. Lauritzen)



Washing and sliding of this side hill into the canal because of excessive seepage from above, and the high water table has cost the irrigators large sums for repairs and also endangered their crops (Photo by C. W. Lauritzen)



meter measurements are not accurate enough to be of value, and it is necessary to measure the permeabilities of the canal bed to form reliable estimates of seepage losses. Recent measurements in Millard County by use of the Salinity Laboratory seepage meter, the constant-head permeameter, and the variable-head permeameter are described in Station Bulletin 313 on Canal Lining Experiments in the Delta Area, Utah.

#### Seepage Measurements in a Lined Canal

Part of the Delta-Melville Companies' C-Canal in Millard County was lined with clay in March and April 1941. After the lining was completed and before water was turned into the canal, the average permeability of the clay, as measured with a variable-head permeameter at 5 points in the bed of the canal, was 0.12 foot per year. The average permeability of the natural sandy soil of the canal bed before lining was 1200 feet per year, which is 10,000 times that of the clay lining. In April 1944 the permeability of the canal bed clay lining, as measured with a 12-inch diameter 14-inch length variable-head permeameter, was 0.38 foot per year.

This permeameter was used again on July 25, 1944 for five tests when the water in the canal bed was only 3 inches deep. The average of permeability, as found in these tests, was 0.36 foot per year. The average of four tests, July 25, 1944, with a 12-inch-diameter meter 30 inches long was 0.12 feet per year, the same as it was as measured just after lining in April and May 1941, with a 15-inch-diameter meter 30 inches long. Temperature changes seem to influence results with the smaller meter more than with the larger one.

Excessive growth of moss in the canal has decreased the velocity of water flow and increased the depth. In some places

#### PLACE OF PASTURES

*(Continued from page 13)*

may be sown directly behind the plow. However, both may be drilled. Rye should be seeded at the rate of 30 to 45 pounds to an acre, crested wheatgrass at 5 to 7 pounds. Plowing and seeding in September and October have given good results. Rye may be pastured the spring following seeding but crested wheatgrass should not be grazed until the latter part of the second year. Crested wheatgrass is favored over rye because of its being a long lived perennial. It is extremely hardy, very palat-

seepage has occurred through the sandy banks of the canal above the clay lining, caused by excessive water depth resulting from moss growth. Some landowners and irrigators, observing evidences of seepage in the vicinity of the lined canal, have erroneously thought that the seepage is through the clay and that the clay lining has no value. These conclusions are not supported by the facts as determined by careful measurement.

The design depth of the clay-lined canal is little more than 4 feet. Recent inspection, by cutting trenches from the bed of the canal to the top along the bank, showed that the clay lining that had been covered with gravel was in good condition, with minor exceptions. Special effort to control moss, and thereby avoid excessive water depths, is essential to full realization of the value of the clay lining.

#### Conclusions

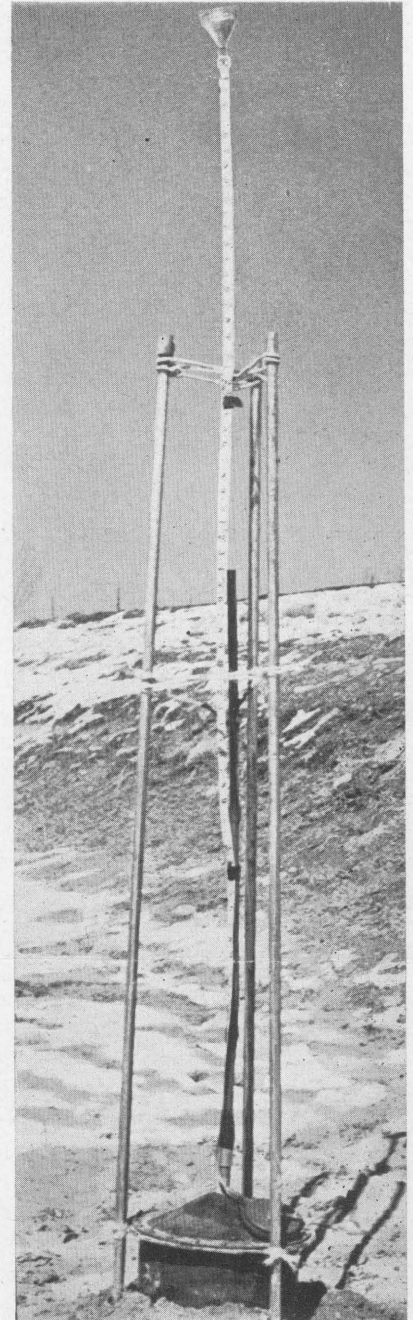
Measurements of seepage losses made thus far in the lined canal near Delta lead to two conclusions:

1. That there has been no measurable change in the permeability of the clay lining in the canal bed in 3½ years, and
2. That the permeability of the clay lining in the bed of the canal, 0.12 foot per year, is so low that seepage losses through this clay are negligible and of no significance.

The first conclusion is evident from the measurements presented. The second will be evident from the fact that a permeability of 0.12 foot per year or 0.06 foot during the six months irrigation season, would permit a loss through the 2 acres average surface of clay lining in contact with canal water, of only 0.12 acre-foot of water from the 4,000 feet of lined canal. This volume of water has a value of only 24 cents.

able in early stages of growth, and it gives adequate soil protection. However, rye has the advantage of providing more immediate pasturage.

With this review of the place pastures occupy in Utah's agriculture, it is evident that feed, which is our most vital concern, can be increased greatly by utilizing land adapted to this use. All four of the areas discussed constitute a great potential reservoir of feed which if further developed and properly managed can be converted into land of significant economic value in producing lambs, wool, beef, hogs, and milk.

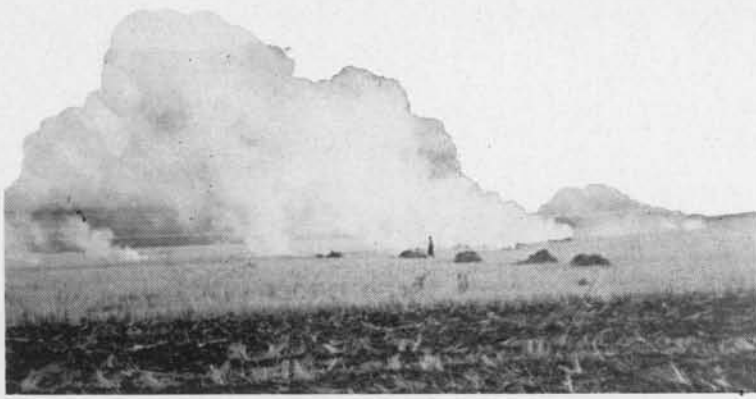


This variable-head permeameter is designed for clays through which water flows very slowly. The irrigation canal bed surface area inside this 12-inch permeameter is 800 times the area of the water surface in the glass tube above. A flow of 1/800 surface inch of water through the soil would therefore cause a lowering of one inch in the glass tube (Photo by Frank Beckwith)

Dr. D. E. Madsen, head of the Department of Veterinary Science, resigned July 1 to go into private practice at San Jose, California.

Dr. Madsen has been connected with the Station since 1929. His main research contributions have been in turkey diseases and diseases of dairy cattle. While here he wrote a number of bulletins and circulars as well as scientific articles which have appeared in technical journals.





Burning straw or other crop residues increases the rate of soil depletion

## ARE UTAH FARMERS DEPLETING THEIR SOILS?

Plant Nutrients Removed in Crops Must Be Returned in Plant Residues or Commercial Fertilizers if Soil Fertility is Maintained

By D. W. THORNE

LESS than 100 years ago Mormon pioneers began the settlement of the fertile lands of Utah and adjacent territory. They chose land for farming primarily on the basis of topography, availability of water for irrigation, and the nature of the vegetation. Land producing sagebrush or grass with a moderately uniform grade suitable for irrigation was considered desirable. Although the agricultural implements employed for tilling the land and the seed planted were inferior to those now used by even the poorer farmers, the yields obtained were generally good. Even with all of the recent improvements in farming it is doubtful whether the average yields of most crops in Utah are any higher than those obtained by the early settlers.

Several reasons have been advanced for the failure of present farmers to produce higher average yields of crops than the pioneers. Insects and diseases which thrive on extensively cultivated crops have increased in most areas. Some farmers are working naturally poor land that the early settlers avoided. But in addition to these factors many believe there has been a general decrease in the productive capacity of Utah soils as a result of unbalanced farming programs.

So many factors are involved in a balanced soil management program that it is not possible to obtain and express any accurate picture of the soils over a wide area such as Utah. In some areas erosion is carrying away more soil fertility than is being removed by crops.

On many farms excessive irrigation is leaching nutrients below the rooting zone of most plants. Increased aeration as a result of cultivation results in rapid organic matter decomposition and an accompanying loss in nitrogen. While losses resulting from the above factors are difficult to evaluate and highly variable from farm to farm, they are, in general, related to the care with which each farmer plans and conducts his soil management program.

### Student Soil Balance Records

During the past three years members of the class in Soil Management at the Utah State Agricultural College have analyzed the balance of nutrients in the soils of their farms as related to cropping and fertilizer practices. In each analysis of a farm the student took farm records or estimates for the previous five years. The acreage and yield of each crop were listed for the period. The quantity of each of the three fertilizer elements: nitrogen, phosphoric acid, and potash, in the crops was calculated on the basis of plant analysis records for each crop as compiled by L. L. Van Slyke in "Fertilizers and Crops." The soil of each farm was thus debited with the quantities of plant nutrients removed in harvested crops. An exception to this method of calculation was that nitrogen in harvested crops of alfalfa and clover was all assumed to have come from the air. In many cases it has been shown that alfalfa adds nitrogen to the soil in addition to that removed in hay crops, but

since such additions are variable they were not considered in this report. Nutrients present in farm manure, crop residues and commercial fertilizer added to soil were credited to the soil's balance.

Farms included in these student records represent every part of Utah and southern Idaho. There were also reports on farms from several surrounding states, including Wyoming, Arizona, Nevada, and California, but these are not included in the present report. As a basis for summarizing the reports the farms were classified as general irrigated farms, livestock farms, and dry farms. Farms classified as livestock were those in which most of the crops produced were fed on the farm. Grouped together in the livestock group were several types of enterprises, such as cattle feeding, dairying, combinations with poultry, hogs, and sheep, and even one farm devoted principally to horse raising.

In the case of dry farms, a number of different combinations were involved so the soil program was based on the most general practice of alternate wheat and fallow. An average yield of 25 bushels of wheat and one ton of straw per acre was assumed.

### Soil Nutrient Balance on Livestock and General Farms

A study of the table furnishes a partial answer to the initial question of whether Utah farmers are depleting their soils. They are removing essential plant nutrients from the soil in much greater quantities than are being returned. Farmers on the general irrigated farms are depleting their soils more rapidly than farmers on livestock farms. There are several reasons for this difference. The general irrigation farmer has a greater proportion of his land in cultivated crops (30 percent), such as sugar beets and potatoes, than the livestock farmer (16 percent) and consequently the general farmer sells a greater proportion of his produce from the farm.

In the case of hay and grain crops, the livestock farmer feeds practically all produced right on the farm and hauls the manure back to the soil. In addition, he frequently buys hay and grain which add to his soil balance. On the other hand, the general farmer sells most of his grain from the farm and in some cases even the hay. These products leaving the farm carry with them nutrients from the soil. Alfalfa, being

a legume, takes most of its nitrogen from the air, so when it is fed and manure returned to soil the soil nitrogen content is increased. Since livestock farmers produce relatively more alfalfa than general farmers (62 percent of acreage compared with 52 percent) a greater net balance of nitrogen might be expected in their soils.

The amount of farm manure returned per acre per year is another index of the effort made to maintain a favorable soil nutrient balance. According to the student records, livestock men added an average of 4.2 tons of manure per acre per year while general farmers add 3.3 tons. Since an average ton of farm manure contains 10 pounds of nitrogen, 5 pounds of phosphoric acid, and 10 pounds of potash, it is seen that an average increase of one ton of manure on each acre of land in the general farms would have resulted in a favorable balance of soil nitrogen. Two additional tons of manure per acre would have balanced the phosphate losses. However, since manure is low in phosphorus it is generally advisable to use commercial phosphate fertilizers to balance the soil nutrients instead of additional amounts of manure.

The large annual deficits in potash may indicate that Utah farmers should use potash fertilizer on their soils, but soil tests show that it will be some time before it will be profitable to add potash fertilizers to most soils in this area.

#### Soil Nutrient Balance on Dry Farms

In the case of dry farms, a steady depletion of the soil is evident. A study of nitrogen in dry farm soils by Professor A. F. Bracken indicates that these soils are losing nitrogen even faster than can be accounted for by that being removed in crops. If the straw is harvested, the rate of depletion is accelerated. If the straw is burned, the phosphate and potash remain in the ash but the nitrogen goes into the air as a gas.

While the data point to the advantage of a livestock system of farming for the maintenance of soil fertility, it might be pointed out that all farms cannot operate profitably as livestock enterprises. Can anything be done on these farms to maintain productivity? In a good soil management program sufficient legumes should be grown to give a favorable balance of nitrogen. Other nutrients should also be conserved by saving crop residues and taking care of all farm manure.

As long as any products are sold from the farm and others are not brought in

Average net annual gain or loss in fertilizer elements in Utah farm soils

Type of farm	Land in alfalfa percent	Land in cultivated crops percent	Net nutrient balance per acre per year		
			Nitrogen pounds	Phosphoric acid pounds	Potash pounds
General irrigated	52	30	-7.4	-10.5	-59.2
Livestock	62	16	28.5	-3.1	-31.8
Dry farm (per crop year)					
Grain (25 bushel)	—	—	-30	-12.8	-7.5
Straw (1 ton)	—	—	-10	-3.0	-12.0

to replace them, there will be a deficit of phosphorus and potash. Over a period of time these elements must be replenished by the addition of commercial fertilizers. But the use of such fertilizers is not recommended until the soil reserves are depleted to the point where plants are unable to obtain adequate quantities of each element from the soil.

#### Suggestions for a Balanced Soil Management Program

For irrigated farms a favorable soil balance can be promoted by (1) growing alfalfa or clovers on the land at least one-half of the time; (2) where hay is not needed, growing green manure crops such as clover and plowing them under; (3) returning all crop residues to the soil, not burning them; (4) conserving all farm manure and returning it to the land; (5) farming carefully to avoid soil erosion and leaching from excess irrigation; (6) adding commercial fertilizers where and when needed.

It is more difficult to balance soil nutrients on dry farms than on irrigated farms. In many areas alfalfa can be worked into a long-time rotation program. Where this is feasible the nitrogen of the soil can be maintained. Where available moisture makes legume crops impracticable, it may be necessary eventually to turn to the use of commercial nitrogen fertilizers. Recent tests on some dry farms in Utah indicate that nitrogen may now be limiting grain yields on some farms. Phosphate fertilizers may also become necessary for dry-land grain but experimental tests have not indicated a need on the farms studied. The soil potash reserves appear ample to supply the needs of dry-farm grain for some time in the future. Erosion control, leaving straw on the land, and careful tillage practices will help maintain soil fertility on dry farms and will delay the time when commercial fertilizers are essential for profitable crop yields.

## VEGETABLE SEED

(Continued from page 3)

many roots were winter-killed in Sevier for successful production of the crop in that area.

Turnip seed trials were successful in Davis County. Other areas where this seed should be equally successful are Cache, Box Elder, Weber, Salt Lake, and Utah Counties.

It is hoped that the production of vegetable seed can be increased because it will be a valuable industry to the people of Utah. It will provide additional cash crops for farmers and should help in absorbing the additional labor available after the war.

Farmers interested in growing seed should contact one of the larger companies contracting seed in this area. Seed companies buy only seed for which they have contracted. These companies furnish information on methods, and have field men who check over the acreage from time to time during the season.

## MIGRATION

(Continued from page 9)

the larger is the proportion of youth who leave it (table 1).

Logan and Provo are exceptions to the downward trend of youth out-migration as size of community increases. This is understandable at Logan where business is less brisk than in many places of comparable size so that young people seek jobs elsewhere. At Provo the percentage who left is lower than at Logan but higher than at Ogden and Salt Lake City.

#### Age at Time of Leaving Home

The age for leaving home begins to be important at 16, at which time 4.0 percent of all migrant youths are on their way (table 2). Gradually the number increases up to 20 years when 3,715 or 12.3 percent leave. This is the year of greatest exodus, but the decline is also gradual for 11.1 percent go in the 21st year and 8.8 percent in the 22nd. By the 25th year the percentage

drops to 3.6 percent, which is smaller than the 16th year. Only 6.7 percent leave at 26 or over. Most of the migration takes place among youth between 16 and 25 years of age.

#### Large Size of Utah Families

Among the 66,657 Utah youth who gave information concerning the number of children in the families from which they came, relatively large size families predominate. Approximately 6 out of 10 (59.1 percent) came from families having 6 or more living children. Children, including step and half brothers and sisters, ranged from 1 to 17 in a family. Seven age groups above six included more than 1,000 children in each.

The large size of rural Utah families and the small average size and low valuation of farms and buildings (table 3) have a definite relation to migration. Farms operated by full owners in Utah have an average value less than any Mountain or Pacific state except Washington, and the valuation is less than any of these states for part owners.

Obviously Utah youth cannot find a satisfactory answer to the problem of making a living through a further subdivision of farms. Until substantial post-war development of manufacturing industries based on the state's natural resources takes place, migration is the only alternative so long as present population trends are dominant.

Table 1. Migration of Utah youth, classified by population of place of family residence, 1940

Population of place of family residence, 1940	Children 15 or more years of age		
	At home	Away from home	Percentage away from home
Less than 100	1,109	1,112	50.1
100- 499	4,450	4,299	49.1
500- 999	3,739	3,623	49.2
1,000- 2,499	6,939	6,517	48.4
2,500- 4,999	4,606	3,799	45.2
5,000- 9,999	1,649	1,238	42.9
10,000-14,999—(Logan)	687	635	48.0
15,000-19,999—(Provo)	1,702	1,497	46.8
44,000-49,999—(Ogden)	2,582	1,704	39.8
150,000—Salt Lake City	8,914	5,860	39.7
Total	36,377	30,284	45.4

Table 2. Young people enumerated in Utah youth survey, classified by place of residence and by age at time of most recent departure from the family home, March, 1941

Age of leaving home	Total number now living away from home	Percentage now living away from home
16 or less	1,214	4.0
17	1,535	5.1
17	2,906	9.6
19	3,685	12.2
20	3,715	12.3
21	3,361	11.1
22	2,661	8.8
23	2,069	6.8
24	1,492	4.9
25	1,108	3.6
26 or more	2,029	6.7
Age not reported	4,509	14.9
Total	30,284	100.0

Table 3. Average value of farms and buildings by farms operated by full owners and by part owners 1940

States	Value of farm and buildings	
	Farms operated by full owners	Farms operated by part owners
	dollars	dollars
Mountain		
Montana	7,219	8,658
Idaho	7,432	9,175
Wyoming	8,002	11,597
Colorado	7,266	6,986
New Mexico	7,382	8,665
Arizona	10,265	15,251
Utah	6,597	6,162
Nevada	16,146	16,495
Pacific		
Washington	5,987	12,150
Oregon	7,074	11,239
California	13,156	18,605

## THE AUTHORS

**Dee A. Broadbent**, research assistant professor of agricultural economics, is especially interested in the economics of livestock production. He has made a special study of livestock trends in Utah.

**Dr. L. H. Pollard**, head of the Department of Vegetable Crops, has charge of Station trials in vegetable seed production. He has also been cooperating with the War Food Administration in the inspection of seed acreages in Utah and Nevada.

**Professor A. F. Bracken** is now on leave from the Station staff, and is serving as agronomist for the Extension Service. He has had charge of the Nephi Experimental Dry Farm for many years.

**Dr. Joseph A. Geddes**, head of the Department of Rural Sociology, was in charge of the rural youth study made in cooperation with the U. S. Division of Population and Rural Welfare, and the State Department of Public Instruction.

Compacted clay linings of canals practically eliminate seepage losses, but will they last? This is the question that has been uppermost with **Dr. O. W. Israelson** since the experimental canal sections were lined in 1940. Now after 3½ years of use, that question can, at least tentatively, be answered in the affirmative. Dr. Israelson is research professor of irrigation.

**Dr. D. W. Thorne**, research associate professor of soils, was born on a farm in Box Elder County. After getting his B.S. at Utah State he worked for his Ph.D. at Iowa State. He was on the staff of Texas A. and M. before coming to the Utah Station in 1939.

**Dr. George F. Knowlton**, research associate professor of entomology, has been granted a leave of absence to take charge of the pest control for the 9th Service Command, U. S. Army. Professor C. J. Sorenson has assumed charge of the work on bee losses. The tomato insect control work is being handled by **Walter Peay**, of the U. S. Bureau of Entomology and Plant Quarantine, stationed on the campus.

Farm women show a higher death rate from tuberculosis than do their sisters in the city.

## LIVESTOCK NUMBERS

(Continued from page 2)

**Stock Sheep:** Stock sheep in Utah expanded very rapidly until 1901 when the all time peak of 2,882,000 was attained. From 1901 to 1905 numbers declined 800 thousand. From 1908 to 1925 they fluctuated between 2.5 million and 2.1 million. Following 1925 the number increased to 2.8 million head in 1931. Since 1932 stock sheep have declined and in 1944 were 2.3 million. It is expected that further liquidation will take place during the coming year because of rising costs of production, a shortage of skilled labor, and the depressing influence of huge stock piles of wool on hand.

The sheep industry is converting its animals into meat while the demand for

meat is high and will likely enter the post-war period in the state and nation with relatively low numbers and consequently will be in a relatively stronger position than other meat industries. The present feed and range prospects may be favorable to the maintenance or even slight expansion of sheep numbers in the state, but economic forces for reduction are at present dominating the industry.

**Dairy Cattle:** The trend of number of dairy cows in Utah has been upward through the history of the state, except for the drought period from 1934 to 1936. As a result of the reduction in beef cattle since the twenties, some additional feed has been made available for other livestock; and dairy numbers have increased enough to make use of most of the available feed. At present there are 121,000 dairy cows in the state with an additional 66,000 heifers which are being kept for milk purposes. The present situation is, and the post-war economy will likely be, favorable for further increase in the dairy industry.

**Horses and Mules:** Number of horses and mules increased until the close of the first World War and since then has trended downward. The peak was attained in 1917 and 1918 when there were approximately 140,000 head compared with 85,000 head in 1944. Inability to obtain tractors and other mechanized equipment has retarded the continued reduction of horses for power and as soon as the farm power machinery situation changes with the close of the present war the old trend will probably continue.

**Hogs:** Hog numbers have always fluctuated more than other kinds of livestock in the state depending upon the price of grain and the price of pork. Normally grain prices and hog prices have been such that Utah farmers in general could not compete commercially with areas where feed prices were relatively cheaper. But from 1940 to 1943 "government grain" was sold in the state at prices favorable for the production of hogs. Utah farmers for the first time could get all the grain they wanted at prices favorable for the production of pork and as a result the number of hogs increased to about three times the normal production. Changed price relationships in the latter part of 1943 and 1944 have set in motion forces which will reduce hog numbers in Utah by January 1, 1945, below pre-war levels.

**Chickens:** The commercial poultry industry is a relatively new industry in Utah. In 1922 Utah had less than one million head of hens. The number increased from less than 1 million in 1922 to over 3 million nine years later. Depression prices were responsible for sharp reduction in the number to 2.2 million by 1935. In 1939 the demand for poultry products improved materially and prices of grains were unusually favorable to poultry production and as a result laying flocks increased and were not checked until feed shortages developed in 1943 and expected demands from the military and civilian channels

would not support egg prices. While there has been a sharp trend upward during the past few years, it is expected that numbers in the immediate future will be at a level somewhat lower than those of January 1, 1944, when there were 2,981,000 hens on Utah farms.

**Turkeys:** Commercial turkey production is the newest of all the important livestock industries in the state. Production of turkeys increased from 200,000 in 1935 to an estimated 1,400,000 in 1944. This industry had its beginning during a period of low feed grain prices and a period of increasing demand for livestock products. Govern-

Table 1. All cattle numbers in United States by geographical divisions 1920-1944<sup>1</sup>

Geographical division	1920	1930	1935	1940	1944
	<b>1,000</b>	<b>1,000</b>	<b>1,000</b>	<b>1,000</b>	<b>1,000</b>
North Atlantic	5,190	4,647	4,750	4,992	5,182
East North Central	10,898	9,659	10,819	11,795	13,465
West North Central	20,213	18,784	19,749	19,507	25,071
South Atlantic	4,943	3,855	4,799	4,573	5,490
South Central	16,466	13,873	17,138	16,280	19,184
Western	12,710	10,185	11,274	11,050	13,800
United States	70,400	61,003	68,529	68,197	82,192
U. S. milk cows and heifers	30,251	33,080	36,357	36,412	40,868

<sup>1</sup>Data from U. S. Bureau of Agricultural Economics

Table 2. Stock sheep numbers in United States by geographical divisions 1920-1944<sup>1</sup>

Geographical division	1920	1930	1935	1940	1944
	<b>1,000</b>	<b>1,000</b>	<b>1,000</b>	<b>1,000</b>	<b>1,000</b>
North Atlantic	1,311	1,113	958	759	765
East North Central	4,318	4,643	5,124	4,433	4,138
West North Central	3,957	5,196	5,984	7,052	7,705
South Atlantic	1,210	1,392	1,305	1,039	914
South Central	5,113	8,188	9,233	11,673	12,321
Western	21,419	25,045	24,030	21,602	19,934
United States	37,328	45,577	46,634	46,558	45,777
Utah	2,380	2,750	2,452	2,329	2,324

<sup>1</sup>Data from U. S. Bureau of Agricultural Economics

Table 3. Number of animal units on Utah farms for selected years

Kind of animal	1920	1930	1940	1943	1944
	<b>1,000</b>	<b>1,000</b>	<b>1,000</b>	<b>1,000</b>	<b>1,000</b>
Horses and mules	127	89	78	81	80
Milk cows	90	135	129	146	151
Other cattle	402	293	273	306	327
Sheep	493	576	496	504	486
Total forage consuming animal units <sup>1</sup>	1,112	1,093	976	1,037	1,044
Sows farrowed	5.5	3.5	6.5	12.8	5.5
Pigs saved	21.5	13.4	24.6	49.6	21.3
Chickens	9.6	25.5	23.7	26.6	29.8
Chickens raised	2.7	8.5	3.3	8.1	7.6
Turkeys raised	3.0	3.4	12.2	20.0	21.0
Total grain consuming animal units <sup>2</sup>	42.3	54.3	70.3	117.1	85.2
Total all animal units	1,154	1,063	1,046	1,154	1,129

<sup>1</sup>Includes all horses, cattle and sheep. Conversion to animal units was made on the basis of .94 A. U. per head for horses, .83 A. U. per head for cattle other than milk cows, 1.25 A. U. per head of milk cows and .20 A. U. per head of sheep.

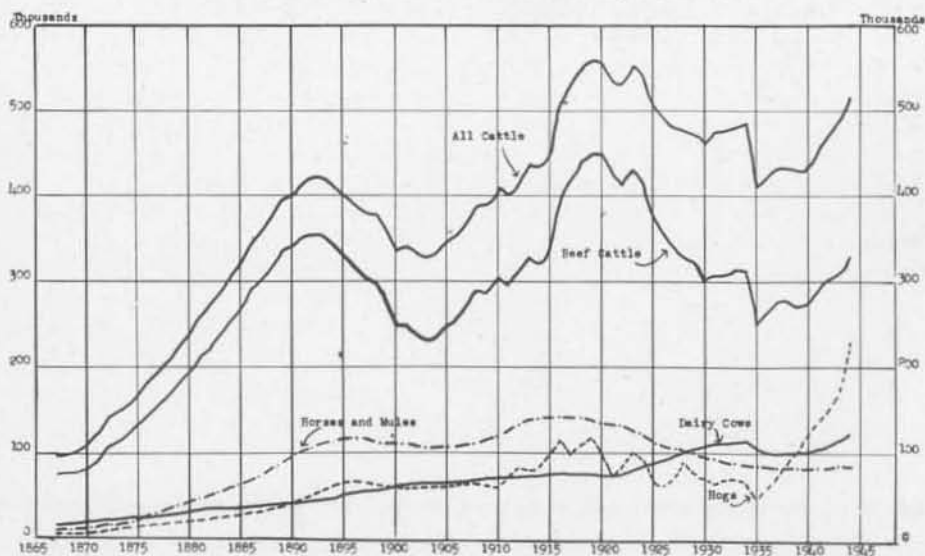
<sup>2</sup>Includes all pigs, chickens and turkeys. Conversion to animal units was made on the basis of .25 A. U. for each sow farrowed, .15 A. U. for each pig saved, .01 A. U. for each chicken on farms on Jan. 1, .002 A. U. for each chicken raised, and .015 A. U. for each turkey raised.

ment surplus wheat has been one of the major sources of feed for the industry during the last two or three years. A large portion of 1942 and 1943 turkey crops has been taken by the government for military purposes and the balance of the production found ready markets where other meats were rationed. Although this is a new industry, producers have ready access to sufficient grains and feeds from Utah and southern Idaho that it may be possible to support this industry at present relatively high levels of production.

**All Livestock:** The total amount of livestock in the state can be measured by reducing all types to a common basis. The number of animal units on Utah farms for selected years is shown in table 3. The heavy forage consuming animals decreased from 1,112 thousand in 1920 to 976 thousand in 1940 and by 1944 were back to 1,044 thousand, which is still 70 thousand less than in 1920 and 50 thousand less than 1930 numbers. The increase of 60 thousand animal units in dairy cows has been more than offset by decreases in horses and sheep. However, it should be stated that more forage is required per animal unit of dairy than for other kinds of livestock so the forage requirement is almost as great in 1944 as it was in 1920 and 1930 when there were more animal units on Utah farms. With range and prospective hay crops in unusually good condition, there will be normal feed supplies to care for all forage consuming animals during the coming winter if it is not unusually long or severe.

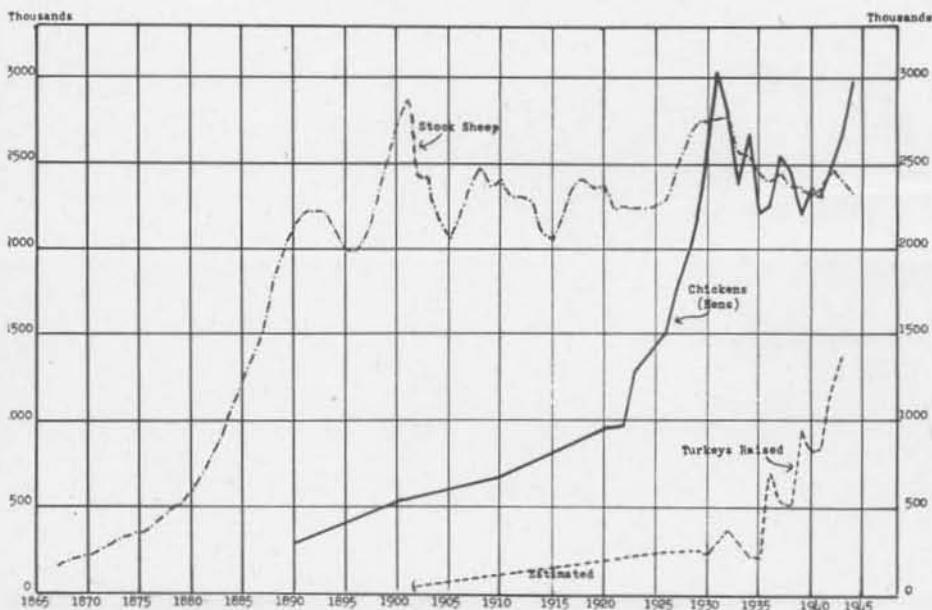
It is in the group of animals depending on grain that the relative increase in numbers has been particularly significant. In 1943 because of unprecedented hog numbers, principal grain consuming animal units reached a new level of 117 thousand, but by 1944, through liquidation of hog numbers, the total animal units declined to 85 thousands. The amount of grain consuming livestock on hand in 1944 is still double that on hand in 1920 and over fifty percent more than the 1940 number. In order to maintain present numbers of these livestock, considerable quantities of grains and supplements will have to be shipped into the state. This deficit of grain can usually be met by holding part of the grain from southern Idaho that is marketed through Ogden and other Utah markets and shipping corn from the Plains states.

Numbers of livestock on farms in Utah, 1867-1944<sup>1</sup>



<sup>1</sup>Bureau of Agricultural Economics, United States Department of Agriculture.

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