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PROGRESS REPORT OF THE STATE EXPERIMENT FARMS

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In cooperation with U.S. Department of Agriculture.
PROGRESS REPORT OF THE STATE EXPERIMENT FARMS

By W. L. QUAYLE

Although the non-irrigated experiment farms in the eastern part of the state suffered from lack of moisture, the experiment farms in the western part of the state, which are all irrigated, received more moisture than normal. Heavy rains in August were recorded for the experiment farms in Sweetwater, Lincoln, and Uinta Counties. This additional moisture made good yields of crops. Some damage to hay was incurred at the experiment farm in Lincoln County due to frequent rains while the fields were being harvested.

On the Experiment Farm in Washakie County water was ample and all crops made an excellent growth during the season. Very satisfactory yields were harvested from commercial fields, as well as from experiment plats.

STATE EXPERIMENT FARM NEAR AFTON
IN LINCOLN COUNTY

The State Experiment Farm near Afton in Lincoln County comprises 200 acres of gravelly loam at an elevation of approximately 6200 feet. The average precipitation is 14.76 inches, and the frost free period is 48 days.

Improvements on the farm consist of a six-room modern cottage, modern dairy barn and milk house, two stock sheds, hog house, garage, horse barn, large blocks of trees, and landscaped grounds.

The experimental program includes methods of handling dairy cattle for milk production, testing of various rations, pasture experiments, feed crop experiments, calf raising tests to determine most economical rations, and tests with trees, fruits, and vegetables.

Since this experiment farm is located in a section where dairying is an important enterprise, projects related to the dairy industry constitute the greater part of the experimental work.
The dairy herd was started in 1927 by purchasing cows from local dairymen. The annual butterfat of the herd has increased since that time from 280 pounds per cow to 400 pounds per cow. This increase has resulted largely from careful selection of cows and the use of good sires. The improvement in this herd makes possible the distribution of high-grade breeding stock to dairymen.

NATIVE MEADOW HAY COMPARED WITH ALFALFA

One lot of cows fed on alfalfa hay and grain produced over a three-year period an average of 42 pounds of milk per head daily. Another lot receiving the same amount of native hay and the same amount of grain as the alfalfa lot produced an average of 37 pounds of milk per head daily. The cows on alfalfa hay lost a small amount in weight. Those on native hay each gained .4 pound per head daily. No other differences were noted in the behavior of the animals.

GRAIN IN THE DAIRY COW RATION

Feeding grain to milk cows in addition to alfalfa hay and pasture resulted in an average four-year milk yield per cow of
11,179 pounds with a butterfat equivalent of 382 pounds. Another lot of cows which received no grain, but which was fed on alfalfa throughout the winter and was on pasture only during the summer, showed an annual milk yield per cow of 10,498 pounds with a butterfat equivalent of 370 pounds.

The grain ration was ground barley fed at the rate of one pound daily to six pounds of milk produced. Little difference has been noted in the weight of the cows.

This test is being continued to determine more accurately the effect of grain on the butterfat yield and the general condition of the animals.

**OPEN SHED COMPARED WITH MODERN BARN STANCHIONS FOR MILK COWS**

This test has continued one year. The results show no significant differences in the milk and butterfat yields of the two lots of cows. The cows in both lots used equal amounts of grain, but those in the open shed consumed a little more hay, and they have shown a slight increase in the production of butterfat, a fact which made the feed cost per pound of butterfat the same for both lots. The cows in the open shed made an average daily gain in body weight of .3 pound per head, and those in the modern stanchions showed a slight loss in weight. It required considerably more bedding to keep the cows clean in the open shed than was used for the cows in stanchions.

**PASTURE MIXTURES**

To answer the frequent inquiries concerning the productivity of various pasture mixtures, a test was started in 1933 with various mixtures of pasture grasses. One series of the plats was manured at the rate of 20 yards per acre, and the other series was cropped without any application of fertilizer.

Some of the mixtures made exceedingly heavy yields the first two years of the test, and then tended to decline in production, while other mixtures continued to make gradual increases from year to year. Where no manure was applied the highest yield, averaged for four years, was 5822 pounds of air-cured hay. This
mixture consisted of orchard grass, Kentucky blue grass, and Alsike clover. The lowest yield was 4548 pounds per acre where timothy, white clover, and orchard grass constituted the mixture. This mixture, when manure was applied, showed an average yield of 8905 pounds, which was the largest average yield for any of the mixtures under the application of manure.

The average of the six different mixtures that were compared in this test shows that the application of manure increased the total yield practically 50 per cent per acre. The four-year average for all the manured plats was 7531 pounds per acre and for the non-manured plats, 5008 pounds per acre. These plats were cut twice each year in computing hay yields. If the increase in the hay due to manure, 2523 pounds per acre, is figured at $8.00 per ton, it will be noted that the manure made a return of $10.00 for each acre in increased hay yields. It is of interest in this connection to note that crested wheat grass tended to disappear after two or three years when seeded alone or in combination with other grasses.

**RENOVATION OF PERMANENT PASTURES**

Land that had been in permanent pastures for some 25 years without any treatment was used in this test. The land is a shallow gravelly loam, underlain with coarser material. Five plats were used in the test. On one of them manure was applied each year at the rate of 20 yards per acre and distributed by means of a brush drag. The next plat had the same amount of manure applied and was cultivated with a stiff shank cultivator. The stiff shank cultivator was used on the third plat, and the fourth plat was double disked each year. Compared with the check plat, which received no treatment, the application of manure showed the greatest improvement.

Averaged for 4 years the yield of cured hay on the manured plat was 4672 pounds per acre and the check plat produced only 2804 pounds. Cultivation had a depressing effect upon the yield. Where manure was applied together with cultivation, the yield showed 3754 pounds per acre. Where the stiff shank cultivator alone was used, the yield was 2010 pounds, and where the plat was
double disked, the yield was 1656 pounds per acre. In all years
but one during the test the cultivated plat showed a smaller yield
than the check plat, and in all years of the test the application
of manure alone gave greater yields than did manure combined
with cultivating.

It seems quite clear from this work that in the renovation of
pastures, such as the one where this test was made that manure
should be applied in liberal quantities. Comparing the plat which
received the application of manure and the plat receiving no treat-
ment the increase was 67 per cent in favor of the manure.

ALFALFA VARIETIES

Grimm alfalfa, Cossack, and Common, averaged for 4 years,
each showed a yield of more than 9000 pounds of cured hay per
acre. Grimm produced the highest, 9945 pounds per acre. In
1936 this variety made a yield of 12,355 pounds per acre. Cossack
was a very close second with an average for the four years of 9663
pounds, and in 1936 it yielded 12,344 pounds, a little over 6 tons
per acre.

Ladak and Modac Chilian have been in the test the last two
years and show an average of 10,715 pounds and 8129 pounds per
acre, respectively.

There was no apparent difference in the quality of hay or the
winter survival of the several varieties.

GRASS SEEDED WITH ALFALFA

Many dairymen have requested that tests be made with mix-
tures of alfalfa and various grasses for the purpose of determin-
ing whether greater hay yields may be had from these mixtures
than from alfalfa seeded alone. To answer this question grass
seed was drilled with Grimm alfalfa beginning in 1934. The
yields are computed for 1935 and 1936. Ten pounds of alfalfa
seed and five pounds of grass seed were used per acre in this test.

A mixture of orchard grass and alfalfa gave an average yield
in two years of 9995 pounds of hay per acre. Alsike clover when
seeded with the Grimm alfalfa produced 8949 pounds per acre.
A mixture of brome grass and Grimm alfalfa produced 8251, and
alfalfa and timothy produced 7904 pounds per acre. None of these yields from the mixtures of alfalfa and grass were equal to the yields of alfalfa when seeded alone. The yield of Grimm alfalfa without any addition of grass was 11,392 pounds per acre, averaged for the last two years.

RENOVATING ALFALFA FIELDS

Alfalfa fields were quite different from grass meadows in their response to cultivation. A check plat of alfalfa, averaged for three years, gave a yield of 9697 pounds per acre. Where the plat was cultivated with the stiff shank cultivator, the yield was increased to 10,415 pounds per acre, and where manure and cultivation were both used on the same plat, the yield was 11,344 pounds per acre.

Only in one year did cultivating depress the yield compared with no treatment. The application of manure and cultivating increased the yield every year during the trial. In this case manure was added at the rate of 20 yards per acre.

GRAIN VARIETIES

Oats. Seven oat varieties have been grown in comparison for five years. There has been a considerable variation in yields during this time, but it is apparent that early maturing varieties are most dependable and give larger yields. The five-year average showed 59.5 bushels per acre for Logan. In 1936 this variety produced 73.1 bushels per acre. A severe hail storm in 1935 reduced the average yield of all varieties very materially. In 1936 Idamine and Gopher were high varieties with recorded yields of 83 bushels per acre each. A number of other varieties produced over 75 bushels per acre. Swedish Select, a variety which has been used by the farmers in that part of the state for a number of years, averaged 41.8 bushels per acre. Its highest yield was 63 bushels per acre in 1932. In that year several of the other varieties exceeded it in yield.

Barley. Improved varieties of barley have been grown for a number of years on the Lincoln County Experiment Farm, and the seed has been widely distributed to farmers and ranchers. The
five-year average yield of Coast barley, which has been a standby for many years, was 52.3 bushels per acre. Its highest yield was 79.0 bushels per acre in 1933. Trebi barley, which was recently introduced by the experiment farm, averaged 52.4 bushels per acre. Haanchen, another variety which the farm has introduced, averaged 49.9 bushels per acre during the five years. In 1936 the highest yield was 78.3 bushels per acre from Horn, which is a comparatively smooth-awned variety, and for this reason is preferred to Coast which has harsh beards. Smyrna barley, which has become quite popular in the Star Valley, has a four-year average yield of 57.5 bushels per acre. Its highest yield was 71.7 bushels per acre in 1936. Several other varieties have been grown for one year. Compared with oats, the pounds of grain produced per acre is considerably more for barley than it is for the oats.

To test grain varieties under practical farm conditions, varieties of oats, wheat, and barley were grown on two private farms, one at each end of the Star Valley, for the purpose of determining the desirability of these grains under conditions as they obtain on commercial farms. Some of these varieties made a showing considerably better than the sorts which are in general use. Desirable varieties are being increased by the experiment farm so that seed of these varieties can be distributed to farmers and ranchers.
ARCHE Field Station

The experiment farm is near Cheyenne in Laramie County. It comprises 880 acres of sandy loam at an elevation of approximately 6000 feet. The average precipitation is 11.97 inches, and the frost free period is 127 days.

Improvements on the farm consist of a superintendent's cottage, foreman's house, bunk house, mess hall, office, horse barn, dairy barn, two granaries, two silos, cattle sheds, and large blocks of trees.

The experimental program is carried on cooperatively by the state and the U.S. Department of Agriculture. It includes crop rotations and cultural practices, varietal tests of cereals and forages, tests with shelterbelts and fruits, weather data, and experiments with livestock including dairy cattle and sheep.

The Effect of Tillage on Crop Yields

In one set of rotations the crops are corn, spring wheat, and oats. In the first one the corn stubble is disked for the spring wheat, and in the next rotation spring plowing is used for each crop, and in the third rotation fall plowing is used for each crop. Over a period of 22 years the results show that the yield of wheat
averaged 12.1 bushels when it was seeded on disked corn stubble, 10.6 bushels when it was seeded on spring plowing, and 7.8 bushels when it was seeded on fall plowing.

The value, of course, of any rotation is measured by the total yield of all crops in the rotation over a period of years. To simplify such a method of measurement, all crops may be reduced to a common denominator in terms of wheat.* Reducing the three crops in the first rotation to a wheat equivalent averaged for all of the years, the yield is 10.1 bushels per acre, when the wheat is drilled on disked corn stubble. The total average yield per year of the rotation when all the crops were on spring plowing was identically the same, 10.1 bushels per acre. But when this three-year rotation is produced on land that is fall plowed for each crop, the total average yield of the rotation in terms of wheat is 7.0 bushels per acre.

WHEAT AND OATS FOLLOWING CORN

Two rotations which are identical, except in the order of sequence of the crops, show that greater yields are obtained when the rotation is corn, spring wheat, oats rather than corn, oats, spring wheat. The total average wheat equivalent of the three crops when they were in the order of corn, wheat, oats, was 10.1 bushels per acre, averaged for 22 years. When the order was corn, oats, spring wheat, the total average wheat equivalent was then 8.7 bushels per acre. In both cases spring plowing was used for each crop every year.

FALLOW IN THE ROTATION

In a rotation in which the sequence is fallow, spring wheat and oats, the total average yield in terms of wheat equivalent was 7.7 bushels per acre.

When the order of the crops was fallow, oats, and spring wheat, the crop equivalent in terms of wheat was 6.6 bushels per acre. In both cases the crop preceding the fallow was on fall plowed land. A comparison of these yields with the yields in ro-

*The wheat equivalent of the various crops, as used in this discussion is an adaptation from United States Department of Agriculture Miscellaneous Circular No. 81.
tations where corn took the place of fallow shows that in terms of wheat equivalent the rotation which consisted of fallow, spring wheat, and oats produced an average of 2.4 bushels less per acre than the rotation of corn, wheat, and oats. In these calculations the cost of preparing and caring for the fallow is one-half that required for producing a crop on a similar area.

**TWO-YEAR ROTATIONS**

A rotation of corn and oats compared with a rotation of corn and spring wheat shows the latter has a total wheat equivalent of 12 bushels per acre and that corn and oats have a wheat equivalent of 10.1 bushels per acre. Both of these rotations have the corn on fall plowed grain stubble and the spring wheat is seeded on disked corn stubble. This difference of practically two bushels per acre in favor of corn and wheat compared with corn and oats is a very appreciable one when it is translated into terms of a commercial farm unit. It might easily be the difference between success and failure in a dry-farming enterprise.

**CORN AND FALLOW IN A ROTATION**

A pair of four-year rotations include corn and fallow in each.

When the sequence of crops was corn, oats, fallow, and spring wheat, the average wheat equivalent yield was 10.5 bushels per acre. In the rotation in which the sequence was corn, wheat, fallow, and oats, the average wheat equivalent yield was 9.6 bushels per acre.

**THE EFFECT OF MANURE ON NON-IRRIGATED CROPS**

Some of the rotations which have continued 11 years show that the application of barnyard manure is of special value in the production of potatoes. These rotations consist of corn, potatoes, beans, and spring wheat. Where all plats were manured at the rate of 10 seventy-five-bushel loads per acre and the seed-bed preparation consisted of duckfooting for each crop, the nine-year average wheat equivalent for the rotation was 15.0 bushels per acre. When the plats were all treated the same, except that they
were spring plowed instead of duckfooted the average wheat equivalent for the rotation was 13 bushels per acre. This comparison shows that duckfooting, which is a cheaper method of seed-bed preparation, produced two bushels more per acre than did spring plowing.

Where no manure was applied and when all the plats were duckfooted, except corn which was seeded on spring plowing, the average wheat equivalent was 13.3 bushels per acre. Disking the wheat on corn ground and fall plowing for the corn gave the lowest yield in terms of wheat which was 10.1 bushels per acre.*

The results of these rotations show that the application of manure greatly increased the yield of potatoes, and contrary to popular opinion, did not increase the amount of scab on the tubers. Superintendent Nelson draws the following conclusions from rotation work that is now going on at the Archer Field Station:

1. That the production of corn is essential to the economical production of wheat and oats.
2. That the production of wheat is more profitable than the production of oats.
3. That a rotation of corn and wheat is more profitable than a rotation of corn, wheat, and oats.
4. That a four-year rotation, in which row crops are grown three years and wheat is grown one year, is more profitable than a two-year rotation of corn and wheat.
5. That plowing is not a vital factor in crop production.
6. That under dry-land conditions manure is of more importance in the production of potatoes and wheat than is plowing. Plowing is more important in the production of corn than manure. Manure and plowing are of about equal importance in the production of beans.
7. Fallow is not adapted to the production of spring wheat and oats; however, it is adapted to the production of winter wheat.

*The wheat equivalent for potatoes and beans was computed by Superintendent A. L. Nelson.
STATE EXPERIMENT FARM NEAR EDEN IN SWEETWATER COUNTY

The State Experiment Farm near Eden in Sweetwater County comprises 160 acres of light sandy loam with water right. The elevation is 6600 feet. The average precipitation is 6.28 inches and the frost free period is 81 days.

Improvements on the farm consist of a five-room cottage, machine shed, two granaries, lamb-feeding pens, dairy barn, and large blocks of trees.

The experimental program includes varietal tests with grains and forage crops, weed control, tests with various pasture mixtures for dairy cattle, fertilizer tests, tests with methods of handling dairy cattle, trees for shelterbelts and home fruits, livestock experimental feeding, and tests in the use of irrigation water for crop production.

PASTURE GRASSES

Ten different pasture mixtures were seeded in the spring of 1936. All of the mixtures have made a splendid growth for the first year and give promise of solving the pasture problem which is of particular interest to the dairy industry of Sweetwater County and similar areas.
ROTATIONS

A number of rotations dealing with the principal crops grown in this section of the state were started three years ago. Unusual drought conditions have limited yields in these various rotations. They are too new to determine just what sequence of crops is most valuable.

It is noted in those rotations where manure is applied at the rate of 16 loads per acre that a very marked increase is obtained in yields as compared with rotations where only a legume crop such as sweet clover is used.

Potatoes in rotation with barley produced 150 bushels per acre.

A five-year rotation consisting of three years of alfalfa and two years of barley gave yields of more than two tons per acre of alfalfa and 1830 pounds of barley grain per acre.

In a similar rotation where peas and oats were seeded instead of barley the yield of the mixed grain was 2265 pounds per acre in 1936.

GRAIN VARIETAL TESTS

For the purpose of obtaining higher yielding grain varieties, tests are under way with oats and barley. These grains are the principal ones grown in that part of the state where the experiment farm is located and are used primarily for the feeding of dairy cattle and also for wintering sheep on the surrounding range country.

Oats. Of seven oat varieties Wisconsin No. 5 produced 20 per cent more grain than the variety which has been used for a number of years by local farmers. Markton, another oat which was introduced by the experiment farm, also produced a substantial margin in yield above the varieties commonly grown. Seed from these better producing sorts is distributed to farmers and ranchers for their own fields.

Barley. Of seven barley varieties, Trebi produced considerably more grain than the variety commonly used in that part of the state. Two of the varieties exceeded the locally grown vari-
eties in the point of straw yield. Horn barley, which has been introduced by the experiment farm, produced a fine quality of grain. The straw of this barley, which has soft beards is eaten readily by livestock. These varieties are being increased for seed distribution.

FERTILIZERS

The application of 10 loads per acre of barnyard manure on land which was seeded in 1936 to alfalfa with a nurse crop of barley produced 2247 pounds of grain per acre. Where 100 pounds of phosphate was used, the grain yield was 2640 pounds per acre. The check plat which had received no fertilizer gave a yield of 1780 pounds of grain.

On old alfalfa fields the application of 100 pounds of phosphate per acre increased the yield of alfalfa for one year, 1936, 275 pounds per acre.

WEED CONTROL

A test to determine means of combating quack grass in badly infested fields was started in 1936. A plat of four and one-half acres infested with a 75 per cent coverage of quack grass was plowed May 28. Since that time it has had a total of 24 cultivations. The disk harrow was used six times and the springtooth harrow has been used for the remainder of the time. The cultivations were made about one week apart, or often enough to prevent any vegetative growth showing above the surface of the ground.

Although the season was an exceptionally wet one, it appears that the cultivation has been successful in checking all surface growth and destroying a great many of the roots. However, it is the plan to keep this plat in clean cultivation for one more season so as to make a complete kill of all quack grass on the field.

CHEMICAL TREATMENT FOR WHITE TOP

Two small plats infested with white top were treated, one with a chemical spray of calcium chlorate and the other with clean cultivation. Two years of work upon these plats succeeded in making a complete kill of the white top within the confines of the plats.
Trees on the Dry Farm Check the Sweep of Storms.

TREES

Twenty-five varieties of trees and willows were set out in 1934 for the purpose of determining those most suitable for wind-break and shelterbelt purposes. There were 25 trees planted of each variety. At the close of the third year there were several varieties that have maintained their original number in a thrifty condition. These include lance-leaf cottonwood, black cottonwood, several willows. Some of these trees have made a growth in one year, 1936, of 7 feet. These particular trees which have just been mentioned seem to be very well adapted to this part of the state. Buffalo berry, native birch, and honey locust have shown the greatest losses of any of the varieties tried. Of the various conifers the limber pine, ponderosa pine, western red cedar, and Colorado spruce have all shown evidence of adaptability.
STATE EXPERIMENT FARM NEAR GILLETTE IN CAMPBELL COUNTY

The State Experiment Farm near Gillette in Campbell County comprises 160 acres of land, the soil of which varies from a light sandy loam to a medium clay loam. The elevation is 4500 feet. The precipitation averages 13.15 inches, and the frost free period is 132 days.

Improvements on the farm consist of superintendent’s cottage, garage, poultry house, barn, machine shed, exhibit hall, large blocks of trees, and feeding corrals.

The experimental program includes corn improvement, production of alfalfa seed, varietal tests with small cereals, tests with forage crops, potatoes, and beans, tillage methods, crop rotations, feeding and fattening swine, feeding lambs, poultry work, demonstrations of shelterbelt plantings, and fruit and vegetable gardening.

TREES

In 1927 the first trees were planted on this experiment farm. Trees have been added to this original planting each year until 7000 trees have been set out. The severest losses occurred in the year of 1936, but even so, there remains at the end of the season nearly 80 per cent of the total plantings. These trees have all made a splendid growth and are a demonstration to farmers and ranchers of what can be done toward beautifying a homestead and protecting buildings and gardens. The varieties that are most resistant to severe conditions appear to be Russian olive, caragana, green ash, Chinese elm, American elm, and box elder. Of the conifers the western yellow pine is recommended as most suitable for windbreak purposes.

GARDENS

The application of small amounts of water from a windmill has proved that garden vegetables may be grown even in the driest years. In the garden which is irrigated occasionally by water from a windmill, practically all vegetables made a good yield in 1936. Bison tomatoes produced at the rate of 312 pounds per 100 feet of row. Cabbage produced 40 pounds for the same length of row. Carrots produced 115 pounds per 100 feet of row, cucumbers, 300 pounds, and crook neck squash, 100 pounds.
Another garden which receives no well water, but which is
grown upon summer fallowed land each year, shows by compar-
ison with the irrigated garden that some yields of certain vegetables
can be had in years even as dry as 1936 when the rainfall during
the growing season was one-third of normal. In this garden
Bison tomatoes per 100 feet of row produced about 25 per cent
as much as they did where windmill irrigation was used. Fair
yields were realized from varieties of summer squash and Hub-
ard squash and pie pumpkins, as well as from Swiss chard and
leaf lettuce. Considerably larger yields could have been harvested
except that grasshoppers destroyed portions of these gardens.

The results have proved conclusively that a home garden on
our dry farms will, by means of a little water from a pump, sup-
ply sufficient vegetables for the kitchen in the most severe sea-
sons. In most years good yields can be obtained from a garden
which is planted on fallow land. Both of these gardens were
protected by windbreaks.

CORN

Corn varieties in 1936 made yields varying from 3 bushels to
10 bushels per acre. The highest yield, 10.3 bushels per acre, was
from a plat of Falconer planted May 26 in 42-inch rows with
furrow openers. It was planted on barley stubble which had been
spring plowed. The average yield for this particular plat over
six years, which includes a number of droughty ones, is 13.75
bushels per acre.

Seed-Bed Preparations. The highest yield for different seed-
bed preparations in 1936 was 10 bushels per acre when the corn
was listed on spring disked barley stubble. However, the high-
est 5-year average yield is 15.6 bushels per acre when the corn
is furrow planted on spring plowing 10 inches deep. Spring plow-
ing 5 inches deep shows an average yield of 15.3 bushels per acre
for five years. For 1936 the 10-inch plowing produced 7.5 bushels
per acre and the 5-inch, 6 bushels per acre. The extra yield from
deep plowing ordinarily does not pay the extra cost of the work.
Planting Dates. Planting Falconer corn at two-week intervals from April 15 to June 15 shows the best yield is obtained by planting June 1, averaged for five years. However, in the dry, hot season of 1936, June 15 gave a slightly higher yield than planting two weeks earlier. All corn was planted with the corn planter with furrow openers attached.

FORAGE CROPS

Annual forage crops have produced greater yields than has alfalfa, averaged for five years. For this period of time Sudan grass produced 1946 pounds per acre. Rainbow flint corn has given a total yield of 2371 pounds per acre, averaged for the same length of time. Hershey millet produced 1387 pounds, amber cane, 1320 pounds, white wonder millet, 1690 pounds, Siberian millet, 740 pounds, and alfalfa from the best yields has averaged 1010 pounds per acre. In 1936 Sudan grass produced 1320 pounds when seeded at the rate of 15 pounds per acre on summer fallow. The two-year average yield of this same plat for 1935 and 1936 is 1482 pounds to the acre.

ROTATIONS

The average of ten years of rotations shows that spring wheat grown continuously on the same ground which is spring plowed has a yield of 8.92 bushels per acre. Where it was grown alternately with summer fallow, the yield was 13 bushels per acre. Oats on summer fallow has an average yield for ten years of 22.98 bushels per acre.

FEEDING

Results of feeding lambs on home-grown rations show that Sudan grass made an average daily gain per head of .28 pounds. Alfalfa made an average daily gain per head of .293. All of the lambs had an average concentrate feed of .75 pounds of corn and .16 pounds of cottonseed cake per head daily.
STATE EXPERIMENT FARM NEAR LANDER
IN FREMONT COUNTY

The State Experiment Farm near Lander in Fremont County comprises 137 acres of heavy loam at an elevation of 5500 feet. The average precipitation is 12.38 inches, and the frost free period is 122 days.

Improvements on the farm consist of a four-room frame house, barn, two sheds, producing orchards, and experimental orchard and nursery for Clarke-McNary tree distribution.

The experimental program includes development and propagation of fruit varieties adapted to various sections of Wyoming, growing and distribution of seedling trees, distributed for windbreaks and shelterbelts under the Clarke-McNary Law in cooperation with the U. S. Department of Agriculture, and developing apple varieties.

Windbreak trees that were distributed in cooperation with the Federal Government under the Clarke-McNary Law totalled 112,619 in the year of 1936. These trees have been distributed to farmers and ranchers in practically every county in the state.

Since the beginning of this work with windbreaks and shelterbelts the Department of State Experiment Farms has distributed over 800,000 trees. Groves of trees have been set out on many homesteads where they have enhanced the appearance and value of the farms and have greatly improved living conditions by protecting buildings and livestock. They have made possible the growing of home gardens and orchards.

Seedling apple trees have been grown in large numbers on the farm and from these, selections of the more desirable ones have been made. A number of these have been named and described. These selections are all better than some of the old varieties that have been generally grown in the state. Trees from these newly developed seedlings are under test in various other parts of the state on experiment farms and in some private orchards.

A few of the outstanding named varieties that have been thus far developed include Poposia, Sundance, Washakie, Roberts, Fremont, Nelson, Mart, Margaret, and Brechsteinia.
These apples are a worth-while contribution to varieties that are now growing in home orchards of farmers and ranchers of Wyoming.

STATE EXPERIMENT FARM NEAR LYMAN IN UINTA COUNTY

The State Experiment Farm near Lyman in Uinta County comprises 200 acres of heavy clay loam with water right. The elevation is 6800 feet. The average precipitation is 8.32 inches, and the frost free period is 77 days.

Improvements on the farm consist of superintend-ent’s cottage, foreman’s cottage, dairy barn, machine shed, granary, hog house, poultry house, sheep barn, and large blocks of trees.

The experimental program includes methods of re-claiming alkali land, special methods for increasing crop yields in that particular section, tests with varieties of cereals, forage crops, potatoes, and field peas, varietal tests with garden vegetables and fruits, weed control, comparing chemical treatments with cultivation prac-tices, feeding and housing tests with dairy cattle, hogs, and poultry, testing native trees for windbreaks and home beautification.

OATS FOR HIGH ALTITUDES

Varietal tests with oats for several years indicate that Mark-ton is the most desirable for localities with the same conditions as found on this experiment farm from the standpoint of high yield and quality. The average yield for this variety for four years, in-cluding 1936, is 68 bushels per acre. In 1934 its average yield was 82 bushels per acre.

Twentieth Century, which is the variety very largely grown in this part of the state, has made an average yield of 40.5 bushels per acre. The difference between this variety and the Markton is 27.5 bushels per acre. This difference based upon the total acres of oats grown in Uinta County in 1934 would have made an increased yield of nearly 50,000 bushels of oats for one year.

Seed from the better yielding varieties of oats is distributed to farmers and ranchers by the Experiment Farm.
BARLEY

Two varieties of barley which may be used for malting purposes were grown on the farm in comparison with Trebi. The yields were practically the same, varying between 40 and 50 bushels per acre.

PHOSPHATE FERTILIZERS

A number of phosphate fertilizers were tested in 1936 on potatoes and on oats. In one case, where meta-calcium phosphate was applied to potatoes, there was an increase in yield which amounted to 5 per cent. On other plats of potatoes and of oats, yields were not increased by the application of the fertilizers. Residual effects which may be apparent in the yields of crops in 1937 on this same land will be reported.

CERTIFIED SEED POTATOES

Yields from certified dry-land seed potatoes, when grown the first year under irrigation, have shown considerably greater returns per acre than when grown the second year under irrigation. Bliss Triumph seed potatoes, when grown the first year under irrigation, gave an average yield in 1936 of 197 bushels per acre. This was 28 per cent more than the second year’s yield under irrigation. The average yield for three years, ending in 1936, shows that the certified seed, the first year under irrigation, has given a yield 23 per cent higher than the same variety of potatoes when grown the second year under irrigation.

ALFALFA

Of several varieties of alfalfa, seeded in 22-inch rows, Ladak showed the highest yield in 1936, producing at the rate of 6.7 tons per acre. The average yield for this variety for three years is 4.35 tons per acre.

Grimm and Cossack alfalfa seeded in 7-inch rows gave yields of 4.8 tons and 4.0 tons per acre, respectively, in 1936. The average yield, however, for these varieties over a period of three years is 5.28 tons for Grimm and 4.96 tons for Cossack alfalfa.
FORAGE CROPS FOR DROUGHT YEARS

In years when irrigation water is scarce the question of producing forage sufficient for feeding livestock is of vital importance. Tests have been made with various forage crops grown under dry-farming conditions to determine those that may prove most suitable under a limited amount of irrigation water. In 1936 sunflowers and corn each used for ensilage produced at the rate of 13,000 pounds per acre and 14,400 pounds per acre, respectively. Under irrigation sunflowers produced nearly twice as much as they did without it, the yield being 25,280 pounds of green forage per acre. Without irrigation Sudan grass produced at the rate of 3,440 pounds of cured hay, and millet made one ton of cured hay per acre. In drier years the millet has been a complete failure, and Sudan grass has produced about three-fourths of a ton to the acre.

HOG FEEDING EXPERIMENTS

A test comparing straight barley with a mixture of 60 per cent of barley and 40 per cent of ground wheat showed that the mixture made slightly more economical pork gains. Pigs averaging 113 pounds were fed for 90 days on each ration. It required 430 pounds of the mixed grain for 100 pounds of gain, compared to 484 pounds of straight barley. The daily gains per head were 2.18 pounds and 1.90 pounds, respectively.

MILK IN A HOG FEEDING RATION

The addition of skim milk for fattening pigs weighing 100 pounds showed that an allowance of one gallon of skim milk per pig daily reduced the amount of grain required for fattening. Where milk was used, it required 360 pounds of grain for each 100 pounds of pork gain, and the daily gain was 1.81 pounds per head. Where no milk was supplied the amount of grain required was 450 pounds for each 100 pounds of gain, and the daily gain was 1.44 pounds per head. The grain consisted of a mixture of 60 per cent of ground barley and 40 per cent of ground oats. In this test 55.38 gallons of skim milk replaced 90 pounds of grain.
GARDEN

Three years of work with garden vegetables has demonstrated to farmers and ranchers in Bridger Valley and surrounding country that a great many garden varieties that have never been used are especially well adapted to high altitudes with short growing seasons. The work of the experiment farm has been instrumental in introducing varieties of garden vegetables that have not been used previously. These include varieties of tomatoes, egg plants, peppers, sweet corn, beans, spinach, lettuce, squash, and a greater variety of special greens such as orach, broccoli, Chinese cabbage, and Swiss chard.

FRUITS

Some seven hundred small bush fruits have been set out and one hundred apple and plum trees. Many of the bush fruits have come into bearing and are a demonstration that many high-producing varieties of good quality are well adapted and can be grown by farmers and ranchers in this part of the state.

DAIRY COWS

Through careful culling and selection of sires the yield of butterfat per cow has been materially increased. The herd of 12 cows produced as much butterfat in 1935 as did the herd in 1931 which then had 22 cows. The type as well as the production of the cows has been greatly improved. Breeding stock from these better cows is distributed to dairymen.

HOME BEAUTIFICATION

A large number of native shrubs and flowers have been planted around the buildings in working out the landscaping plan. There are also tests with imported shrubs and plants. This work has demonstrated the possibility of greatly enhancing the appearance of every ranch and farmstead by proper selection and cultivation of home-grown plants which may be secured in the nearby hills and creek bottoms.
SHERIDAN FIELD STATION

The Sheridan Field Station near Sheridan in Sheridan County comprises 320 acres of clay loam varying from light sandy spotted soil to medium heavy gumbo. The elevation is 3800 feet. The precipitation averages 14.76 inches. The frost free period is 127 days.

Part of the improvements are owned by the U. S. Department of Agriculture with which the State is cooperating. They include superintendent’s cottage, assistant’s cottage, messhall, office building, barn, implement shed, and corrals and sheds for pasture experiments with sheep and hogs.

The experimental program includes experiments with crop rotations, varietal tests with cereals and forage crops, crop cultural methods, soil moisture determinations, weather data, arbor culture, pasture experiments with sheep and hogs.

PASTURING SHEEP

Crested wheat grass compared with native grass as a pasture for sheep showed considerably more carrying capacity during the early part of the growing season. One lot of sheep during thirty days of pasturing on crested wheat grass made a total lamb gain of 33.3 pounds per acre, as compared with 13.5 pounds per acre on native grass. The crested wheat grass carried 3 lambs per acre and the native pasture, 1.2 lambs per acre. Later in the season the native grass pastures made greater gain than the crested wheat grass, due to the fact that the crested wheat grass becomes dry and harsh later in the season while the native grass is still relatively tender and palatable.

Rotation grazing, using native pastures, showed that the rotation pastures carried twice as many lambs per acre as the continuously grazed pasture. In the rotation method of handling three pastures, the first pasture is grazed early in the season one year, late in the season the second year, and in mid-season the third year. The other pastures follow in like sequence. This arrangement gives the grass an opportunity for early growth and for reseeding. The pastures under such a method tend to thicken up and eliminate weeds.
HOGS

Two lots of hogs were on annual crops pasture and alfalfa pasture, respectively. These were compared with hogs fed in a dry lot. All pastures were practically exhausted by July 13, after which the several lots were fed together.

From May 9 to July 13, sixty-six days, the hogs in the dry lot made a daily gain of 1.25 pounds. The lot on alfalfa showed an average daily gain per head of 1.19 pounds, and those on the annual crops made an average daily gain of 1.16 pounds. The annual crops comprised winter rye, barley, and peas. The pasture lots had supplementary feed of tankage and grain. This year’s results showed that the dry lot pigs in making gains used 324 pounds of grain and 13 pounds of tankage. For those on alfalfa pasture, 100 pounds of gain required 329 pounds of grain and 19.5 pounds of tankage. The hogs on annual pastures required grain at the rate of 338 pounds and 17.2 pounds of tankage per 100 pounds of gain.

The experience of the several years indicates that there is little or no saving, so far as the amount of feed is concerned, by pasturing hogs compared to feeding them in the dry lot. No difference in the health of the hogs has been noticed.

CROPS

Winter Wheat. Winter wheat was severely damaged by winter killing, the most extensive injury from this cause which has occurred during the existence of the station. The patchy stands of winter wheat were ravaged by grasshoppers and the growth was checked by hot, dry weather. In the rotations where winter wheat is seeded on fallow, the average yield of all plats was 4 bushels per acre. There were, however, outstanding plats, the highest of which made 11.3 bushels per acre.

The average for 19 years at this station shows that winter wheat has an average yield, when it is on fallow, of 29.8 bushels per acre, and when it is seeded on corn ground, the yield averages 25.1 bushels per acre. Following crops of small grains the yield has averaged for this period of time 14.1 bushels per acre.
Dates and Rates of Seeding Winter Wheat. An experiment with dates of seeding winter wheat which was carried on for 15 years shows that the best time of seeding in that part of the state is during the month of September up to the 15th of October. The 15-year average yield of wheat for September seeding is 36 bushels per acre, and the August seeding averages 28.1 bushels per acre.

One bushel of seed per acre has given greater returns than lighter seedings, and only slightly less than heavier rates of seeding.

Varietal Tests. In a varietal test of winter wheats in 1936, Montana No. 36 made a yield of 11.3 bushels per acre, the average of three plats. Kanred and Nebraska No. 60 each made practically the same yield as Montana No. 36, which has an average 11-year yield of 34.2 bushels per acre.

SPRING CEREALS

On fallow, spring wheat in 1936 produced 2.3 bushels per acre, oats 3.5 bushels, and barley 1.7 bushels. These were all in rotations where the grain was on summer fallow.

Averaged for 19 years, spring wheat has a yield of 21.2 bushels per acre when seeded on fallow. When it follows corn, the yield averages 17.3 bushels per acre, and following small grain, the yield averages 14.4 bushels per acre.

Averaged for the same length of time oats has a record of 44.4 bushels per acre on fallow. On corn ground it has an average yield of 37.3 bushels per acre, and when it followed another small grain crop, the average yield is 32.6 bushels per acre.

Barley averaged for 19 years and seeded on fallow has a record of 38.1 bushels per acre. On corn ground the yield is 32.8 bushels per acre, and following other small grain crops the yield averages 23.6 bushels per acre.

DATE OF SEEDING SPRING CROPS

Eighteen years of work shows that seeding spring wheat as soon as field work begins in the spring gives an average yield of 19.5 bushels per acre. When the seeding is done two weeks later,
the average yield is 18.5 bushels per acre. For seedings still later the crop has frequently been a failure.

Oat yields averaged for 18 years show that the early seedings have averaged 41 bushels per acre, the mid-season planting 38 bushels per acre, and late seeding 30 bushels per acre.

Barley, seeded when farm work begins in the spring, shows an average yield of 33.6 bushels per acre; very late seeding produces 21.3 bushels per acre, and mid-season planting, 33.0 bushels per acre.

VARIETIES OF SPRING GRAIN

Over a considerable period of time Ceres has yielded the highest of any of the spring wheats. For the 11 years, ending in 1935, the average yield for this variety is 28.9 bushels per acre. Marquis, which is a very popular spring wheat, has averaged 25.8 bushels per acre for the same period of time.

Oats. The 1936 high yields of oats were made by Carleton and Markton, each averaging 8.6 bushels per acre when they were averaged from three plats for each variety. Swedish Select and Victory were among the poorest in the 1936 plats.

The average yield for Markton oats over a seven-year period, ending in 1935, is 39.5 bushels to the acre. Gopher oats has an average yield of 38.9 bushels per acre, and 60-Day, 38.6 bushels per acre. Swedish Select, which has been used by farmers for a number of years, shows an average yield for this period of 29.4 bushels per acre.

The eleven-year average yield for oats from 1924 to 1935 shows an average yield of 56.4 bushels per acre for Markton as compared with 44.0 for Swedish Select.

Barley. Barley suffered more from grasshopper damage than did either wheat or oats. Spartan was the least attacked by the insects and made an average yield of 5.7 bushels per acre, which was among the best yields of the various varieties tried this year.

Trebi has been the best yielder over the entire period, averaging 41.2 bushels per acre for 19 years. Coast barley for the same length of time has an average yield of 36.7 bushels per acre.
Crested Wheat Grass Protected by a Shelter Belt.

Corn. Ten varieties were included in the test with corn. In spite of the drought, the height averaged 32 inches. Only fodder was harvested in 1936. The highest yield was 470 pounds per acre on fallow. After small grain when the ground was subsoiled before planting the corn, the yield was 400 pounds of fodder per acre. Some of these varieties seemed to be less attractive to grasshoppers than others.

In the date-of-seeding test the highest yield has resulted when it was planted in the first week of June.

Sorgo. When planted in rows, this crop produced a fair yield and justifies the conclusion that it is one of the very best forage crops for non-irrigated lands, particularly in years of drought. On corn ground it produced 1300 pounds of forage per acre.

Alfalfa. For eleven years, ending in 1935, Ladak shows the highest yield, slightly over 1½ tons per acre. Cossack yielded second and Grimm third with a yield of slightly over a ton each per acre for the same period. The experience of the farm shows that there is very little difference in close seeding compared with planting in rows. The average for 18 years shows that close seedings have produced at the rate of 2192 pounds per acre and seeding in rows, 2076 pounds per acre.
Grasses. For the various grasses tried on the experiment farm, the tests indicate that the two most hardy and best adapted to dry-land conditions are crested wheat grass and brome grass. Crested wheat grass, when it was seeded in rows, had an average yield of 1698 pounds of hay per acre for the 12-year period ending in 1935. The close seeding produced at the rate of 1649 pounds to the acre. Brome grass has an average yield for this same period of 1500 pounds per acre when seeded in rows, and 1250 pounds per acre from the close seedings.

A cooperative project with the Soil Conservation Service has been started in an attempt to determine those grasses which are most suitable to dry-land conditions and which can be used to re-seed barren lands and to thicken up ranges.

SEED DISTRIBUTION

The work with varieties of small grains and forages has shown that some of these crops are especially well suited to dry-land agriculture. Seed from such varieties has been increased and distributed to farmers and ranchers in the northern part of the state. The accompanying table shows the approximate amount of seed that has been distributed since 1926.

The distribution of these large quantities of pure seed from proven varieties has increased the crop returns of farmers many fold and has given them the assurance that they are using the varieties that are best suited to their particular conditions.
PURE SEED OF IMPROVED VARIETIES BEST ADAPTED FOR THIS SECTION
Approximate amount of seed distributed to farmers by the Sheridan Field Station from 1926 to 1936, inclusive.

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<th>Kind of Seed</th>
<th>Pounds in Sheridan County</th>
<th>Pounds in other Wyoming Counties</th>
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<td>Trebi</td>
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STATE EXPERIMENT FARM NEAR TORRINGTON
IN GOSHEN COUNTY

The State Experiment Farm near Torrington in Goshen County comprises 160 acres of light sandy loam with water right. The elevation is 4,100 feet. The precipitation averages 12.28 inches, and the frost free period is 123 days.

The improvements on the farm consist of superintendent's cottage, two small houses for extra help, a modern poultry plant, horse barn, machine shed, 2 silos, and feeding yards fitted for experimentation with sheep and steers, and large blocks of trees.

The experimental program includes development of better cropping systems with crops of the section—potatoes, sugar beets, corn and alfalfa—with relation to livestock feeding, fertilizer tests, comparing commercial fertilizers with barnyard manure for various crops, comparison of seed potatoes when grown under irrigation and seed potatoes under dry-land conditions, tests to control potato diseases under irrigation, testing various strains of potatoes for the purpose of eliminating those that are undesirable, tests of varieties of alfalfa, experiments with methods of storing potatoes, demonstrations with gardens and fruit varieties suitable for irrigated sections, tests with livestock including feeding and housing tests with lambs, hogs, steers, and poultry, and demonstration of tree plantings for shelterbelts.

LIGHTS FOR EGG PRODUCTION

Three years' testing of artificial lights for laying hens showed that the total number of eggs per hen where lights were used was approximately one-half dozen more annually than where lights were not used. The greatest difference was in the extra number of eggs layed by the lighted birds during the months when prices were high. This fact made the cash returns above feed and lights approximately 20 per cent more for the lighted house than it was for the non-lighted house. The flocks averaged approximately 84 hens in each house during the test.
MILK FOR GROWING CHICKS

A test with 1500 chicks divided into three houses showed that replacing one-third of the meat meal in a standard ration, by skim milk increased the rate of gain and reduced the feed cost of the pullets 23 per cent, compared to a corn-barley ration without milk.

VITAMIN SUPPLEMENTS FOR LAYING HENS

The use of alfalfa and cod liver oil in laying mashes showed that when alfalfa leaf meal and cod liver oil were used together the largest number of eggs was produced and at the lowest feed cost.

There was very little difference either in the number of eggs produced or the feed cost from a ration containing cod liver oil and one containing alfalfa leaf meal.

Feeding whole alfalfa as the vitamin-bearing supplement resulted in the second highest egg yield and at the highest feed cost.

The scratch ration in this test consisted of barley and the mash was made up of ground barley, middlings, bran, and meat scrap. The windows of the laying houses were opened when weather permitted.

ALFALFA VARIETIES

Ladak alfalfa produced 5.9 tons per acre in 1936. Cossack produced 4.7 tons, and Grimm alfalfa, 3.7 tons. These alfalfas were seeded in 1934, except Grimm which was seeded in 1935.

FERTILIZATION AND CULTIVATION OF ALFALFA

Giving alfalfa a light dressing of manure and spring-toothing the surface in the spring has increased the yields from 4.25 tons per acre to 4.75 tons, averaged for three years. Springtoothing the alfalfa without any application of fertilizer did not increase the yield.

WILT RESISTANCE OF ALFALFA VARIETIES

Because irrigated alfalfa fields in many parts of the state rapidly deteriorate and die out three or four years after seeding, the experiment farm is working on varieties and strains with the view of determining those that are most resistant to wilt disease.
and which will produce more satisfactory yields of hay. After five years of work a great many varieties that were seeded on the experiment farm have completely disappeared. One strain called Hardistan shows a survival of approximately 38 per cent of the plants and Ladak shows 14 per cent survival. Common alfalfa has a survival of 12 per cent. Of 16 various strains of imported Turkestan the survival varies from 16 to 56 per cent. This work is being continued and the best strains will be selected and increased so as to improve the yield of alfalfa in the state.

**SEEDING ALFALFA**

In light, sandy soils where the summers are comparatively hot, it has been difficult in some instances to secure a stand of alfalfa from spring seeding. This has been very largely due to the difficulty in keeping the tender plants moist during the hot weather when they are establishing a root system. To overcome this trouble tests have been made with seeding alfalfa in small grain stubble in August. The average of three years of this work shows that larger yields have been obtained from fall seeding than from spring seeding. This has been due largely to the fact that better stands of alfalfa were secured in the fall. The three-year average yield per acre from seeding alfalfa in the spring was 5.0 tons per acre and from the fall seeding the average yield was 5.6 tons per acre.

The experiment farm suggests for the production of alfalfa:

1. Get a good stand. Do not seed more acres than can be kept from burning.
2. Cut so as to get three equal cuttings, rather than a coarse first cutting, a good second cutting, and a light third cutting.
3. Irrigate early in the spring, late in the fall, and at least once each cutting, the amount depending upon the available water and the nature of the soil.
4. When grasshoppers are numerous, leave strips along ditches and scatter bait there, rather than all over the field.
5. When the alfalfa gets thin, plow it up. A good practice is to plow up and seed a definite acreage each year.
OATS

Mid-season oats have given the best yields on the experiment farm. Markton, Swedish Select, and Colorado No. 37 produced 53.6 bushels, 51.2 bushels, and 53.6 bushels per acre, respectively in 1935. In 1936, due to shortage of irrigation water, the yields were less. The results indicate that Markton is a very desirable variety for this part of the state. A small sample of winter oats was seeded in the fall of 1935 and made a fair crop. This variety is being increased for the purpose of further testing.

POTATOES FROM CERTIFIED SEED

Although there is a wide variation in the yields of potatoes from certified seed, depending upon the source of the seed, the tests show that the average on all plats of certified seed is nearly twice as great as the average of yields from non-certified seed.

Testing Triumph potatoes from seed that was reported to be exceptionally early maturing proved that there was no difference in the time of maturity of the crop from the early seed and that from the regular certified Bliss Triumph seed.

So-called “tough skin” Triumph potatoes were planted in comparison with normal potatoes. The results of digging showed no apparent difference in the skins of the potatoes from the different seed lots.

DATE OF PLANTING POTATOES

One year’s results from planting potatoes May 24 showed that this field required three sprayings to control Colorado potato beetles, and the yield was 190 sacks per acre. When the planting was delayed approximately two weeks, only one spraying was required to control the beetles, and the yield was 193 sacks per acre. The condition of maturity was apparently the same from both plantings.

STEM WILT OF POTATOES

Potatoes harvested from certified Triumph seed showed no wilt in 1935 and 1936. The yields for these two years were 198 bushels and 304 bushels per acre, respectively.
When the seed end of the seed potatoes showed wilt at planting time, there was an average of 7 per cent of wilt in the crop during the two years, 1935 and 1936, and the yield was 197 bushels per acre in 1935 and 298 bushels per acre in 1936. However, when the stem end showed the presence of wilt in the seed pieces, the harvested crop averaged 15 per cent of wilt and the yield for 1935 was 145 bushels per acre and in 1936, 180 bushels per acre. These results indicate that it is highly important to use seed potatoes free from disease.

STORING POTATOES

Stored potatoes receiving various bin treatments showed little or no benefit during the first year. All of the bins of potatoes kept well. The second year there was a slight decrease in the amount of shrink where the potatoes were treated. Two of the spray treatments seemed to injure the tubers.

SPRAYING FOR PURPLE TOP

Spraying for "purple top" in 1935 did not reveal any benefit to the sprayed potatoes as compared with the check plats which were not sprayed. In 1936 some plats of Cobbler were increased as much as 66 bushels per acre from two sprayings of lime-sulfur, and Triumphs were increased 104 bushels per acre from spraying. The spraying was applied at a pressure of 350 pounds.

TESTS WITH SUGAR BEETS

From six different strains of sugar beets seeded, there was little difference in yield. The highest returns of beets were from two varieties, *Danish* and *Dippe*.

*Manure on Sugar Beets.* The application of barnyard manure to sugar beets in a rotation consisting of one year of barley, three years of alfalfa, one year of potatoes, and two years of beets, has shown a decided increase in the second year of the beets where the manure was applied compared with the rotation where no manure was used. The average six-year yield of the first year of manured beets was 13.6 tons per acre, and the non-manured beets was 12.6 tons per acre. In the second year of the beets,
manure gave a yield of 13.0 tons per acre and where no manure was used the yield was 5.8 tons per acre.

**Nitrates for Beets.** In this test, five plats were used for each treatment. The fertilizer consisted of a mixture of sodium nitrate and ammonium sulphate, which was applied at different times during the growing season. In all cases the fertilizer increased the yields. Sixty pounds per acre in two applications produced a yield of 18.52 tons per acre. Forty pounds per acre in three applications gave a yield of 18.40 tons per acre. The check plat which received no treatment produced 14.40 tons per acre.

**Phosphate Fertilizers for Beets.** Phosphate fertilizer in various forms was applied to sugar beets at the rate of 100 pounds per acre. All of the treated plats were increased from 4 to 1.6 tons per acre over the non-treated plats. The average of 15 plats treated with different forms of phosphate fertilizer showed an increase of .94 ton per acre.

**Ridge Planting of Beets.** Ridge planting of beets did not produce yields as large as the surface planting. This test was carried on sandy soil and it was impossible to keep the ridges moist while the young beets were starting.

**ANNUAL LEGUMES**

Severe hail storms cut down the yield of forage crops. Field peas recovered slightly and made a yield of 1 ton per acre. Annual sweet clover produced 2.25 tons of hay per acre by August 1 and was 12 to 18 inches high when frozen down in the fall.

**Soy Beans.** Several varieties of soy beans were tested on the experiment farm. Some of the plats of soy beans obtained a height of 3 feet and produced 2.1 tons of hay per acre by September 1, where they were seeded on clean ground. Where they were seeded on stubble land, they did not compete with the weeds.

**ANNUAL GRASSES**

**Sudan Grass.** Sudan grass yielded 1.5 to 2.0 tons of hay per cutting. If the grass is planted early, two cuttings may be harvested. The hay is relished by most stock.
Crested Wheat Grass. Crested wheat grass seeded in 1934 produced fair pasture in 1935. On sandy soil it withstands pasturing fairly well and is resistant to drouth conditions.

Reed Canary Grass. This grass has made a splendid growth but was so badly mixed with clover that accurate yields could not be determined. It reached a height of approximately 3 feet and remained green until frozen down in the fall.

GARDENS

Much valuable work has been done with testing various vegetable varieties. It is evident from this work that a great many vegetables, the seed of which is ordinarily sold on the market, are not as well adapted to some of our farm conditions as the catalog descriptions would indicate. Different varieties of root crops, vines, legumes, and leaf crops have been tested and many new varieties have proved themselves to be highly valuable in this part of the state.

Fall planting of some of the hardier garden seeds indicates that such varieties as lettuce, radishes, carrots, parsnips, and seed onions can be safely planted in the fall and will produce a moderate crop the next year considerably earlier than could be obtained from spring seeding.

CATTLE FEEDING

Adding grain to a ration of wet pulp, alfalfa, and beet molasses increased the rate of gain from 2.39 pounds daily to 2.56 pounds daily. It also increased the cost of feed from $6.32 to $7.17 per 100 pounds gain, figuring feed at current prices.

One year's test comparing Johnstown molasses with Steffens molasses, both beet sugar by-products, showed that slightly greater gains were obtained from the Johnstown molasses.

One year's test with steers showed that where barley, pulp, alfalfa, and cottonseed cake comprised the ration, the average daily gain was 2.0 pounds per head. When beet tops were substituted in place of the alfalfa the average daily gain was 1.8 pounds per head.
In another comparison where soy bean meal was used in place of cottonseed cake, the one year's results indicated a slightly greater rate of gain for the soy-bean product.

Supplying all of the feed in panels rather than feeding the grain in a separate feed lot increased the rate of gain on lambs from .23 pound to .29 pound per head per day.

Dipping lambs for ticks at the beginning of the feeding period did not appreciably increase the rate of gain, but it reduced the amount of feed required per unit of gain.

STATE EXPERIMENT FARM NEAR WORLAND IN WASHAKIE COUNTY

The State Experiment Farm near Worland in Washakie County is conducted in cooperation with the State Board of Charities and Reform. There is no designated amount of land for experimental purposes. The soil is a heavy loam with many "slick" spots. The elevation is 4100 feet. The average precipitation is 7.46 inches, and the frost free period is 134 days.

None of the improvements are owned by the Department of State Experiment Farms.

The experimental program includes development of better cropping systems in connection with livestock feeding, tests with cereals and forage crops, alfalfa tests for hay production and for seed production, fertilizer tests comparing mineral fertilizer and barnyard manure on sugar beets and other crops, crop rotation, and feeding experiments with sheep and cattle, dealing with the use of by-products of beet sugar in various combinations.

ALFALFA

Five years of work with 13 different alfalfa varieties and strains show conclusively that all varieties tend to die out very rapidly after the third year from seeding, and that it is to the advantage of farmers to rotate their alfalfa with other crops, so that the alfalfa will be plowed up every third or fourth year.

The average yield of six varieties in 1932, the first year they were harvested, was five tons per acre in three cuttings. The next year the average yield was 5.75 tons per acre. The third year it
was 6.5 tons. In the fourth year, 1935, the average yield was 4.1 tons per acre, and in 1936 the average yield was 2.6 tons per acre.

Except in the first year, when Ladak was considerably higher in yield than the other varieties, there was not a great deal of difference in the yields of the several varieties.

Ladak for the five-year period shows the highest average yield of 5 tons per acre, although Turkestan (Potter strain) produced very nearly as much with an average return of 4.97 tons per acre.

The Ladak alfalfa is exceedingly fine, even the first cutting has finer stems than the second cutting of many other varieties, and for that reason it is a high quality hay. It is slow to recover growth after the first cutting, and for that reason it has the appearance of being a shy producer.

The yields of these several varieties of alfalfa were closely correlated with the percentage of wilt infection. As the wilt increased from year to year in all varieties, the stand of the plants was very materially reduced and likewise the yield. Although Ladak did not show the largest stand of plants, it was less affected by wilt than the other varieties.
CROP ROTATIONS

Of a number of rotations, all including a legume crop and sugar beets, there are several that have been recommended as very well adapted to the irrigated lands of the Big Horn Basin.

One of the rotations consists of two years of alfalfa followed by a year of beans and then two years of sugar beets. The barley is seeded as a nurse crop with the alfalfa. In this rotation the third crop of alfalfa is plowed under the second year that it produces hay. Manure is applied in the fall on the land which is to be seeded in beets the following year and the ground is fall plowed.

Another satisfactory rotation consists of three years of alfalfa followed by two years of beets and then barley used as a nurse crop for new alfalfa. In this rotation also the third crop of alfalfa is plowed under, preceding the beets, and manure is applied the same as in the other rotation. In this cropping system careful attention must be given to plowing and diskng the alfalfa land that is prepared for beets, in order to obtain a satisfactory killing of the alfalfa.

A rotation where sweet clover was pastured by sheep gives promise of being very much worth while where a large proportion of the land is to be given to the production of sugar beets. It consists of a year of sweet clover which is pastured with sheep, two years of sugar beets, and then the clover is reseeded with barley as a nurse crop.

The use of annual sweet clover may be employed in the following manner: The clover is plowed under as green manure in the year that it is planted, about six weeks after the nurse crop of barley has been harvested. Beans are seeded the next year. Then sugar beets are grown for two more years. Where a continued program of this combination is used, a dressing of barnyard manure should be applied to the beet land.

All of these rotations are planned with the view of having legume crops immediately preceding sugar beets. Results from the experiments show that the first year of sugar beets, after a legume crop, outyields the second year of sugar beets. For this
reason the rotation should be relatively short, so as to get the benefit of the legume crop to the beets, since this is the cash crop and large yields are important.

PASTURING SHEEP

When 40-pound lambs with their ewes were pastured on alfalfa in 1936, they made an average daily gain of .49 pound per head. The gain per acre of alfalfa was 453 pounds. Lamb losses, however, due to bloat reduced this gain to 358 net pounds per acre. If this value is credited at 8 cents per pound, it shows a return of $28.64 for each acre of alfalfa. This return was in addition to the ewes that were carried for the 140 days of the experiment.

In a permanent grass pasture the carrying capacity averaged for three years has been 5 ewes and 6 lambs per acre, and the total lambs gain per acre has been 300 pounds each season. This has a net return of $24.00 per acre for the use of pasture land. The pasture seeding was:

MORTON’S MIXTURE

Smooth Brome .................. 9 lbs.
Orchard Grass .................. 9 lbs.
Meadow Fescue ................ 5 lbs.
Timothy .................. 4 lbs.
Yellow Sweet Clover ............ 3 lbs.

BEANS

Work by the experiment farm in cooperation with the Wyoming Pure Seed Growers’ Association has resulted in the improvement of a number of seed bean varieties. The work was started in 1933 with twenty outstanding plants each, of several varieties. From these, careful field selections have been made and the best have been retained. There are now six improved selections, some of which are showing very much promise for the bean industry.

Golden Wax has been greatly improved. The vines are much larger than the parent and the pods are longer and straighter. The canning quality of the bean is, therefore, greatly improved. Seed from these improved selections is distributed to the bean growers of the state.
SUGAR BEETS IN HILLS VERSUS CONTINUOUS DRILLING

Replicated plats of sugar beets, half of which were seeded in continuous rows, were compared with the other half which were seeded in 10-inch hills. Nine and one-half pounds of seed per acre was saved by planting in hills, which at the current prices represented $1.52. The stand averaged for all of the plats showed 94 plants per 100 feet where continuous row planting was used against 71 plants for the hill-drop method. However, the yields were nearly equal for the two methods of planting. The average for all plats for the continuous row planting was 13.9 tons per acre, and the yield for the hill-drop method was 14.0 tons per acre. This represents but one year's work.

SPACING BEETS

Spacing sugar beets at various distances apart, from 8 to 14 inches, showed the greatest yield, 13.7 tons per acre, when they were spaced 12 inches apart. Ten inches apart made 12.0 tons per acre, and 8 inches, 11.0 tons per acre. These figures include just one year's work, and of course are not final.

DUCKFOOTING COMPARED WITH SPRING PLOWING

FOR SUGAR BEETS

A part of a field which had been in sugar beets in 1935 was spring plowed and disked several times before planting the sugar beets in 1936. Another part of the same field was worked down by duckfooting three times, but with no plowing.

The difference in yield of sugar beets this year, averaged for three plats, showed 2.25 tons per acre in favor of land prepared by spring plowing. The duckfooted land produced 10.2 tons per acre.

MINERAL FERTILIZER FOR SUGAR BEETS

One year's results from the application of phosphate fertilizers to corn and to sugar beets showed that an application of 100 pounds per acre of calcium meta-phosphate produced an increase in sugar beets of 1.35 tons per acre and 7 bushels of corn to the acre. Super phosphate also increased the yield of sugar beets by 1.88 tons per acre, and corn by 3.4 bushels per acre. These were averages of duplicate plats.

An average of four years in the testing of fertilizers on sugar beets shows that there is a carry-over effect in the second year.
from the time of application. The commercial fertilizers and barnyard manure were applied to the beets in 1933 and 1935. The total increase for plats receiving a top dressing of 12 loads per acre of barnyard manure was 13.6 tons of beets for four years. This resulted from the application of 24 tons of barnyard manure. Where phosphate was applied at the rate of 100 pounds per acre in 1933 and again in 1935, the total increase in yield for the four years was 8.27 tons of beets per acre. If beets are valued at $6.00 per ton, the barnyard manure showed a value of $3.40 per load, and the phosphate, a value of $24.80 per 100 pounds.

CULTIVATION AND FERTILIZATION OF ALFALFA

The average annual increase for three years from one treatment of alfalfa by cultivation in 1933 was .12 ton per acre. When the alfalfa was manured and cultivated in 1933, the average annual increase for the three years above the check plat was .40 ton per acre. When the alfalfa was phosphated in 1933, the average annual increase for the three years was .25 ton per acre. All yields showed the greatest increases the first year after the treatments.

The cultivation was made with the duckfoot cultivator equipped with bull tongues. The manure was applied at the rate of 12 loads per acre. Phosphate was applied at the rate of 100 pounds per acre and drilled into the soil.

LIVESTOCK FEEDING

Feeders in the Big Horn Basin find it very difficult to feed large quantities of concentrates, particularly barley, to lambs without incurring severe death losses. In one test several lots of lambs are self-fed with different combinations of barley, dried beet pulp, chopped alfalfa, and wet pulp. Already these lambs are consuming fifty per cent more concentrates than the lambs which are hand-fed. There is no appreciable increase in the death losses, but the gains for the self-fed lambs are proportionately larger. This system of feeding appears to be one that will solve the problem of death losses from large rations of concentrates.

Detailed reports on other feeding projects are contained in Wyoming Experiment Station Bulletins No. 191 and No. 216.
The following publications of the Wyoming Experiment Station may be had upon request: (Revised list January, 1937.)

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203. Poultry Feeding, Housing, and Lighting Experiments at the Wyoming Experiment Station.
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205. Economic Studies of Irrigated Farms in Big Horn County.
207. A Five-Year Study of Hampshire Show Sheep.
209. Forty Years of Weather Records.
210. Crossbreeding with Western Ewes.
211. The Wyoming Straw-Loft Poultry House.
212. Steer Feeding in Southeastern Wyoming.
213. Effect of Storage upon the Vitamin C Content of Wyoming Potatoes.
216. Sugar Beet By-Products for Fattening Lambs.


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