Agricultural Production in Utah for 1945

Report of Committee on 1945 Production Summarized by W. Preston Thomas

An increase in production of food and fiber for 1945-46 is needed to meet demands. The U. S. War Food Administration has estimated that during 1945-46 the total food requirements for United States civilians, military and lend-lease shipments and European and Asiatic relief will be from 3 to 10 percent greater than 1944 production. An adjustment in the agricultural programs undoubtedly will be necessary when the various foreign countries get back into full production. An increase in world production of agricultural products will not likely materialize until after 1945.

At the request of the U. S. Food Administration, a study of Utah’s food and fiber production for 1945 was made by the staff of the Utah State Agricultural College and the U. S. Bureau of Agricultural Economics, cooperating with various federal agencies. Recommendations on Utah’s agricultural production program for next year have been sent to Washington for consideration with other state reports for use in making up a national food production program for 1945. The men making this study took into consideration the increased demand for food and fiber, the agricultural resources available, and the price relationships between agricultural and non-agricultural commodities and between various agricultural commodities.

The availability of agricultural resources for crop production for 1945 should be at least equal to and possibly greater than for 1944. It is reported that most of Utah reservoirs will carry some storage water for 1945. Supplies of machinery, fertilizers, labor, and marketing facilities for 1945 will be at least equal to and likely more favorable than in 1944.

It is recognized that the most potent factor in obtaining increases in food production during this war emergency is a favorable price relationship. To obtain the necessary food to meet requirements commensurate prices and income between farm and non-farm groups must be maintained. Also a relatively favorable price relationship between essential foods must be established and maintained if a balanced production program is to result.

There was a wide variation in price support programs for essential agricultural products for 1944. This lack of balance in price relationships was the major factor influencing changes in Utah’s 1944 agricultural production from the goals adopted at the beginning of the year. Utah’s agricultural production will continue to be unbalanced if the 1944 price program is applied for 1945.

It was the opinion of the committee that a 1945 production program built on the 1944 price schedule would not give the desired production or make the best utilization of land and other productive resources. The pre-war and 1944 agricultural production for Utah and estimates for 1945 are shown in tables 1 and 2. Estimates for 1945 were based on (1) 1944 price schedules, and (2) on prices adjusted to obtain the desired production.

RECOMMENDATIONS ON 1945 PRODUCTION BY COMMODITIES

Fresh vegetables

An increase in acreage devoted to the production of fresh vegetables to meet the demands of the local market, and of onions and celery that can be grown and shipped to advantage to distant markets, is justified.

Seed

Approximately 1600 acres of vegetable seed was grown in Utah in 1944. This acreage includes onion, lettuce, bean, carrot, celery, radish, cabbage, turnip, table beet and parsnip. As farmers become experienced in the production of seed and present demand continues, the acreage may be safely expanded. It is expected that the acreage will be increased to 2000 for 1945.

High quality sugar beet seed has been grown in Utah for some time. The acreage was reduced from 688 acres in 1941 to 469 acres in 1944. Nine hundred acres are recommended for 1945.

In areas where production is favorable it is recommended to increase production of alfalfa, clover, and some grass seeds.

Dry beans

This crop has a high priority as a war crop. It is a new crop for most Utah farmers except those located in the southeastern part of the state. Because of price and competition with other crops, only a small acreage has been grown in other areas. The acreage for 1944 was only 11,000 and a slight reduction is recommended for 1945.

Sugar beets

The acreage planted to sugar beets fluctuates with the relative price for beets compared to competing crops. From 1926 until 1943 the sugar beet acreage in Utah ranged between 45,000 and 55,000 acres. In 1943 and in 1944 because of higher prices for competing crops that required less labor the acre-
Department of Dairy Husbandry and Manufacturing

The Department of Dairy Husbandry and Manufacturing of the Utah State Agricultural College was organized in 1916. Some of the earliest problems investigated were a comparison of the various methods of skimming milk; factors in the production of good cheese; best kinds of roughage for milk production; the comparative value, measured in dairy products, of the soiling system of feeding dairy cows and of pasture feeding.

In 1924 the Cronquist farm, consisting of 86 acres of irrigated land with farm buildings and equipment, was acquired as a dairy experimental unit. Through cooperation with the U. S. Bureau of Dairy Industry a herd of purebred Holstein-Fresian cattle was acquired and cooperative breeding and feeding studies were begun. This setup made possible the systematic study of dairy problems pertaining to breeding, feeding, housing, costs of production and use of pasture land.

A study of the relative value of wet beet pulp and of corn silage in the dairy ration showed that cows on the wet beet-pulp ration produced slightly more milk and butterfat than did those on corn silage rations. They exhibited a lower breeding efficiency and showed other evidences of a lack of phosphorus.

Other feeding studies have shown that alfalfa hay, pasture and chopped barley increased milk production an average of 22 percent over alfalfa hay and pasture. Alfalfa hay, pasture and corn silage increased production 6 percent over the base ration.

In the breeding program, the continuous use of proved sires has resulted in an inheritance for high milk and butterfat production. Through this program animals of superior breeding and transmitting ability have been put into the dairy herds in Utah.

Results of pasture improvement and management studies have brought about radical changes in the management of irrigated pasture throughout the state. These studies have shown that fertilizers greatly increase the quantity and quality of forage produced, that rotation grazing allows new forage to get an adequate growth before the pasture is grazed again.

The College dairy herd composed of purebred Holstein and Jersey cattle has been maintained as a separate herd for judging and other instructional purposes.

The experimental herd was the first herd accredited free of Bang's disease in Utah, and has continued to point the way for eradication of this disease in the state.

The dairy manufacturing division is well equipped to analyze and manufacture or process market milk, butter, cheese, and ice cream. Between 3000 to 5000 pounds of milk are received daily which are used in teaching the making of dairy products and quality and technical control work. Instruction and demonstrations are given to short course students from commercial plants throughout the year. Some research work is done in cooperation with the Experiment Station and in recent years five master's theses have been written from the research conducted in dairy manufacturing. The creamery has also provided an important service to the campus and college cafeteria in making available for sale plenty of dairy products of high quality.

An extension dairy specialist was first appointed in 1922. He has worked with the farmers of the state in an effort to improve the quality of their milking herds.
THE ALFALFA SEED PRODUCTION PROBLEM

Intensive Studies by Station and U.S.D.A. Scientists Hold
Promise of Solving Problem

THE history of alfalfa seed production in Utah since 1925 has been one of gradually declining yields. In that year, Utah’s 22 million pound crop was about 40 percent of the nation’s total production, while the estimated three and one-half million pounds produced in 1943 was only 5.4 percent of the total production in the United States. Equally striking has been the drop in one-half percent of the nation’s total production in Utah since 1925 has been

Two years ago, the Utah Agricultural Experiment Station entered into a cooperative project with the U.S. Department of Agriculture to investigate thoroughly the problem of declining alfalfa seed yields. The method of attack includes studies of agronomic practices and injurious and beneficial insects as they affect seed production. Encouraging progress is being made which gives some light on causes of low yields and also gives promise of their ultimate control.

Alfalfa fields may blossom sparsely or not at all when heavily infested by lygus bugs. Serious bud injury may then occur with practically no hope of harvesting a seed crop. Lygus bugs are very difficult to control because of their rapid breeding and their habit of migrating to succulent growth. Recent evidence obtained by Professor C. J. Sorenson of the Utah Station and by

Frank V. Lieberman and Q. A. Hare, of the Agricultural Research Administration, when using some of the newly developed insecticides, appears to indicate that a satisfactory solution to the lygus problem may come when the new insecticides being used now for military purposes become available for commercial use.

From investigations conducted by Dr. J. W. Carlson and G. H. Vansell of the Agricultural Research Administration in Utah this season, it is reasonably certain that alfalfa flowers must be tripped to obtain a good seed set. The sexual parts of the flowers are enclosed in a hood or keel and must be released by opening the keel (tripping) before effective pollination is possible. An abundance of evidence is available to show that tripping is not always adequate and that lack of tripping is probably sometimes one of the major causes of crop failure.

The tripping agents found in Utah alfalfa are honeybees and wild bees which nest in or on the ground. Current agricultural practices have sometimes been destructive to the ground nesting bees. Careless practices have undoubtedly depleted their population in some localities and even caused their extinction. No evidence has been found to show that honeybees are other than beneficial to the alfalfa seed crop.

Blossoms of alfalfa were found to be a poor competitor to many weeds in their ability to attract both the wild bees and the pollen collecting honey-bees. Some of the more attractive weeds are sweet clover, Canada thistle, sunflower, gum

weeds, chicory, from which the pollen requirement of bees are apparently satisfied without collecting from alfalfa. Certain cultivated plants such as corn and red clover also attract bees away from alfalfa. Means whereby alfalfa can be made more attractive to honeybees as a source of pollen is a phase of the problem now receiving attention.

Alfalfa growers may take certain positive action to the benefit of seed production as follows:

1) Preserve and encourage increase of wild bees by protecting their nesting places and by using care in the application of insecticides. The use of insecticides on plants in blossom may be very destructive to bees.

2) Encourage the keeping of honeybees near alfalfa fields. This may be done by providing apiary sites and otherwise protecting beekeepers’ interests.

3) Lessen competition from weeds by cutting or otherwise destroying them before the alfalfa seed crop blooms.

4) Rank growing succulent alfalfa apparently is not attractive to the pollen bees, but is attractive to harmful insects such as the lygus bug. The grower, therefore, should regulate his irrigation practices for seed production so that this type of growth will not occur.

From the preview of the work now in progress, it is believed that alfalfa seed growers can look forward with considerably more optimism than has been the case in the past decade, providing these suggestions are put into practice.

(A later issue of Farm and Home Science will contain more detailed information on the experimental work on alfalfa seed production being conducted at the Utah Station in cooperation with the Agricultural Research Administration.)
FARM AND HOME SCIENCE
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. 696

RESEARCH IN AGRICULTURE

SINCE 1900, scientific research in industry has brought many new developments into our homes and our daily activities. Some of the more common of these are the telephone, electric lights and refrigerators, the sewing machine, the radio, the automobile, the airplane, the paved road, and new medicine for the treatment and control of disease, such as sulfa drugs and penicillin. The knowledge of proper methods of sanitation, of vitamins and improved diets for better nutrition is also the product of scientific research.

Most of these things are now coming to be so commonplace that we are prone to forget the time when we did not have them. Likewise, we sometimes fail to recognize that they are the product of long years of painstaking, scientific research. This research has been supported by the colleges and universities, by industry and by the state and federal governments.

Scientific research in agriculture has also been going forward in the state agricultural experiment stations and in the laboratories and field stations of the U. S. Department of Agriculture. The record of achievement has been just as marked and the developments just as significant to the welfare of the people and the nation as have been the new developments in industrial research. These developments include new varieties of plants of superior quality and yielding ability and also resistant to disease, improved strains of livestock, better feeding and management practices, powerful insecticides for the control of insect pests, improved methods of combating plant and animal diseases, high quality commercial fertilizers, and methods of soil management for their conservation and continued productivity, improved machinery for the more effective utilization of labor and conservation of the crops produced. There is scarcely a crop or animal grown, or farm practice employed, that has not been improved or developed by the agricultural scientists in their research efforts. We are prone, however, to forget this; or we fail to recognize the part that scientific research has had in the developments for the improvement of agriculture. Without these improvements, the record wartime production on the farms of America could not have been possible.

What about the future possibilities for improvement of agriculture through scientific research? The leaders of industry have long been convinced that they cannot afford to leave the future to chance any more than can the problems of industry. This is the job of the leader in any field, but the problems of agriculture are so different that the problems of industry. This is the job of the leader in any field, but the problems of agriculture are so different that the problems of agriculture are not the same as the problems of industry. This can be done through the present research agencies of the agricultural experiment stations, together with the federal research agencies. Liberal financial support should be given these research agencies by the state and federal governments as the good resulting from the improvements to agriculture will reflect to the general welfare of all the people.

(Continued on page 6)

WILLIAM WILLIAMS HENDERSON — 1879-1944

FOLLOWING a confining illness of approximately two months resulting from heart trouble, Dr. W. W. Henderson, prominent and beloved teacher at the Utah State Agricultural College during 21 years, died October 31, 1944.

He was born at Clarkston, Cache County, Utah, May 23, 1879. When he was nine years of age, his parents moved the family to Robin, Idaho, where he was raised on a farm. During his young manhood and periodically through many years, he assisted his father in the mercantile business at Arimo, Idaho.

He attended the grade schools in Utah and Idaho. His natural thirst for learning brought him to the Brigham Young College at Logan, and from this institution he obtained a bachelor of arts degree in 1903. Immediately following this, he entered the University of Chicago, later transferring to Cornell University where he obtained a master of science degree in 1905.

Returning from Cornell University, W. W. Henderson became instructor in biology at the Brigham Young College, serving in this position from 1905 to 1910. From 1910 to 1914 he was principal of the L.D.S. Weber Academy in Ogden.

In 1917, Professor Henderson came to the Utah State Agricultural College as head of the Department of Zoology and Entomology, professor of zoology and entomology, and entomologist of the Agricultural Experiment Station. He continued in these positions until 1920 when he became president of the Brigham Young College, serving there until that institution was discontinued as a college in 1926.

Obtaining his doctor of philosophy degree in 1924 from the University of California, Dr. Henderson returned to the Utah State Agricultural College in 1926, resuming his former position. With the exception of one year, 1928-29, he served the College continuously from 1926 to the time of his death. For that year he had been granted a leave of absence to serve as the first director of the L.D.S. Institute which he had also aided in planning and building, organizing its courses and in selecting its faculty.

Dr. Henderson took a prominent part in all campus activities of a scholastic or professional nature. For years he served as chairman of the Attendance and Scholarship committee. He aided in organizing and sponsoring such campus organizations as the Genetics Seminar, Zoology Seminar and the Utah-zoa Society. He rendered valuable service in establishing the Utah State Chapter of the Society of the Sigma Xi on the campus in 1942 and served as its president during 1943-44. He was a member of the Faculty Advisory Council and other faculty organizations and committees.

Dr. Henderson possessed a natural penchant for discovering truth and a zeal for teaching it. He searched for it in its original sources of the great out-of-doors, in the laboratory, and in their total earnings is going into research and new developments as a safeguard for the future.

Can agriculture afford to leave its future to chance any more than can industry? After careful analysis we believe all will agree that the problems of agriculture should be tackled with as much vigor and with the benefit of as much scientific knowledge and training as are the problems of industry. This can be done through the present research agencies of the agricultural experiment stations, together with the federal research agencies. Liberal financial support should be given these research agencies by the state and federal governments as the good resulting from the improvements to agriculture will reflect to the general welfare of all the people.

Farm and Home Science
FRUIT POLLINATION—A PROBLEM IN UTAH

Scarcity of Bees and Improper Orchard Practices Have Resulted in Lowered Yields in Utah Orchards

By A. L. STARK

LAST season many Utah fruit growers were disappointed at the light set of fruit in their orchards because spring bloom appeared adequate and the weather was quite favorable during the bloom period. This disappointment occurs every season to a few scattered growers, but last spring it was more general than usual and affected more fruits than the customary sweet cherry, Hale peach, and Anjou pear. Even apple trees, which ordinarily set a good crop, failed to set a normal bloom. There are several factors which might have been responsible for this light set, but the principal one was inadequate population of bees to do the job.

Bees are Necessary for Pollination

Bees are essential to the pollination of fruit blossoms. Other insects may be responsible for the pollination of an occasional flower but these would not begin to do the job well enough for a commercial set of fruit. There are growers who consider wind an important factor in the pollination of fruit bloom but careful investigation has shown that pollen from fruit trees is not wind-blown and that no pollination occurs as a result of wind. Nut trees, corn, and the common grasses are pollinated by pollen carried in the wind but this method is not a factor with fruit trees.

The importance of bees in fruit setting was well illustrated in Utah last year. One explanation for the unsatisfactory set of fruit in most sections was the extremely low population of bees in fruit-producing areas. During the winter hundreds of colonies of bees died in the northern part of the state, where the bulk of the fruit is produced. Even though an attempt was made to replace these heavy losses with package bees, the actual working population was far below normal in most orchards and the set of fruit was correspondingly low.

Package Bees are Not Satisfactory

Package bees are not the answer to the pollination problem. Many studies have been conducted in various parts of the country on the relative merits of well established strong colonies and newly established package bees. All of these have shown that package bees are relatively ineffective pollinizers compared with overwintering strong colonies. The reason for this is that many of the bees in the package terminate their normal six-week life span before they become established in their new home. They also fly less freely at low temperatures than do well established strong colonies, and until a temperature of 72 to 74 degrees F. is reached their flight is quite limited. At 50 to 60 degrees F. bees in weak colonies exhibit considerable activity at these cool temperatures. Inasmuch as these low temperatures are often prevalent during the pollination season in Utah, it is quite evident that strong colonies of bees should be placed in the orchards for pollination.

The question will naturally arise as to just what constitutes a strong colony of bees. The strength of the colony can be observed by an inspection of the hive. Hives containing eight or more combs having brood are considered strong colonies. Where only four to six combs contain brood, the colony is considered only moderately strong or weak. Orchardists who rent bees should consider the strength of the colonies that are placed in the orchard in determining the rental price. Wherever possible only well established strong colonies should be rented.

How Many Colonies are Necessary

If the weather and other factors are favorable one strong colony of bees per acre will be sufficient. In most instances, however, all factors are not favorable and to insure for these unfavorable conditions two or three colonies would be better. This is especially true in sweet cherry orchards, J. H. Hale peaches, and in pear orchards. If package bees or weak overwintering colonies are used, more than three hives per acre are desirable.

The placement of the colonies in the orchard is important. In bright warm weather bees will fly as far as one and one-half miles from the hive in search of pollen and nectar. On some occasions they have been known to fly as far as eight miles. In cool or windy weather and in cloudy weather the flight is confined to short distances from the hive. Because of this, distribution of the colonies throughout the orchard is necessary to insure adequate pollination during cool, cloudy, or windy weather. Since it is impossible to predict in advance the kind of weather that will occur during the pollination season, it would be well to distribute the hives at regular intervals over the orchard in anticipation of unfavorable weather.

The hives should face east or preferably south and should be so placed as to get as much full sun as possible. Protection from the wind is desirable. Moving the colonies into the orchard several weeks in advance of bloom allows the bees to become adjusted to their new location before the flowers open. To prevent the bees from drifting back to their old location, it is advisable to move them at least five miles or more from where they worked previously.

Pollinating Varieties Necessary

Even though there are plenty of bees present, there are many fruit varieties that will not set fruit if pollinized with their own pollen. Most varieties of tree
fruits will set better crops when cross-pollination occurs.

The three sweet cherry varieties, Bing, Lambert, and Royal Anne, are inter-unfruitful and therefore require a fourth variety to set a crop. Black Tartarian and Windsor are commonly used for this purpose in Utah. Both of these pollinating varieties are essential since Black Tartarian will sometimes bloom too early to pollinate Lambert. A minimum of the pollinating varieties is desirable because of the inferior market value of the fruit. A pollinizer planted every third tree in every third row will supply sufficient pollinating surface for sweet cherries. Where a solid block of sweet cherries has been planted without pollinizers, budding in three or four branches of a pollinating variety in the top of each tree is an effective way to solve the problem. One small branch does not give sufficient pollinating surface to set a good commercial crop. Placing bouquets of a pollinating variety in buckets throughout the orchard during bloom has some beneficial influence.

Sour cherry and apricot varieties grown in Utah may be planted in solid blocks without regard for pollination. Most peach varieties are also self-fruitful but the J. H. Hale is an exception. This variety has defective pollen and requires pollen from some other peach variety to set a crop.

Bartlett pears are self-fruitful under some conditions and not under others. To be certain of a good set of pears, it is better to interplant another variety for cross-pollination. Anjou or any other pear variety that blooms at the same time may be used as a pollinizer for Bartlett. Anjou is self-unfruitful and therefore requires another pear variety for a satisfactory set. Heavy pruning of mature Anjou trees is also helpful in obtaining a good commercial crop.

Providing pollinizers for apples is a good policy under Utah conditions. Delicious, McIntosh, Stayman and Winesap are self-unfruitful and require cross-pollination for a satisfactory crop. Jonathan and Rome Beauty sometimes fail to set a good crop with their own pollen. Winesap and Stayman are inter-unfruitful but may be used to pollinate other varieties. There is enough overlap in bloom so that most apple varieties commonly grown in Utah will serve as pollinizers for each other.

Italian prunes set a satisfactory crop when planted in a large block without pollinizers. Satsuma and Santa Rosa plums will pollinate each other but are self-unfruitful. Duarte is a much better pollinizer than Satsuma which is rather poor for most Japanese plums commonly grown in Utah. All plums of this type require cross-pollination for a satisfactory crop and single varieties should never be planted alone.

In a season like last spring where many fruits overlapped in bloom, bees are selective in their choice of flowers. Under such conditions pears will be neglected and the honey bees will work flowers of apples, cherries and the other fruits in preference to the pear bloom. The reason for this has been explained by the low sugar content of pear blooms. The sugar content of nectar from fruit tree flowers is as follows: sweet cherry, 50-60 percent; peach and nectarine, around 30 percent; apple, 45-55 percent; sour cherry, 20-40 percent; apricot, 5-25 percent; and Bartlett pears, 8-10 percent.

**Orchardist Should Protect the Bees**

Spraying fruit trees in full bloom with lead arsenate will result in heavy bee poisoning. There is no pest in Utah that necessitates spraying with lead arsenate, or any other similar stomach poison, at the time of full bloom. The bloom should be almost gone before the calyx spray is applied. Spray that drops from the trees on a cover crop in flower will also result in bee poisoning. Orchardists should inform beekeepers in advance as to spray dates so that the bees may be moved from the orchards before any poisoning occurs. If the bees must remain in the orchard any cover crops in bloom should be cut before spraying and adequate water for the bees should be provided near the colonies so that the bees will not drink the spray mixture from the wet vegetation.

Bee men need the fruit bloom and orchardists need the bees. It is to the mutual advantage of both to work together in the solution of their problems.

---

**W. W. HENDERSON**

(Continued from page 4)

the works of other researchers. He was an earnest courageous champion of all truth and of the scientific method of obtaining it. However, because of the large amount of executive work required of him in most of his positions, he was prevented from doing as much original research as he desired to do. Nevertheless, he made important contributions to science, particularly with reference to the taxonomy of western Orthoptera.

His collections of Orthoptera number thousands of specimens and dozens of species that he has collected in the fields, in canyons, on mountains and on the deserts of Utah.

Dr. Henderson held membership in the following honorary and scientific societies: Sigma Xi, Cornell Chapter, 1905; Phi Kappa Phi; American Association for the Advancement of Science; Entomological Society of America; Pan Pacific Entomological Society; American Genetics Association; American Eugenics Society; American Association of University Professors; and Utah Academy of Sciences, Arts and Letters.

Dr. Henderson's greatest contribution was perhaps that which he made in the classroom. He was particularly efficient as a teacher. This resulted from a combination of factors, including his natural capabilities, proficient training, his continuous, thorough and systematic preparation and presentation of subject matter, together with his sympathetic understanding of student character and problems. His nobleness of character, wisdom, meekness, sincerity, guilelessness, efficiency and friendliness developed in students and associates alike, a wholesome respect and sincere affection.

The high esteem and kind affection in which the students of Utah State Agricultural College held this devoted teacher was manifest by their dedication of the 1935 Buzzer to him.

To all of his work Dr. Henderson brought enthusiasm, freshness and excellence. During recent months and years, his youthfulness of spirit and ambition was revealed by his frequently expressed desire to continue on with his teaching and research work. He was tireless in all of his efforts and his enthusiasm, zeal and devotion to duty often carried him far beyond the point to which his physical strength should have been taxed.

The interests and work of Dr. Henderson extended beyond the College campus to community, state and national problems. He rendered unstinted, efficient and highly inspirational service as a church teacher and speaker. He wielded a wholesome, effective influence in civic and political activities.

Dr. Henderson was highly respected and greatly admired by all who knew him. In his passing, the College, the community, the state and the nation have lost a great teacher, a valiant scientist, a sincere friend and a champion of truth and right.—Charles J. Sorensen.
Is There a Better Way to Eradicate Noxious Weeds
Experimental Results Show Certain Cropping Practices are Successful in Eradication

By R. J. EVANS

THE ultimate objective of the state weed program is the eradicating of noxious weeds. At present, the recommended methods for weed eradication include the use of chemicals and the practice of clean cultivation. The use of chemicals in weed control is expensive and is not always certain. Clean cultivation, as widely employed for the control of wild morning-glory and whitetop, is expensive and retires the land from cropping for two or three years. Because of the expense and loss of income from the land many farmers feel they cannot afford to begin a weed control program.

Less expensive methods of weed control need further investigation. Some rapid-growing crops which produce a dense foliage may be able to compete successfully with most weeds. There are also many intensively cultivated crops which could be used in a weed control program by the more careful farmers. Some farmers, for example, have reported that the intensive cultivation practiced in celery production has produced almost complete kills of morning-glory and whitetop.

Two field experiments have been conducted by the Utah Agricultural Experiment Station to study some of the possible cropping practices that might be useful in a weed control program. One field was located near Logan on five acres of land heavily infested with morning-glory. The second field of five acres was located near Palmyra in Utah County and was uniformly covered with whitetop.

Each of these fields was divided into plots 33 x 60 feet. About 33 different cropping practices were carried out with each practice repeated on three different plots. The crops planted included sugar beets, corn, barley, wheat, alfalfa, soybeans, sorghum, smooth bromegrass, Reed canary grass, and a pasture mixture. The experiments were continued for three years (1939-1942). In 1943 the fields were uniformly plowed. After the loose organic materials had decayed, three trenches were dug in each plot to determine the quantities of live roots of the noxious weeds left following each treatment. The accompanying table shows the various cropping systems used on the whitetop plots at Palmyra and the average weights of the whitetop roots found per trench following each practice.

The most striking result of these studies is the good weed kills obtained by growing sugar beets, corn, sorghum and soybeans. The results obtained here are indicative of what could be accomplished by farmers with a series of intensively cultivated crops. Many farmers fail with such a program, however, because they do not clean the weeds out thoroughly from around the crop plants, or they miss a cultivation or two. If corn is check planted so that it can be cultivated in two directions, the amount of hand labor required in a weed control program is greatly reduced over that needed when sugar beets or other crops are grown.

The kills obtained with barley and soybeans are of perhaps more interest than those resulting from the cultivated crops. With these crops, the land was plowed early in the spring. This set the weeds back and gave the barley a chance to get well established before the whitetop emerged. The barley then shaded the weeds and kept them fairly well under control until the barley matured. Following the harvest of the barley, the land was clean cultivated the remainder of the summer and fall. Soybeans are planted much later than

(Continued on page 13)
WEEDS THAT MAY BECOME NOXIOUS

Small Areas of Weeds Should Be Eradicated and Not Allowed to Become Menace to Large Districts

By ARTHUR H. HOLMGREN

The early recognition of weed pests is important in weed control programs. Small patches of even the most persistent weeds can be brought under control so that further spread will be prevented if a noxious weed is recognized and destroyed before its spread becomes general.

Four weeds, which are at present restricted to certain areas of the state, but which, if allowed to spread, may become serious pests, are described and illustrated here. Two of the plants (nut-grass and halogeton) have been discussed before (FARM & HOME SCIENCE, Sept. 1940; Dec. 1943), but the serious problems each will add, if allowed to spread further, justify this reminder.

Nut-grass

The fertile farming areas in Moab, Grand County, are rapidly being invaded by nut-grass (Cyperus esculentus L.). This pest is now the most serious weed problem in one of the finest truck gardening communities in the state. Untold damage can be expected wherever this plant becomes established. Celery producing areas would be seriously affected because the plant thrives in well irrigated soils. Nut-grass should be recognized as readily as wild morning-glory or whitetop. It is a perennial, living from year to year as do most noxious weeds, and reproduced by seeds and tubers which may remain dormant for several seasons. The triangular stems, which vary from 10 to 18 inches in height, do not branch, and the entire plant looks very much like a grass. The straw-colored spikelets are subtended by several long leaf-like bracts.

Nut-grass is widespread throughout the United States. It is most troublesome in the eastern states and along the Pacific Coast. Although its occurrence in Utah is sporadic—Grand, Salt Lake, and Utah Counties—nut-grass can quickly become well established in every farming community in the state if it is not recognized before the damage is done.

Halogeton

Halogeton (Halogeton glomeratus ([M. Bieb.] C. A. Mey.) has become so well established in the western part of the state that it should be looked for around the farm and ranch. The poisonous nature of the plant is known, and serious livestock losses have been attributed to this recent introduction. If halogeton invades fields and waste places near farm buildings, livestock losses should be expected—especially in the fall of the year. The plant looks very much like Russian-thistle and is an annual, reproducing by seeds. The leaves of halogeton end abruptly in a hair-like point, whereas the leaves of Russian-thistle gradually taper to a sharp point (See illustration, page 15). At maturity the winged covers of the seeds often form a solid mass from the ground to the tips of each branch.

The juicy, fleshy leaves of halogeton seem to attract sheep when other forage is dry. Although the plants are poisonous to both sheep and cattle, losses caused by halogeton poisoning have occurred only with sheep, as cattle rarely eat the plant. Halogeton is extremely drought resistant and even after long dry periods under arid conditions the...
plants may contain an excess of 80 percent water.

Field Buttercup

Field buttercup (Ranunculus arvensis L.) is invading alfalfa and grain fields in the vicinity of Smithfield, Cache County. The plant is an annual and reproduces by seeds. The stems often become much branched and vary from 8 to 12 inches in height. The lower leaves have a definite leaf stalk and are frequently undivided; the upper leaves are without a leaf stalk and divided into 3 narrow divisions. The flowers are bright yellow and solitary or in clusters. The fruits are clustered in groups of 4-7 and armed with spines. Field buttercup might become a serious pest in alfalfa fields where it thrives and rapidly becomes disseminated through haying operations. A single plant will produce 100-200 spiny fruits which reduce the quality of hay.

If sufficient palatable forage is available field buttercup is not eaten because it contains a disagreeable acrid juice which is somewhat poisonous. Dried plants are apparently harmless as the poison evaporates when the plants are cut with the hay. The most objectionable features of the plants are the spiny fruits that are produced in such abundance. Sore mouths might be expected in livestock feeding on hay containing matured field buttepcups.

Madder

Madder (Rubia tinctorum L.) has been known in Utah for several years. It has not yet become established as a troublesome weed, although it has most of the characteristics of one. It reproduces by seeds and has heavy rootstocks like most noxious weeds. The stems often become woody at the base and are armed with hooked prickles on the angles. The flowers are yellow and grouped together in clusters. Madder thrives on ditchbanks and in rich soil. The roots of madder contain a dye which yields colors of great permanence and stability. Madder colors include shades of red—Madder red and the well-known Turkey-red, which possesses a much higher degree of luster and fixity—pink, black, purple, and chocolate. The plant was extensively cultivated in Holland, France, Italy, and Turkey for centuries until alizarin, the important coloring principle in madder, was artificially produced in 1869.

The bones of animals fed madder turn red, as well as the claws and beaks of birds, because of the peculiar chemical affinity of phosphate of lime for the dye.

Of the four plants discussed above, nut-grass and halogeton are most serious. Their noxious potentialities are already known and constant vigilance may prevent grave losses in farm crops and livestock.

James A Bennett, at present employed in range livestock investigations at the experimental station at Swift Current, Saskatchewan, Canada, has been appointed assistant professor of animal husbandry. Mr. Bennett will fill the position left vacant by Dr. I. F. Edwards who leaves January 1 to take over his family farm in Iowa. Mr. Bennett received both his B.S. and M.S. degrees at Utah State.
NEW RANGE CATTLE EXPERIMENT INITIATED

Study Being Made of Influence of Age of Breeding and Season of Grazing on Production of Range Cattle

By L. F. EDWARDS and L. A. STODDART

Improving the production of range cattle is the purpose of another study initiated June 1, 1944, by the Departments of Animal Husbandry and Range Management. The study is designed to compare the effect of age of breeding heifers upon their efficiency of reproduction and the effect of early grazing of summer range upon the productivity of the forage. The experimental work is being conducted on two adjoining fenced pastures, a part of the Cache National Forest, and located 22 miles east of Logan. These pastures, approximately 200 acres each, are typical mountainous summer range, the vegetation being chiefly aspen and sagebrush of high productivity. Cattle used for the studies include 69 head of yearling Hereford heifers owned by four members of the Logan Canyon Cattlemen's Association.

Bringing cattle onto the summer range at a late date is primarily for the purpose of protecting the range. The established beginning date in northern Utah on high elevation ranges is July 1. Providing other range or farm feed to cows during June is, of course, costly to the producer. Although some experiments suggest that too young forage is not so nutritious to animals as somewhat more mature feed, all indications suggest that by June 1, plants are adequately mature to make good feed on the mountain ranges. There remains, however, the question as to whether this early grazing will injure the range. If, over a long-time period, range production decreases as a result of early grazing, then the producer would benefit by providing other range during June. Conversely, if production does not decrease, then in view of good animal gains during June and shortage of other feed, early grazing would clearly be desirable. Effects of early grazing on range production have been studied but little on summer ranges.

To determine whether high mountain ranges are harmed by early grazing, one experimental pasture used in this study is opened to grazing June 1; the other, July 1. At present, stocking is adjusted so as to graze the pastures at exactly the same intensity—that is, the pasture grazed a shorter season supports more animals while being grazed. If differences are not detectable over a period of years, however, more animals will be placed on the long-season pasture so that this pasture supports the same number of animals as the short-season pasture, but supports them for a longer period.

To determine whether range production decreases, a dual check is available. Animal gains and production will decrease upon serious depletion of the range. Even before this decrease takes place, however, a decrease in preferred forage plants and an increase in low forage plants will occur. To detect the latter changes, a number of study plots have been located in each pasture, showing detailed location and size of thousands of forage plants. By re-examining these plots the slightest increase or decrease in plants or changes in their vigor will be detected long before the change is readily visible to the casual observer.

Allowing range heifers to be bred when yearlings is a common practice in Utah. In most cases, cattlemen have had no opportunity to control the age to breed heifers since they are grazed on the open range along with the breeding herd. The outlook for extensive range reseeding and the establishment of breeding pastures on the forest promise facilities which will allow cattlemen...
to have more control over breeding operation. Therefore, it is particularly important to have reliable information at hand relative to the desirable age to breed range heifers.

Economic studies or surveys of range cattle operations indicate that allowing heifers to be bred when yearlings results in a higher death loss among heifers at calving time, a decrease in calf crop percentage, and lighter calves at weaning time. This was found to be particularly true in cases of heifers that had been wintered under poor conditions and were thin at calving time. The studies reveal that such heifers tend to develop into undersized cows and may fail to produce a calf the following year.

Results of experimental studies are not entirely in agreement with respect to the practice of breeding range heifers when yearlings, compared to deferred breeding until 2-year-olds. McCampbell (1920) of the Kansas Agricultural Experiment Station, concluded from a five-year study with heifers developed without grain, that breeding them to drop their calves at 3 years of age was the most practical under range and semirange conditions. Heifers bred to calve at 2 years of age, in comparison with those in the "deferred breeding" group, weighed an average of 48 pounds less at maturity; the first calf crop was 30 percent lower; and the weight of calves at weaning, over a 3-year period, averaged 57.5 pounds less.

On the other hand, Withycombe et al. (1930) at the Oregon Station, in summarizing results of a 6-year study of deferred breeding of beef heifers, reported that it was most profitable to breed heifers to calve at 2 years of age, even when they were not fed liberally during the wintering period. At the age of 6.5 years, the cows that had dropped their first calves when 2-year-olds had produced an average of 0.7 more calf for the entire period than those that dropped their first calves when 3-year-olds. Early breeding did not affect the size of the calves produced in subsequent years. At 4 years of age, the difference in weight between the two groups of cows was slightly less than 100 pounds in favor of the cows in the "deferred breeding" group.

In view of the need for more experimental information concerning the influence of age of breeding upon the efficiency of reproduction in range cattle, the Utah Station designed an experiment to study this problem. On July 1, 1944, the experimental heifers were divided into two comparable groups and put into separate pastures. Two bulls were allowed to run with one group of heifers for an 86-day period, July 1 to September 25. No bulls were allowed with the other group. These heifers will not be bred until the 1945 breeding season, beginning July 1, at which time they will be 2-year-olds.

The efficiency of reproduction of the two groups of heifers will be studied over a period of at least 5 years. Results of the investigation will be based on the development of the heifers when they become mature cows, calf crop percentage, pounds of beef produced per cow, and net returns to the operator. The extent to which these factors are influenced by feeding and management practices employed by the cooperating cattlemen during the wintering period will be given proper consideration.

**AGRICULTURAL PRODUCTION 1945**

(Continued from page 1)

age fell to 34,000. It appears to be quite unlikely that beet acreage, under the present price and cost relationships, can be increased above this low level of 34,400 acres, and it may decline still further if the labor situation becomes more critical and there is no improvement in prices. In order to obtain the desired acreage, however, the price would need to be raised to a point where it would be commensurate with competing crops.

**Potatoes**

Under the assumption that 1944 prices will prevail for 1945 crops, there is likely to be little change in potato acreage in 1945. It is thought that the acreage grown in marginal areas should be greatly reduced. A discontinuation of growing potatoes in areas not favorable because of soil, irrigation water, climate, and location, would reduce the acreage to about 15,000 acres.

**Processing vegetables**

An increase in the acreage of vegetables for processing over the 1944 acreage is anticipated. This increase will likely tax to the limit the processing facilities of the state for peas, lima beans, and corn and will far exceed the capacity for processing tomatoes, especially if a favorable year with high yields should be experienced.

The present support price on tomatoes is sufficient to enable the processors to contract for an acreage above plant capacity. It is estimated that with 1944 price schedules for tomatoes, that the acreage for 1945 will be increased to 12,000 acres. It is estimated that with certain moderate increases in machinery, the present plant capacity of 9,000 acres could handle 10,000 to 11,000 acres.

The 1945 acreage of snap beans will probably be far below the recommendations for 1944. An increase of $25.00 per ton in the support price for pole beans failed to induce the farmers to contract the desired acreage. Because the support price on bush beans was held at the 1943 level a reduction of over 30 percent in the usual contracted acreage has occurred. The farmers feel that the support price for bush beans is not sufficient to bring the crop into fair competition with other crops that utilize less labor. If the present relationships in support prices are maintained for 1945 the desirable acreage for snap beans will be difficult to obtain.

**Barley**

Barley acreage reached an all time high in 1943, but was reduced in 1944. In most irrigated areas in the state barley produces more pounds of feed to the acre than do other small grains. For this reason it was recommended that the 1945 barley acreage be increased by 25,000 acres over the 1944 production.

**Spring wheat**

The acreage of wheat grown for feed on irrigated land should be replaced by barley other than where wheat yields as much or more per acre than barley. Wheat production on irrigated land may be justified in such cases.

**Winter wheat**

The place to obtain more wheat is on dry land where there is no competition from other crops. High prices combined with favorable moisture conditions are causing substantial expansion in dry land wheat. The principal danger in expanding the dry farm wheat acreage is that wheat may be planted under such unfavorable physical conditions that the yields may not be high enough to justify the expense.

**Oats**

Because of the lower yields (pounds per acre of oats compared to barley or wheat) the oat acreage should be reduced except in areas especially adapted for oat production.

**Hay crops**

Hay crops, principally alfalfa of about 500,000 acres, represents the largest
Livestock

During the years 1941, 1942, and 1943 the number of livestock of most kinds in Utah was relatively high and was increasing. Exceptions were horses and sheep which during the past three years declined below the past ten-year average. The high numbers of livestock were made possible by better than average climatic conditions which resulted in better than average grazing resources on ranges and pastures, and above normal per acre yields of feed crops. Also the ratio of feed prices to prices of meat and livestock products has been favorable for an expansion of numbers. This was particularly important and resulted in substantial increases in hog and turkey numbers.

As the better than normal feed supply condition and price relationships cannot be depended upon to continue during 1945 or the succeeding years, some additional readjustment in the numbers of some kinds of livestock seems necessary. In suggesting readjustment in the numbers, national food requirements as well as production resources have been kept in mind. It is suggested that the reduction be made in beef cattle as the ranges are better adapted to sheep. While this is the desirable situation, under present price conditions it is likely that sheep numbers will decline further, but appreciable decreases in beef cattle are not likely. In addition to relieving the ranges somewhat, the decreases in range livestock numbers and cattle put on feed also make some additional harvested feed available for other classes of livestock. Dairy cattle numbers may well be increased to utilize most of it. As a result total numbers of stock cattle and calves probably will not decrease at all under conditions assumed for 1945. However, because of the record high numbers of cattle in the nation and the strong possibility of price declines, together with the pressure of livestock numbers on feed supplies, both in the nation and in the state, it is thought that a moderate reduction in beef cattle numbers would be desirable.

A material reduction in the number of sheep and lambs as well as beef cattle to be placed on feed is also suggested as the feed required for fattening can be better utilized by humans, dairy cows, chickens, or range breeding stock. Only in case of large surpluses of feed is it desirable to finish many cattle or sheep.

The number of hogs expected in 1944 is about adjusted to Utah conditions. Under normal conditions hogs in Utah are grown out to a large extent on non-marketable feeds and with only a few hogs per farm. This is as it should be, and this practice should be encouraged; otherwise, hogs compete directly with dairy cows and chickens for the limited supply of local feed grains. A return to more nearly normal conditions seems to have taken place.

Egg production in Utah has been primarily from commercial producers and has fluctuated in volume with variations in price of eggs and the cost of feed. The trend in numbers has been up during the past few years. However, because of less favorable price relationships and some uncertainty resulting from lower feed reserves, the number expected for 1945 and 1946 is slightly less than for 1944.

Turkey production on a commercial basis has been increasing rapidly since 1935. The industry, particularly in the last few years, has been based on the cheap wheat produced in Utah and southern Idaho and low cost government controlled supplies of grain which have been shipped into the state. Assuming that existing price relationships continue the number of turkeys raised in 1945 and 1946 is expected to continue upward. However, it is likely that for the best balance of livestock and feeds no further increase should take place.

 Utah has about 45,000,000 acres of land used by range livestock. This area by the nature of its topography and climate can never be used for any other agricultural production. It is important, therefore, to plan the agricultural economy of the state to center around this vast natural resource. Sufficient production of livestock feed on the tillable farm land to give efficient balance with range land is important. The trend of grain feeding of dairy cows is upward.

<table>
<thead>
<tr>
<th>Crop</th>
<th>1941 acres</th>
<th>1944 acres</th>
<th>Estimate for 1945 based on 1944 prices Adjusted prices</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sugar beets</td>
<td>42,000</td>
<td>34,000</td>
<td>34,000</td>
</tr>
<tr>
<td>Potatoes</td>
<td>11,200</td>
<td>18,000</td>
<td>19,000</td>
</tr>
<tr>
<td>Dry beans</td>
<td>5,000</td>
<td>12,000</td>
<td>11,300</td>
</tr>
<tr>
<td>Truck crops for processing</td>
<td>24,930</td>
<td>27,400</td>
<td>33,375</td>
</tr>
<tr>
<td>Truck crops for market</td>
<td>5,350</td>
<td>5,845</td>
<td>6,350</td>
</tr>
<tr>
<td>Sugar beet seed</td>
<td>688</td>
<td>469</td>
<td>750</td>
</tr>
<tr>
<td>Vegetable seed</td>
<td>120</td>
<td>1,600</td>
<td>2,000</td>
</tr>
<tr>
<td>Total row crops</td>
<td>89,288</td>
<td>99,314</td>
<td>106,775</td>
</tr>
<tr>
<td>Corn</td>
<td>29,000</td>
<td>26,000</td>
<td>29,000</td>
</tr>
<tr>
<td>Oats</td>
<td>50,000</td>
<td>36,000</td>
<td>51,000</td>
</tr>
<tr>
<td>Barley</td>
<td>133,000</td>
<td>150,000</td>
<td>160,000</td>
</tr>
<tr>
<td>Winter wheat</td>
<td>206,000</td>
<td>231,000</td>
<td>235,000</td>
</tr>
<tr>
<td>Spring wheat</td>
<td>70,000</td>
<td>75,000</td>
<td>70,000</td>
</tr>
<tr>
<td>Rye</td>
<td>5,000</td>
<td>6,000</td>
<td>6,000</td>
</tr>
<tr>
<td>Total cereals</td>
<td>483,000</td>
<td>534,000</td>
<td>551,000</td>
</tr>
<tr>
<td>All tame hay</td>
<td>491,000</td>
<td>491,000</td>
<td>499,000</td>
</tr>
<tr>
<td>Rotation cropland pasture</td>
<td>56,000</td>
<td>59,000</td>
<td>55,800</td>
</tr>
<tr>
<td>Total cropland used for sod crops</td>
<td>547,000</td>
<td>550,000</td>
<td>554,800</td>
</tr>
<tr>
<td>Summer fallow</td>
<td>181,000</td>
<td>211,100</td>
<td>235,100</td>
</tr>
<tr>
<td>Idle cropland</td>
<td>144,800</td>
<td>114,886</td>
<td>73,125</td>
</tr>
<tr>
<td>Total cropland</td>
<td>1,445,088</td>
<td>1,509,000</td>
<td>1,520,800</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Crop</th>
<th>Numbers and production</th>
</tr>
</thead>
<tbody>
<tr>
<td>Horses, mules, and colts</td>
<td>86</td>
</tr>
<tr>
<td>Cattle and calves, all</td>
<td>486</td>
</tr>
<tr>
<td>Cows kept for milk, 2 years +</td>
<td>117</td>
</tr>
<tr>
<td>Other cows, 2 years +</td>
<td>122</td>
</tr>
<tr>
<td>Sheep and lambs, all</td>
<td>2,521</td>
</tr>
<tr>
<td>Ewes, 1 year +</td>
<td>2,098</td>
</tr>
<tr>
<td>Hens and pullets</td>
<td>2,483</td>
</tr>
<tr>
<td>Chickens raised</td>
<td>4,031</td>
</tr>
<tr>
<td>Turkeys raised</td>
<td>1,341</td>
</tr>
<tr>
<td>Sows farrowed, spring</td>
<td>28</td>
</tr>
<tr>
<td>Sows farrowed, fall</td>
<td>23</td>
</tr>
</tbody>
</table>
and may well continue somewhat beyond the present. Most of Utah’s sheep and some cattle receive no farm feed at all unless it is for a limited critical period such as during a heavy snow storm when they cannot graze. Under such emergency conditions it is essential that stocks of feed, usually some concentrate such as corn, cottonseed cake, or pellets, are available.

**BETTER WAY TO ERADICATE NOXIOUS WEEDS**

(Continued from page 7)

barley, so with this crop it was possible to clean cultivate for a period during the spring. The soybeans grow rapidly during the warm weather and act as an excellent smother crop for the weeds on through into the fall. While soybeans have not been very successful as a seed crop in Utah, some farmers might well consider growing them for hay on land infested with whitetop.

In walking over a well managed pasture on land infested with whitetop or morning-glory, one gets the impression that the grasses are killing out the weeds. Upon plowing the land, however, one immediately finds that the weeds are still there. This does not necessarily mean, however, that the pasture has no value in a weed control program. A glance at the figures in the table shows that all of the grasses and pasture mixtures have reduced the weed root populations to less than one-half of those found in the untreated plots. Much of the success from the use of pastures in weed control depends upon the establishment of a good stand of pasture plants and the carrying out of a pasture management program such that a dense, vigorously-growing sod is maintained.

The results of the experiments reported here could be applied in many ways in a whitetop-control program. For rapid and complete eradication of the weed, the program should be built around clean cultivation and the growth of cultivated crops. One suggestive program might be clean cultivation of the land the first year, check planted corn cultivated at regular two-week intervals or as often as necessary to keep down weeds the second year, and sugar beets the third year. Chemicals should be used in the fence lines and along ditch banks that cannot be cultivated. Where immediate eradication of the weeds is impractical, they can be kept under control and their vigor greatly diminished by a rotation such as barley, rotation pasture (or alfalfa for three years), check planted and cross cultivated corn one year, and sugar beets one year. The success of such a rotation will, of course, depend almost entirely on the care exercised in managing the crops. A good farmer might almost eradicate noxious weeds with such a program over a number of years.

### Whitetop Plot Treatments

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Whitetop root dry wt.</th>
<th>Average grams</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Barley</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plowed early spring and planted 1940</td>
<td>0.007</td>
<td>0.007</td>
</tr>
<tr>
<td>Fallowed 1940, planted spring 1941</td>
<td>0.007</td>
<td></td>
</tr>
<tr>
<td><strong>Alfalfa</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plowed early spring and planted 1940</td>
<td>1.623</td>
<td>2.658</td>
</tr>
<tr>
<td>Fallowed and planted August 1, 1940</td>
<td>1.912</td>
<td></td>
</tr>
<tr>
<td>Plowed when whitetop was in bloom and planted July 1, 1940</td>
<td>5.994</td>
<td>2.746</td>
</tr>
<tr>
<td>Fallowed 1940, planted spring 1941</td>
<td>1.381</td>
<td></td>
</tr>
<tr>
<td>Fallowed 1940 and 1941, planted August 1, 1941</td>
<td>0.220</td>
<td></td>
</tr>
<tr>
<td><strong>Smooth bromegrass</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plowed early spring and planted 1940</td>
<td>0.585</td>
<td>1.855</td>
</tr>
<tr>
<td>Fallowed and planted August 1, 1940</td>
<td>5.373</td>
<td></td>
</tr>
<tr>
<td>Plowed when whitetop was in bloom and planted July 1, 1940</td>
<td>2.583</td>
<td></td>
</tr>
<tr>
<td>Fallowed 1940, planted spring 1941</td>
<td>2.129</td>
<td></td>
</tr>
<tr>
<td>Fallowed 1940 and 1941, planted August 1, 1941</td>
<td>0.939</td>
<td></td>
</tr>
<tr>
<td><strong>Reed canary grass</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plowed early spring and planted 1940</td>
<td>1.489</td>
<td>5.683</td>
</tr>
<tr>
<td>Fallowed and planted August 1, 1940</td>
<td>3.191</td>
<td>1.585</td>
</tr>
<tr>
<td>Plowed when whitetop was in bloom and planted July 1, 1940</td>
<td>5.267</td>
<td></td>
</tr>
<tr>
<td>Fallowed 1940, planted spring 1941</td>
<td>0.552</td>
<td></td>
</tr>
<tr>
<td>Fallowed 1940 and 1941, planted August 1, 1941</td>
<td>0.696</td>
<td></td>
</tr>
<tr>
<td><strong>Pasture mixture</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plowed early spring and planted 1940</td>
<td>0.961</td>
<td>2.157</td>
</tr>
<tr>
<td>Fallowed and planted August 1, 1940</td>
<td>3.191</td>
<td></td>
</tr>
<tr>
<td>Plowed when whitetop was in bloom and planted July 1, 1940</td>
<td>5.267</td>
<td></td>
</tr>
<tr>
<td>Fallowed 1940, planted spring 1941</td>
<td>0.552</td>
<td></td>
</tr>
<tr>
<td>Fallowed 1940 and 1941, planted August 1, 1941</td>
<td>0.696</td>
<td></td>
</tr>
<tr>
<td><strong>Sugar beets</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plowed early spring and planted 1940</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Fallowed 1940, planted 1941 and 1942</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td><strong>Corn</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plowed early spring and planted 1940</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Fallowed 1940, planted 1941 and 1942</td>
<td>0.001</td>
<td>0.0</td>
</tr>
<tr>
<td><strong>Soybeans</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plowed early spring and planted 1940</td>
<td>0.028</td>
<td>0.0</td>
</tr>
<tr>
<td>Fallowed 1940, planted 1941 and 1942</td>
<td>0.0</td>
<td>0.014</td>
</tr>
<tr>
<td><strong>Sorghum</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plowed early spring and planted 1940</td>
<td>0.005</td>
<td>0.002</td>
</tr>
<tr>
<td>Fallowed 1940, planted 1941 and 1942</td>
<td>0.0</td>
<td></td>
</tr>
<tr>
<td><strong>Wheat</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fallowed (seeded fall-1940)</td>
<td>0.209</td>
<td>0.105</td>
</tr>
<tr>
<td>Plowed when whitetop was in bloom 1940, seeded fall 1940 and 1941</td>
<td>0.002</td>
<td></td>
</tr>
<tr>
<td><strong>Check</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average</td>
<td>5.683</td>
<td>5.105</td>
</tr>
<tr>
<td>Average</td>
<td>4.527</td>
<td></td>
</tr>
</tbody>
</table>

*The plots were sampled in the spring of 1944 after all plots had been fallowed during 1943 to destroy all crop plants. Each plot was sampled in three places and the data in the table are the average of 9 samples. The smaller the amount of roots the more effective was the treatment.*
TWO years ago the 25th Utah State Legislature made a special appropriation of $75,000 to the Agricultural Experiment Station for the biennium 1943-45. This, with the regular appropriation, made a total of $175,994, an increase in state funds of $86,840 over the previous biennium. Since the 26th Legislature convenes in January, it may be well to make an accounting to the people of Utah of how these funds have been and are being used.

This increased appropriation has made possible the initiation of a number of much needed research and service projects, among which are (1) new horticultural research, (2) sheep management and breeding studies, (3) establishment of the branch veterinary laboratory at Provo, (4) bee loss investigations, (5) production of foundation seed stock of cereals, potatoes, and vegetables, and (6) increased funds for the investigation of tomato diseases.

In June 1943, the Station purchased a 71-acre farm in Pleasant View, just north of Ogden. This farm is located in one of the better fruit producing areas of the state and will be used for (1) the testing of improved varieties of stone fruits in an effort to find those best suited to Utah conditions, (2) the investigating of orchard soil management practices to determine practical methods of maintaining the organic matter content and general fertility level of orchard lands, and (3) the study of irrigation of orchards on steep lands to prevent erosion.

In the spring of 1944 the Station purchased about 1000 head of Rambouillet range sheep. These sheep are being grazed on summer range purchased by the Branch Agricultural College in the mountains east of Cedar City, and on winter range near Modena which has been set aside by the U. S. Grazing Service for experimental purposes. Certain phases of the research program are also being conducted at the Desert Range Station in cooperation with the U. S. Forest Service. Both the range management and the sheep production and management phases of range sheep production are being studied.

In the animal husbandry phase of this study high quality rams are being used to determine the feasibility of developing a superior flock of sheep having smooth body, open face, long staple and producing a high fleece weight of clean wool and a large market lamb. The comparative value and adaptability of high quality Rambouillet and white face crossbred sheep for southern Utah range conditions will also be studied. Another phase of this project is to study the factors affecting the percentage lamb crop and to determine the feasibility of increasing this percentage under range conditions.

In the range management phases of this project an attempt is being made to determine the most efficient method of developing spring and fall pasture for sheep by the use of rye, wheat, and perennial grasses, and likewise the most economical use to be obtained from these pastures following their development. Studies on the summer range are attempting to determine the most economical and practical methods for grazing sheep. Attention is given to conservation of range resources and continued productivity. Similar studies are being made on desert winter range lands in cooperation with the U. S. Forest Service and the U. S. Grazing Service.

Because of the difficulty of sending animal disease specimens from the central and southern parts of the state to the Veterinary Laboratory at Logan, a branch laboratory has been established at Provo to serve the central part of the state in the diagnosis and investigation of livestock and poultry diseases. Another laboratory has also been opened recently in Cedar City especially for testing turkey blood samples for pullorum disease. At present Professor Harold Nelson from the Logan laboratory is in charge of the work.

Another problem being investigated with the special legislative funds is the cause and control of the serious bee losses that have occurred in Utah during the past few years. Control of these losses will not only add to the security of the men engaged in beekeeping, it will also insure more adequate pollination of fruits and other insect-pollinated plants.

A source of high quality, disease-free seed has been a need in the state, especially since the war. The Station has undertaken the responsibility of producing foundation seed of cereals, alfalfa, and other forage crops, potatoes and biennial vegetables. This seed will be increased by approved farmers and certified and distributed through the Utah Crop Improvement Association.

The special state appropriation has also made possible the enlarging of the tomato disease investigations being conducted in cooperation with the U. S. Bureau of Plant Industry as well as the continuance of the weed control investigations. It has also released funds formerly used to support some of these programs for use in other work. These funds have all been used or are now budgeted to investigate problems of great urgency to the prosperity of Utah’s agriculture. Much of the work must have continued support if it is to produce results. There are many other problems that also need solution if agriculture in Utah is to be profitable. Support for research must be continuous.

RESEARCH INVESTIGATIONS SPONSORED BY SPECIAL STATE APPROPRIATION

Another problem being investigated with the special legislative funds is the cause and control of the serious bee losses that have occurred in Utah during the past few years. Control of these losses will not only add to the security of the men engaged in beekeeping, but will also insure more adequate pollination of fruits and other insect-pollinated plants.

A source of high quality, disease-free seed has been a need in the state, especially since the war. The Station has undertaken the responsibility of producing foundation seed of cereals, alfalfa, and other forage crops, potatoes and biennial vegetables. This seed will be increased by approved farmers and certified and distributed through the Utah Crop Improvement Association.

The special state appropriation has also made possible the enlarging of the tomato disease investigations being conducted in cooperation with the U. S. Bureau of Plant Industry as well as the continuance of the weed control investigations. It has also released funds formerly used to support some of these programs for use in other work. These funds have all been used or are now budgeted to investigate problems of great urgency to the prosperity of Utah’s agriculture. Much of the work must have continued support if it is to produce results. There are many other problems that also need solution if agriculture in Utah is to be profitable. Support for research must be continuous.

GRASS

Grass is the forfiveness of nature—her constant benediction. Fields trampled with battle, saturated with blood, torn with the ruts of cannon, grow green again with grass, and carnage is forgotten. Streets abandoned by traffic becomes grass-grown like rural lanes, and are obliterated. Forests decay, harvests perish, flowers vanish, but grass is immortal. Beleagured by the sullen hosts of winter, it with stands the rude outline of the world. Its tenacious fibres hold the earth in its place, and prevent its soluble components from washing into the wasting sea. It invades the solitude of deserts, climbs the inaccessible slopes and forbidding pinnacles of mountains, modifies climates, and determines the history, character and destiny of nations. Unobtrusive and patient, it has immortal vigor and aggression. Banished from the thoroughfare and the field, it bides its time to return and when vigilance is relaxed, or the dynasty has perished, it silently resumes the throne from which it has been expelled, but which it never abdicates. It bears no blazonry or bloom to soften the rude outline of the world. Its tenacious fibres hold the earth in its place, and prevent its soluble components from washing into the wasting sea. It invades the solitude of deserts, climbs the inaccessible slopes and forbidding pinnacles of mountains, modifies climates, and determines the history, character and destiny of nations. Unobtrusive and patient, it has immortal vigor and aggression. Banished from the thoroughfare and the field, it bides its time to return and when vigilance is relaxed, or the dynasty has perished, it silently resumes the throne from which it has been expelled, but which it never abdicates. It bears no blazonry or bloom to charm the senses with fragrance or splendor, but its homely hue is more enchanting than the lily or the rose. It yields no fruit in earth or air, and yet should its harvest fail for a single year, famine would depopulate the world.—John James Ingalls.
SAFFLOWER, A POSSIBLE ECONOMICAL OIL-SEED CROP FOR UTAH

By D. W. PITTMAN

The popular interest in soybeans as an oil-seed crop, coupled with the fact that the returns from soybeans as grown here do not seem to justify the use of the good land and plentiful irrigation water for their production, prompted the trial of some other oil-seed crop.

Safflower (Carthamus tinctorius L.) is a desert oil-seed crop that has long been grown in the Near East on hot desert areas where there is a small quantity of irrigation water available. The oil is used as a cooking oil, especially with rice, and also for soap and for paint. The press cake from hulled seed is said to be very similar as a feed to that from soybeans. If the seed is not hulled before extracting, the cake is high in crude fiber but good for cattle or sheep. In the Orient, safflower is also used as a source of dye similar to saffron.

The plant is rather branchy and broad-leaved, about two feet tall, with orange-colored flowers on the ends of the branches somewhat resembling an aster, to which plant it is related. The edges of the leaves and flower heads are set with small but very sharp spines. So sharp are these spines that it is rather painful to walk through a field of safflower. There are thornless varieties, but the yield of seed of these is said to be small. The seed resembles small, peg-shaped sunflower seed.

Safflower seed was obtained from Frank Rabak, associate biochemist of the Division of Drug and Related Plants, U. S. Bureau of Plant Industry, Soils and Agricultural Engineering, who has tried it in different semi-arid regions for some time. This seed has been grown at the Huntley, Montana Experiment Station of the U. S. Department of Agriculture.

The seed was drilled at the rate of about 60 lbs. per acre on May 13. During the cool, wet weather of May and early June, the plants grew slowly and it seemed as though they might be submerged under a dense growth of foxtail grass, but about July 1, when the weather turned hot and dry, they quickly grew to full height and largely crowded out the grass.

The original intention had been to grow the crop without irrigation, but on July 29 and again on Sept. 1, the plants were dry so they were irrigated.

On each of these dates a moderate stream of water was hurried rapidly over the patch with no time allowed for soaking, and it is doubtful if the patch had more than 4 or 5 inches of irrigation water altogether.

The crop was slow to mature but because the stiff stems and hard heads seemed proof against lodging or shattering, it was left standing in the field till Sept. 30. An attempt to cut the crop with a binder was not successful. The stiff, thorny plants rolled up the canvasses like tumbleweed and the bundles were uneven. However, a small combine harvested the crop quite easily.

The yield of the safflower seed was 1360 lbs. or 31.8 measured bushels per acre. (The actual weight was 42.7 lbs. per bushel.) Since safflower, like soybeans, is said to be about 20 percent oil, this compares favorably with the 1500 pounds or 25 bushels per acre which is the highest yield from soybeans obtained here. However, the soybeans were grown on well manured land adjacent to 22-ton per acre sugar beets, and had about 25 to 30 inches of irrigation water, while the safflower was grown on unmanured land adjacent to 7-ton sugar beets and had only about 5 inches of irrigation water.

The hard stems and thorny leaves of safflower seem to have no value except as fertilizer and without a processing plant the seed is probably of little value, except perhaps as poultry feed. If there really is a demand for vegetable oil for cooking or for paint, then from this trial it would seem feasible to produce large quantities quite economically from safflower on land that has only a little irrigation water available.

More information about safflower in general can be obtained from U. S. Department of Agriculture Circular No. 366 (1935) by Frank Rabak.

Professor D. C. Tingey, research associate professor of agronomy, has returned to the campus. For the past two years, Professor Tingey has been connected with the Bureau of Plant Industry, Soils and Agricultural Engineering in the guayule research work, with headquarters at Salinas, California. Although Professor Tingey will maintain an office on the campus, he will complete the analysis of his research data for the government before taking over his work here.

A. Branch with spine-like leaves of Russian-thistle, which gradually taper to a point. B. Branch with fleshy leaves of halogoten which end abruptly in a hair-like point.
VALUE OF VACCINATION IN CONTROL OF BANG'S DISEASE
Scientist Explains Limitations in Use of Vaccine

By C. W. RIGGS

T
de United States Department of Agriculture has conservatively estimated that the annual loss in the United States from Bang's disease in cattle alone amounts to $30,000,000. Add to this the human sickness and deaths resulting from undulant fever, contracted from cows with Bang's disease, and it is easy to understand why this disease ranks first in importance on the list of infectious diseases of livestock.

Years of extensive research and field trials by the U. S. Bureau of Animal Industry have led to the production of a vaccine for use against Bang's disease which has proved highly effective in protecting cattle from calphood to at least 6 or 8 years of age. Used properly, this vaccine is a valuable weapon in the fight against Bang's disease, or brucellosis as the disease is scientifically known. Used improperly, the vaccine is useless, and may even cause abortion in cows. Furthermore, it may cause adult animals to become reactors to the tests for brucellosis.

Proper Use of Vaccine

What then is the proper way to use the vaccine? Experience has shown that the best time to administer it is when calves are between four and eight months of age. Younger animals will not develop a satisfactory immunity, while older animals are likely to remain reactors to the test after vaccination. If a reliable brand of vaccine is used at the proper age, calphood vaccination is a definite success as a preventative measure.

When Not to Use Vaccine

Under what conditions should vaccine not be used? It should not be used on older cattle except in certain unusual cases. Records show that the vaccine, given to a pregnant cow, may actually cause an abortion. Recently, it has been demonstrated that the Strain 19 organisms in Bang's vaccine may cause undulant fever in man. These organisms are shed in the milk of cows vaccinated when lactating. Cows which are vaccinated as adults may remain positive to the test for years, so that when occasion arises to have a herd tested, individuals will react to the Bang's test and are therefore classed as dangerous and unfit for breeding, interstate shipping, shows, sales, or production of market milk. They cannot be sold as Bang's free animals, although the owner feels the reaction to the test is solely the result of vaccination. The test will not differentiate between animals reacting because of the natural, virulent brucella organism, and animals reacting as a result of vaccination.

Vaccination Will Not Cure Bang's Disease

Certainly an infected animal should never be vaccinated. Such a practice is worthless and dangerous in that it gives a false sense of security. A naturally infected animal becomes immune to Bang's disease without vaccination. Most cows having the disease abort only their first calf, and a very few their second. But the immunity of the cow merely allows her to harbor and spread the brucella organisms without herself showing any ill effects. She may still spread the disease to other cows and even to humans through her milk. Many men are convinced that vaccination is valuable in sterility cases. It is easy enough to see where they might draw such a conclusion, and logical to see why this is incorrect. These men have cows which lose a calf from Bang's disease. They vaccinate the cow and she carries her next calf to full term; therefore, they conclude, vaccination cured her. They do not realize that the cow would have carried her second calf even without vaccination, nor do they realize that a vaccinated but infected cow is still a dangerous spreader. There is no known cure for brucellosis. The best thing to do with a reactor is to sell her for beef. Second best is to keep her isolated from the rest of the herd. If a program of testing, removing reactors, and vaccination of calves is faithfully followed, Bang's disease may be safely and surely eliminated from a herd.

THE AUTHORS

Dr. W. P. Thomas, head of the Department of Agricultural Economics, is chairman of the committee on agricultural production goals for the state. Each year since the beginning of the war, this committee, like similar committees in the other states, has worked out production goals for essential food and fiber products. These goals have been based upon requirements to meet civilian, military and lend-lease needs, upon agricultural resources available in the state, and upon price relationships. After the recommendations are drawn up by the committee, they are submitted to Washington and then to a large group of men from state, federal and other agricultural organizations in the state before they are adopted.

Professor C. J. Sorenson, research associate professor of entomology, has worked very closely with the late Dr. W. W. Henderson since 1926.

Dr. A. L. Stark, formerly research professor of horticulture, resigned October 1 and is now director of agricultural research and information, Wasatch Chemical Company.

Dr. R. J. Evans, professor and head of the Agronomy Department, has directed the state weed control program, and also the research work on weed eradication, for a number of years.

This is the second article on weeds written by Professor Arthur H. Holmgren of the Botany Department for Farm and Home Science. The December issue, a year book, contains a more detailed account of the new poisonous weed, halogoton, that is invading western ranges and has already become the cause of extensive livestock losses in Nevada.

Dr. I. F. Edwards, assistant research professor of animal husbandry, and Dr. L. A. Stoddart, research professor of range management, are cooperating in range livestock studies. This article discusses the work being done on the summer range in Logan Canyon. Another study is being made on spring-fall range in the Benmore area in Tooele County.

Professor D. W. Pittman, associate professor of agronomy, spent the three years from 1940 to 1943 in Iran where he saw safflower grown in an arid climate similar to that of Utah.

Dr. C. W. Riggs, acting head of the Department of Veterinary Science, is a graduate of Colorado State College. He has been a member of the staff since January 1943.

CONTENTS

Agricultural production in Utah 1945, by W. P. Thomas............................................. 1
Department of Dairy Husbandry and Manufacturing.............................................. 2
The alfalfa seed production problem.......................................................... 3
Research in agriculture................................................................................. 4
William Williams Henderson........................................................................ 4
A fruit pollination—a problem in Utah, by A. L. Stark................................. 5
Is there a better way to eradicate noxious weeds, by R. J. Evans............... 7
Weeds that may become noxious, by Arthur H. Holmgren......................... 8
New range cattle experiment initiated, by I. F. Edwards and L. A. Stoddart. 10
Research investigations sponsored by special state appropriation.............. 14
Safflower, a possible economical oil-seed crop for Utah, by D. W. Pittman... 15
Value of vaccination in control of Bang's disease, by C. W. Riggs............. 16