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WORK OF THE NEWLANDS FIELD STATION, NEVADA 1924–1927

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INTRODUCTION

The work of the Newlands Field Station (near Fallon, Nev.) is chiefly investigational. It includes experiments in the reclamation of alkali lands, studies relating to drainage and underground waters of the Newlands reclamation project, the testing of varieties of crop plants, and cooperative experiments with the Nevada Agricultural Experiment Station in the feeding of hogs and dairy cows. In addition weather records are kept in cooperation with the United States Weather Bureau.

The problem of successful crop production in this region has been closely associated with the amount and nature of the alkaline salts encountered in the soil and the depth and the salt content of the underground waters. One of the major activities of this station has been a study of these problems, both as to corrective methods and as to crops that might be best adapted to existing conditions. Large areas still remain unclaimed, and some producing areas have become unproductive because of a rising water table. However, much of the rising water has been eliminated by the construction of a system of open drains.

The cooperative livestock feeding experiments were undertaken with the object of determining the best methods of handling and feeding dairy cows and pigs under local conditions by utilizing feeds that are produced on the project. The rapid increase of some kinds of livestock on the project calls for further work in this direction.

AGRICULTURAL CONDITIONS ON THE PROJECT [1]

CROP CONDITIONS

In 1921 the irrigated areas of the project had reached an aggregate of 46,143 acres. During the four years following, namely, 1922 to 1925, inclusive, there was a gradual decrease to 41,008 acres, a decline of about 11 per cent. During 1926 there was a gain of 4,451 acres, making a total irrigated area of 45,459 acres for that year. In 1927 there was a further increase of 3,796 acres, making the highest total yet reached, 49,255 acres.

The decline in the irrigated area during the four years following 1921 was probably due chiefly to adverse economic conditions. The greatest decrease, occurring in 1925, followed the quarantine placed against Nevada hay by the State of California. The increases of 1926 and 1927 can be accounted for by an increase in the number of dairy cows, sheep, and poultry on the project and the winter feeding of more beef cattle. Also the beneficial effect of the drainage on the project is being felt. Some land that had become unfit for cultivation because of seepage has been releveled and if not already in crop is being irrigated to leach out the salts.

Since the beginning of farming on the project, alfalfa has outranked all other crops in the number of acres devoted to its production. It was early discovered that alfalfa was a crop well suited to the soil and climatic conditions of this locality. On some of the land it is almost necessary to grow alfalfa for a number of years before other crops can be grown. Prior to 1925 the alfalfa hay not needed by livestock on the project was shipped to markets in California. This outlet was closed in 1924 when the discovery of the alfalfa weevil on the project was followed by quarantine regulations by the State of California.

Following the closing of the California markets there was temporarily a surplus of hay and a decline in price and in acreage. (Table 1.) However, as more of the farmers turned to dairying and to feeding sheep and cattle, it was found that the hay crop could be consumed locally and made to give good returns.

It has been contended that the agriculture of the project is too largely devoted to one crop. It is advocated from time to time that some of the present alfalfa acreage should be used for other crops. The question arises as to what crops should be substituted on some of this alfalfa land. The yields obtained from wheat and barley and the prices for them during the last few years have not warranted a substitution of these crops for alfalfa, except that they might be grown on some old alfalfa land for a year or two until such land is again put in alfalfa. However, it has been shown that the farmers who have had some acreage in potatoes each year during a 10-year period have realized a fair income from this crop. There are also such crops as truck, fruit, and cantaloupes that return large profits when the supply can be consumed by the local community or sold in near-by markets. When the volume of production of these truck crops becomes so large as to necessitate shipping to distant markets, it is doubtful whether they can be depended upon to yield profitable returns.

[1] The Newlands reclamation project is located in western Nevada, surrounding the town of Fallon, on a short branch from the main line of the Southern Pacific Railroad. Its water supply is drawn from the Truckee and Carson Rivers. Each year the Bureau of Reclamation of the Department of the Interior takes a census of the agricultural pursuits of the Newlands project. This is the source of most of the data here used in describing agricultural conditions.

TABLE 1.—*Acreage of principal crops grown on the Newlands reclamation project during the 4-year period 1924-1927*

[Based on reports made by the Bureau of Reclamation]

Items of comparison	1924	1925	1926	1927
	Acres	*Acres*	*Acres*	*Acres*
Net acreage irrigated	44,280	41,008	45,459	49,255
Established alfalfa	30,652	28,183	28,961	29,849
Newly seeded alfalfa	1,166	2,459	2,196	1,977
Wheat	4,081	4,670	2,836	4,829
Oats, barley, and corn	618	1,207	1,276	1,732
Cantaloupes	532	510	335	261
Potatoes and garden crops	431	370	461	760
Native pasture	3,625	2,659	4,313	7,129

Next to alfalfa, wheat occupies the largest acreage of irrigated land. The production of this crop is largely confined to lands on the south and east sides of the project that are not entirely satisfactory for the production of alfalfa. Wheat generally replaces alfalfa on the better soils of the project when it becomes necessary to rework old alfalfa land. It is then used as a nurse crop for a new stand of alfalfa. The average reported acre yields range not far from 1,300 pounds, or about 22 bushels.

The growing of sugar beets as a profitable enterprise is still unproved. Several attempts have been made, but owing to economic factors, such as high-priced labor and occasional severe infestation of the curly-top disease, together with long hauls to the factory, beet raising has not proved successful. At the present time another attempt is being made to give this industry a trial.

The area devoted to barley, oats, and corn is not large. Of the three crops, barley is the most extensively grown, with corn next and oats last.

Cantaloupes have been reported separately from the garden and truck crops since 1921, when there were 129 acres. In 1922 the acreage was 336, and in 1923 it was 350. The crop matures rather late in the season and is largely shipped to eastern markets.

A relatively small acreage is devoted to garden crops, including potatoes. It is believed that it would be advantageous if more attention were given to the production of potatoes.

In order that some idea as to the growth or decline during recent years of the percentage of the irrigated area of alfalfa, grain, miscellaneous crops, and seeped area may be given, Table 2 is presented. The proportion of alfalfa increased from 1912 to 1925, when it reached 75 per cent of the total irrigated area. The proportion of land devoted to grain was highest in 1927, when it reached 16 per cent. The area of miscellaneous crops, such as truck, potatoes, silage corn, and cantaloupes, has continued rather uniform during the last 10 years. The grass pasture is mostly salt-grass land unsuitable for cultivation and consists largely of land near Carson Lake, being used as community pasture. A good deal of the seeped area comes under this classification, although some seeped land is to be found in small areas on farms.

TABLE 2.—*Relative areas expressed as percentages of the total irrigated acreage devoted to various crops on the Newlands project farms during the 16-year period 1912 to 1927*

Year	Proportion of total irrigated area (per cent)				Year	Proportion of total irrigated area (per cent)			
	Alfalfa	Grain	Miscellaneous	Grass pasture and seeped land		Alfalfa	Grain	Miscellaneous	Grass pasture and seeped land
1912	44	14	4	38	1920	68	10	3	19
1913	43	9	13	35	1921	68	7	5	20
1914	55	8	6	31	1922	69	6	5	20
1915	50	12	7	31	1923	67	8	4	21
1916	54	12	5	29	1924	72	10	4	14
1917	56	9	10	25	1925	75	13	4	8
1918	60	13	5	22	1926	68	15	4	13
1919	63	13	3	21	1927	65	16	6	13

LIVESTOCK CONDITIONS

It has long been clear that for the Newlands project the system of farming should be one in which most of the crop products are used locally by livestock. The climatic and crop conditions have appeared to favor dairying and poultry as the major livestock industries. In the early years of the project the hay and pasture resources were largely utilized in the winter feeding of cattle and sheep from the surrounding ranges. The project continues to be an important adjunct to range operations, but in later years dairying and poultry raising have become increasingly important.

A summary of the annual census of livestock on project farms for the 14-year period 1914 to 1927, inclusive, is given in Table 3. This table shows that during the last four years enumerated in the table there has been a decrease in the number of horses and mules and in the number of beef cattle. There was an increase recorded in the number of dairy cattle, farm sheep, hogs, turkeys, chickens, and hives of bees.

TABLE 3.—*Number of head of livestock and hives of bees on Newlands project farms during the 14-year period 1914 to 1927*

Year	Horses and mules	Cattle			Sheep	Hogs	Poultry		Hives of bees
		Beef	Dairy	Total			Turkeys	Others	
1914	3,483	4,540	1,503	6,043	1,981	3,815	6,972	27,399	1,621
1915	3,780	5,957	2,433	8,390	4,710	4,836	12,000	22,912	2,500
1916	3,911	7,802	2,537	10,339	5,452	6,092	15,239	29,270	2,958
1917	3,467	7,581	2,044	9,625	3,346	3,170	9,042	24,056	1,933
1918	3,734	8,839	1,895	10,734	3,560	3,343	4,746	20,220	1,589
1919	3,532	6,778	1,850	8,628	3,347	3,048	3,442	25,932	2,821
1920	3,875	7,428	2,072	9,500	4,611	2,211	3,624	28,780	2,683
1921	4,038	6,732	3,597	10,329	7,707	1,793	4,834	28,582	2,983
1922	3,730	4,601	5,088	9,689	7,961	3,214	12,130	44,131	1,267
1923	3,822	4,266	6,738	11,004	7,286	2,975	27,254	45,240	2,302
1924	3,818	4,889	7,366	12,255	4,624	2,296	22,415	49,896	2,249
1925	3,222	4,663	7,796	12,459	12,807	1,972	20,429	54,833	2,913
1926	3,314	6,052	8,523	14,575	7,930	2,265	30,613	70,632	2,607
1927	3,374	2,802	9,357	12,159	7,230	3,446	47,898	94,931	2,722

DAIRYING

The growth of the dairy-cow population of the project has been rapid during the last seven years. Previous to 1919 the numbers declined for several years because during the war the high prices being paid for alfalfa hay caused many farmers to dispose of their cows. The downward trend of prices following 1920 was instrumental in forcing some farmers into the dairy business once more in order to realize a profit on their hay. The California quarantine of 1924 was still another factor causing an increase in dairy cows. The number of milk cows has increased from about 2,000 in 1920 to about 9,300 cows and heifers in 1927, an increase of more than 350 per cent in seven years.

It is probable that the number of dairy cows will continue to increase, as no other livestock industry seems to fit in so well with the cropping system of the project. The assurance of plenty of alfalfa hay relieves the dairyman of any worry in regard to a shortage of feed. Most of the feeding has been done on this feed alone, but the increase in production of the individual herds will probably lead to the feeding of some forms of concentrates, possibly barley. Some barley is at present being grown on the project, but it has not proved to be a very profitable crop because of the present market price of rolled barley and the light acre tonnage under local conditions.

There has been some trouble from sterility among the dairy herds of the project. Various reasons have been advanced as to the causes of this trouble, but nothing definite has been determined. Some persons think this condition is due to to the one-feed ration of hay; others think it may be due to the lack of green feed and silage in the ration. It is hoped that the dairy feeding experiments now being conducted at the station will throw some light on this matter.

Such infectious diseases as tuberculosis are limited to a very small percentage of the dairy animals. The last survey made by the State veterinary control service showed about one-half of 1 per cent reactors. When found, all positive cases automatically become the property of the State and are slaughtered. It is not likely that this disease will increase to any great extent, as practically all introductions of dairy cattle have ceased. Most of the increase in herds during the last four or five years has been from local offspring. The last year has seen exportations rather than importations, some 700 head being exported from the project.

The marketing of dairy products on the project has never been much of a problem. A little whole milk is sold in town, but the greater part is separated on the farm and the cream sold either to a local creamery or for shipment. At present the local creamery receives about half of this output, the remainder being shipped to California creameries. Trucks make trips about the project gathering up the cream, which is taken to a central cream-testing laboratory operated by the State, where samples are taken and the fat percentage determined. This fixes the basis of price. The presence of two or more representatives of outside creameries bidding for the cream of the project has tended to keep the local price of butterfat equal to or better than San Francisco quotations for extra butter.

A study of the dairy industry was made in 1925 by L. E. Cline, extension specialist on the project. This included a comparison of

the dairy statistics of 1915 with those of the year 1925, with a view to determining whether the number of farmers engaged in dairying had increased along with the increase in the number of dairy animals. The following conditions were found: There were 106 farms in 1915 having 10 head of dairy cows or less. In 1925 there were 208 farms in this class. In 1915 there were 21 farms with 10 to 20 dairy cows; in 1925 there were 135 such farms. In 1915 there were 10 farms with 20 to 30 head of dairy stock, and in 1925 there were 38 such farms. During this 10-year period the number of farms engaged in dairying had almost trebled.

HOGS

It has always been a puzzle to the representatives of the station why more hogs are not being raised on the Newlands project than are shown by the reclamation census figures each year. All pig-feeding experiments conducted in recent years at the station farm have shown a profit. When it is taken into consideration that the production of pork is a natural adjunct to dairying where skim milk is available, it seems that the number of hogs on the project should be much greater than it is. Both the poultry industry and veal production consume some of the skim milk, but a large proportion of it still is not efficiently used. There are times of the year that this quantity of unused skim milk increases, that is, during the winter months following the sale of the turkey crop. It seems that the growing of a few hogs on each farm should be encouraged.

SHEEP

The number of sheep reported on project farms has fluctuated widely during the years of record. In 1925 there was a very large increase, but the number dropped back in the following year to the average. It would seem that with so many acres of waste land and with so much cheap alfalfa hay the farm sheep industry should be a fairly profitable one. Several farmers have maintained their flocks over a period of years and report a substantial profit for the enterprise.

Many sheep are fed on the project each winter. They are generally driven in by large sheep owners from the summer range in various places throughout the State. This winter feeding of sheep as well as cattle is a very large item in the disposal of the alfalfa-hay crop.

BEEF CATTLE

The number of beef animals on the farms of the project has decreased 41 per cent during the last four years. Many farmers are finding a more profitable outlet for their hay through other uses. The lack of suitable near-by range has most probably been a factor of great importance in limiting the number of beef animals. Many hundreds of head of beef cattle are fed on the project each year. Some of these are shipped in by outside cattlemen and others are purchased outright by local operators. Most of these cattle come from the eastern part of the State or from near-by States. They are fed during the winter months on alfalfa hay and either cottonseed cake or grain. The chief outlet for these animals when they are ready for market is California.

POULTRY

The climate of the Newlands project has seemed to favor the poultry industry. This condition, together with the small capital requirement and quick returns on the money invested, have caused a very rapid increase in poultry production. Probably 200 farmers are keeping poultry on a commercial scale; that is, there are about 200 flocks of more than 100 hens.

Previous to 1925 Reno was the chief market for eggs from western Nevada. There have been times when, because of overproduction, eggs were selling for less than it cost to produce them. Early in 1926 a local cooperative poultrymen's association was formed, and arrangements were made with dealers in Los Angeles markets to handle all surplus eggs. This has stabilized the local market and made the production of eggs more profitable.

The growing of turkeys for the holiday markets has become an important industry on the Newlands project. During the 1927 season 47,898 turkeys were grown, an increase of 430 per cent over the number raised 10 years before. Some of these were grown in large

FIGURE 1.—Turkeys on one of the Newlands project farms

flocks of 1,000 birds or over. (Fig. 1.) Most of these are consigned to San Francisco and Los Angeles markets and are the source of much ready cash to the local farmers. The estimated value of this crop in 1927 was $242,000.

Much work has been done by L. E. Cline to determine the best method of controlling disease in turkeys under local conditions. One of the serious diseases with which the local turkey producer has to contend is blackhead. After various treatments with such intestinal antiseptics and astringents as sulphur-carbolate compound, bichloride of mercury, Epsom salt, and ipecac had been tried, a treatment of powdered tobacco was tried. The use of this remedy proved to be the most effective. The method of feeding as prescribed by Mr. Cline is to mix powdered tobacco at the rate of 4 or 5 per cent in a bran

mash. The birds are allowed free access to this mixture for three or four days. This is followed by purging with Epsom salt. This method of combating blackhead is easily applied and has been very successful.

It is to be expected that the turkey growers will have to combat chicken pox in the near future. This may be done by obtaining vaccine from the State agricultural experiment station and vaccinating all fowls. It is highly essential to have all the breeding stock vaccinated, and if the disease breaks out later in the new crop of birds, it is best to take immediate steps to control it.

Studies of the cost of production were undertaken by Mr. Cline. It was found that during the growing period it took approximately 3½ pounds of grain to produce 1 pound of gain when the birds were allowed free range. During the fattening period it took 5½ pounds of grain to produce a pound of gain under similar conditions. Turkeys accustomed to free range when penned up for fattening required about twice as much grain to produce a pound of gain.

RABBITS

There are seven ranches on the project that grow rabbits for market. It has been found that rabbits will produce economical gains when fed on third cutting of alfalfa hay. They will consume 15 per cent of their weight in hay each day and produce 1.9 per cent daily gain. The greatest handicap to this industry is disease. It is necessary to keep all the hutches extremely clean, and the rabbits should be protected from drafts and always have plenty of clean food and water. The work required to accomplish this is an important item in the cost of production.

WEATHER CONDITIONS

Weather records are kept at the Newlands Field Station in cooperation with the United States Weather Bureau and with the Biophysical Laboratory of the Bureau of Plant Industry. The observations are summarized in Table 4.

In 1924 the killing frosts of May 5, 6, and 7 were two weeks earlier than usual for the last killing frost in the spring. A temperature of 32° F. was recorded for June 19 of that year, but as such slight damage was done the last killing frost is recorded as occurring on May 7. The first freeze in the fall occurred on September 21. The frost-free period was therefore 136 days. The length of this frost-free period might have resulted in a large crop of fruit except for a low temperature of 20° F., which occurred on April 26. This cold was so severe that many of the fruit buds were killed before they opened.

The year 1925 was an exceptionally fine year for fruit. The last really damaging freeze occurred on April 1, when the temperature dropped to 25° F. A temperature of 29° F. was recorded on April 24, and temperatures of 31° on April 27 and May 8. These three freezes did very little damage. The first freeze in the fall occurred on September 22. The frost-free period was 136 days—13 days longer than the average.

The year 1926, with seven days longer frost-free period than the average and no particularly heavy freeze in the early spring, proved to

be another good year for fruit. The temperature of 28°, recorded on May 8, did very little damage, as the long stretch of warm weather previous to this time had developed the fruit beyond the stage where it would have been hurt by a temperature as low as 28°.

TABLE 4.—*Summary of climatological observations at the Newlands Field Station for the 22-year period 1906 to 1927*

PRECIPITATION (INCHES)

Items covered	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Average for 22 years [1]	0.64	0.51	0.38	0.54	0.46	0.34	0.16	0.29	0.34	0.39	0.31	0.55
For 1924	.59	.48	.36	T.	.04	0	T.	0	.06	1.15	.45	.70
For 1925	.03	.72	.60	.56	1.07	1.00	.51	.65	.58	.99	.10	.42
For 1926	.43	.84	.18	1.42	.02	.05	.03	.01	0	.24	1.16	.34
For 1927	.47	1.02	.13	.34	.15	.12	.09	T.	.16	.68	.10	.38

EVAPORATION (INCHES)

Average for 18 years [2]	1.06	1.54	3.97	5.93	7.91	9.19	10.18	9.08	6.15	3.70	1.87	0.85
For 1924	------	------	2.89	5.25	7.37	7.59	8.59	8.18	5.48	3.33	1.75	------
For 1925	------	2.06	------	4.99	6.04	6.01	7.41	7.06	4.96	2.87	1.28	.52
For 1926	.74	1.46	3.81	4.80	6.74	8.21	8.34	7.56	5.38	3.47	1.78	------
For 1927	.56	1.49	3.40	5.38	7.38	7.30	8.63	7.13	4.77	3.31	1.67	.67

DAILY WIND VELOCITY (MILES PER HOUR)

Average for 19 years [3]	2.54	3.28	4.23	4.94	4.34	3.62	2.81	2.55	2.56	2.29	2.32	2.32
For 1924	.69	1.39	4.01	3.98	3.13	2.91	2.08	1.81	1.88	2.53	1.68	1.58
For 1925	1.52	3.18	3.11	4.33	3.07	2.64	1.74	1.91	1.86	1.28	1.53	.96
For 1926	1.75	2.55	2.66	2.80	2.92	2.72	1.97	2.03	1.83	1.40	2.17	1.95
For 1927	1.96	3.03	3.19	3.83	4.64	3.14	2.54	2.01	2.03	1.33	2.16	1.96

TEMPERATURE (° F.)

Average for 22 years: [4]												
Absolute maximum	58.4	64.3	73.6	80.9	88.4	96.5	100.4	98.7	91.8	82.7	71.7	60.7
Daily maximum	43.2	50.3	58.8	66.4	73.6	83.8	93.1	90.8	80.2	68.1	56.1	43.9
Absolute minimum	−.2	8.1	15.5	20.4	28.3	35.9	43.7	40.4	29.3	19.8	10.3	3.0
Daily minimum	17.0	23.2	27.5	34.4	40.8	47.3	54.1	51.2	42.3	32.6	24.3	18.8
Monthly mean	30.1	36.7	43.2	50.4	57.2	65.5	73.6	70.9	61.1	50.4	40.7	30.5
22-year record:												
Highest recorded	70	78	79	89	102	102	105	103	96	89	86	74
Lowest recorded	−25	−12	9	13	21	31	38	35	22	13	−1	−4
For the year 1924:												
Absolute maximum	41	68	67	78	92	100	99	100	94	81	74	52
Mean maximum	28.0	55.3	53.9	68.1	81.8	87.4	92.8	90.4	81.8	66.5	54.6	35.5
Absolute minimum	−18	17	15	16	31	32	42	38	24	23	12	−10
Mean minimum	.3	25.3	25.3	32.5	43.8	44.9	51.9	48.4	40.5	33.2	22.9	16.8
Mean	13.8	40.3	39.6	50.3	62.8	66.2	72.3	69.4	61.1	49.8	38.7	26.1
For the year 1925:												
Absolute maximum	62	67	77	78	87	101	103	97	87	76	64	58
Mean maximum	49.3	57.2	59.9	66.5	76.4	81.5	92.8	86.3	76.6	66.4	53.9	44.5
Absolute minimum	11	16	18	25	31	34	49	38	24	24	10	12
Mean minimum	21.4	26.9	28.9	37.4	43.9	48.3	57.4	50.5	41.0	31.2	22.5	19.9
Mean	35.4	42.1	44.4	51.9	60.1	64.9	75.1	68.4	58.8	48.8	38.2	32.2
For the year 1926:												
Absolute maximum	59	66	74	84	91	101	101	100	89	86	74	60
Mean maximum	45.2	53.3	63.7	71.3	77.4	90.3	93.7	90.1	77.7	71.5	61.3	43.2
Absolute minimum	5	19	17	31	28	39	46	35	22	14	17	3
Mean minimum	15.6	26.0	27.6	40.4	41.4	50.4	54.2	49.6	35.5	31.1	30.6	20.5
Mean	30.4	39.6	45.6	55.8	59.4	70.3	73.9	69.9	56.6	51.3	50.0	31.8
For the year 1927:												
Absolute maximum	68	62	70	87	93	94	98	95	92	85	71	60
Mean maximum	48.5	50.8	57.9	65.4	71.7	84	93.2	87.7	75.5	71.6	59.9	41.6
Absolute minimum	6	11	13	13	29	36	41	38	28	19	10	−2.0
Mean minimum	20.5	27.4	26.6	32.2	38.7	47.4	51.9	48.4	39.5	32.3	28.8	12.4
Mean	34.5	39.1	42.2	48.8	55.2	65.7	72.6	68.0	57.5	51.9	44.3	27.0

[1] The records for January and March cover only 21 years.
[2] January and February records are for 13 years. Records for March are for 16 years and for December 15 years; the other months have records for 18 years.
[3] The records for January, February, March, and November cover only 17 years; those for April, October and December are for 18 years.
[4] The records for March and October cover only 21 years.

TABLE 4.—*Summary of climatological observations at the Newlands Field Station for the 22-year period 1906 to 1927*—Continued

ASPECT OF THE SKY (DAYS)

Items covered	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Average for 22 years:[4]												
Clear	13.9	13.7	17.7	17.2	18.4	22.0	23.5	24.6	22.4	22.4	17.2	14.2
Partly cloudy	7.6	6.7	6.9	6.7	8.1	4.4	4.8	3.6	4.1	3.8	5.8	6.3
Cloudy	9.4	7.9	6.4	6.1	4.5	3.6	2.8	2.7	3.5	4.8	7.1	10.5
For 1924:												
Clear	16	13	13	22	25	26	27	26	24	15	21	9
Partly cloudy	2	5	6	4	4	4	2	5	5	11	3	5
Cloudy	13	11	12	4	2	0	2	0	1	4	6	17
For 1925:												
Clear	13	12	21	13	12	18	20	20	24	22	9	17
Partly cloudy	4	6	4	8	12	4	5	5	2	4	9	2
Cloudy	14	10	6	9	7	8	6	6	4	5	12	12
For 1926:												
Clear	17	10	23	16	24	21	22	23	27	24	9	14
Partly cloudy	4	6	3	6	5	5	5	3	3	5	4	6
Cloudy	10	12	5	8	2	4	4	5	0	2	17	11
For 1927:												
Clear	11	7	11	15	19	19	26	25	20	24	11	18
Partly cloudy	8	8	6	7	8	6	4	3	6	3	4	3
Cloudy	12	13	14	8	4	5	1	3	4	4	15	10

KILLING FROSTS

Year	Last in spring	First in autumn	Frost-free period (days)	Year	Last in spring	First in autumn	Frost-free period (days)
1906	May 31	Oct. 4	125	1918	May 29	Oct. 7	130
1907	May 14	Sept. 19	127	1919	May 6	Sept. 22	138
1908	May 30	Sept. 25	117	1920	May 3	Sept. 25	144
1909	May 24	Sept. 22	120	1921	May 29	Sept. 13	106
1910	May 16	Sept. 23	129	1922	May 28	Oct. 4	128
1911	May 27	Sept. 18	113	1923	June 13	Sept. 24	102
1912	May 22	Sept. 25	125	1924	May 7	Sept. 21	136
1913	May 13	Sept. 23	132	1925	May 8	Sept. 22	136
1914	Apr. 24	Sept. 9	137	1926	May 11	Sept. 19	130
1915	May 20	Sept. 14	116	1927	May 29	Sept. 8	101
1916	June 1	Sept. 10	100				
1917	May 21	Sept. 25	126	Average	May 20	Sept. 21	123

[4] The records for March and October cover only 21 years.

The frost-free period for 1927 was 22 days shorter than the average. A frost on May 29 destroyed many of the fruit blossoms, and as a result there was only a fair crop of fruit in the fall. The frost on September 8 killed most of the garden truck and melon vines. This made a rather short season for the cantaloupe growers.

The coldest temperature recorded for the four years was −18° F., in January, 1924; the hottest was 103° F., in July, 1925. The mean temperatures for the years 1924 and 1927 were a little below normal; the mean temperatures for 1925 and 1926 were slightly above normal, that of 1926 being the highest.

The average yearly precipitation for the Newlands project is 4.91 inches. The total precipitation for 1924 was 3.83 inches, which was 1.08 inches below normal; in 1925 the precipitation was 7.23 inches, which was 2.32 inches above normal; in 1926 it was 4.72 inches, which was 0.19 inch below normal; and in 1927 3.64 inches, which was 1.27 inches below normal.

VARIETAL AND CULTURAL TESTS OF FIELD CROPS

POTATO EXPERIMENTS

During the last four years two varietal tests have been made with potatoes—one in 1925 and another in 1927. A test started in 1926 was a failure on account of a severe infestation of blight. This blight has been present in former years but has not caused such damage as it did during that year. The chief pest with which potato growers have had to deal has been a nematode infection. This eelworm trouble is present in practically all of the potato fields, in some cases infecting most of the potatoes. The years in which the infection seems to have been greatest on the station farm were those in which potatoes were planted on soil that had been in alfalfa the previous year. When potatoes followed other cultivated crops the infestation was much less.

The test made in 1925 was on a plot of ground belonging to the Churchill County High School at Fallon, Nev. The use of this location was obtained through an agreement with the school trustees. The soil of this plot was considered more uniform than any available on the station farm that year. The potatoes were planted April 27 in 175-foot rows. The distance between rows was 3 feet. The first two rows were checkrows; the third and fourth rows were planted to one of the varieties on test; the fifth and sixth, check; the seventh and eighth, a variety; and so on until 18 rows had been planted. The remainder of the plantings were in single rows with the exception of rows 20 and 21, which constituted a double check. This double-row arrangement was chosen because it was thought that the yield of two adjoining rows might more nearly offset any irregularities influencing the yield that might be encountered in the soil.

The varieties chosen for these experiments were British Queen, Portland Netted Gem, Pride of Multnomah, American Wonder, Quick Lunch, and locally grown Netted Gem as a check. The first four varieties named were certified potatoes obtained from a commercial seed company, the last two being locally grown selected tubers from the 1924 crop. The variety known as American Wonder failed to sprout, and the rows were replanted on June 11 with a variety that had been shipped to the local markets from Michigan. These were sold under the name Michigan Rural.

Table 5 gives the detailed data recorded on this experiment. The yields of the various varieties are given in pounds to the row. In converting these into bushels per acre it was found that the sum of the acre yields of all the rows of British Queen equaled 267 bushels of marketable potatoes; those of Portland Netted Gem, 291 bushels; those of Pride of Multnomah, 345 bushels; those of Michigan Rural, 173 bushels; those of Quick Lunch, 31 bushels; an average for all checkrows of 179 bushels.

The variety known as Pride of Multnomah produced the most marketable tubers; but when the production of marketable potatoes is figured on the basis of a comparison with the nearest checkrows, the British Queen was the heaviest producer. To obtain this comparison, an average was taken of the totals of the four checkrows bordering on the two of the trial variety, which in the case of the British Queen were rows 1, 2, 5, and 6.

TABLE 5.—*Varietal tests with potatoes on the Churchill County High School tract in 1925*

Rows	Variety	Yield			Marketable	Marketable yields		Total yields	
		Total	Marketable	Culls		Average of adjoining plots	Comparison of varieties with check	Average of adjoining plots	Comparison of varieties with check
		Pounds	*Pounds*	*Pounds*	*Per cent*	*Pounds*	*Per cent*	*Pounds*	*Per cent*
1, 2	Check (local Netted Gem)	386	246	140	64				
3, 4	British Queen	604	491	113	81		159		135
5, 6	Check	511	372	139	73	309		448	
7, 8	Portland Netted Gem	538	421	117	78		140		124
9, 10	Check	361	231	130	64	301		436	
11, 12	Michigan Rural	314	251	63	80		73		56
13, 14	Check	759	459	300	61	345		560	
15, 16	Pride of Multnomah	947	500	447	53		137		135
17, 18	Check	643	272	371	42	365		701	
19	Quick Lunch	51	30	21	59		16		11
20, 21	Check	266	113	153	43	193		454	
22	British Queen	158	89	69	56		101		77
23	Check	143	63	80	44	88		205	
24	Quick Lunch	30	15	15	50		25		23
25	Check	122	57	65	47	60		132	

Here, as in the 1925 tests, the Pride of Multnomah variety produced the most marketable tubers. When the production of marketable potatoes was figured on a basis of a comparison with the nearest checkrows, the Pride of Multnomah also proved to be the heaviest producer.

TABLE 6.—*Varietal tests with potatoes on the station farm in 1927*

Rows	Variety	Yield			Marketable	Marketable yields		Total yields	
		Total	Marketable	Culls		Average of adjoining plots	Comparison of varieties with check	Average of adjoining plots	Comparison of varieties with check
		Pounds	*Pounds*	*Pounds*	*Per cent*	*Pounds*	*Per cent*	*Pounds*	*Per cent*
1, 2	Check (local)	267	209	58	78				
3, 4	Portland Netted Gem	289	246	43	85		110		100
5, 6	Check	311	238	73	77	223		289	
7, 8	Pride of Multnomah	371	274	97	74		112		116
9, 10	Check	329	251	78	76	244		320	
11, 12	Burbank	337	262	75	78		109		104
13, 14	Check	316	229	87	73	240		322	
15, 16	Quick Lunch	245	159	86	65		74		80
17, 18	Check	295	203	92	69	216		305	

The potato experiments in 1927 were conducted on the station farm on soil that was considered most nearly uniform. The varieties chosen were a local Netted Gem as check, which was selected from potatoes grown the previous year on the station farm, Pride of Multnomah and Burbank from a commercial seed company, Portland Netted Gem, and locally grown Quick Lunch. The British Queen variety could not be obtained. The arrangement followed the same general plan that was used in 1925. Double rows, 126 feet in length and 3½ feet apart, were used throughout the experiment. Each alternate double row was planted with local Netted Gem.

Table 6 gives the detailed data recorded. The yields are shown in pounds per row. The conversion of the yields of marketable potatoes into bushels per acre shows that Portland Netted Gem produced 203 bushels to the acre, Pride of Multnomah 226 bushels, Burbank 216 bushels, and Quick Lunch 131 bushels, the average for all the checkrows being 186 bushels.

CORN VARIETY TESTS

In 1924, 1925, and 1926 tests were conducted with field corn to determine the time of maturity and yield of several varieties. All the varieties selected for these tests were reputed to be early maturing. The growing season at Fallon, Nev., averages 123 frost-free days, which ordinarily would be long enough to mature corn. Because of the wide daily range in temperature, many varieties that in other regions would mature in this length of time will not do so in this locality. In all these tests the corn was planted about May 10 and harvested after the first frost in the fall, or about September 21.

TABLE 7.—*Tests of varieties of field corn on the Churchill County High School tract in 1924, 1925, and 1926*

Order of planting	Variety	Average height of stalks	Area planted	Stand	Gross yield	Dry weight compared with harvested weight	Yield, dry corn on cob	Shelling proportion	Yield, dry shelled corn	Acre yield		Rank, based on—	
										Shelled corn	Corrected to perfect stand	Yield of perfect stand	Maturity
1	2	3	4	5	6	7	8	9	10	11	12	13	14
	Season of 1924:	*Ft.*	*Acre*	*P. ct.*	*Lbs.*	*P. ct.*	*Lbs.*	*P. ct.*	*Lbs.*	*Lbs.*	*Lbs.*		
1	De Wolf's Prolific	8.0	0.0578	97	249	81	202	80	162	2,803	2,890	2	1
2	Early Murdock	7.5	.0578	95	250	76	190	79	150	2,595	2,732	4	3
3	Wisconsin No. 7	7.3	.0578	88	218	79	172	80	138	2,388	2,714	5	2
4	Oregon White Dent	7.0	.0578	74	137	70	96	81	78	1,349	1,823	9	9
5	Minnesota No. 13	6.8	.0868	94	258	72	186	81	151	1,740	1,851	8	7
6	Gurney's Rainbow	7.0	.0578	92	314	72	226	71	160	2,768	3,009	1	8
7	Wimple's Yellow Dent.	7.0	.0578	98	233	73	170	79	134	2,318	2,365	6	5
8	Wisconsin No. 25	6.5	.0578	97	197	70	138	78	108	1,869	1,927	7	10
9	Golden Surprise	8.5	.0578	95	150	67	101	81	82	1,419	1,494	11	11
10	Rustler's White Dent	6.8	.0578	94	149	76	113	80	90	1,557	1,656	10	4
11	Squaw	6.0	.0578	92	265	73	193	77	149	2,578	2,802	3	6
	Season of 1925:												
1	De Wolf's Prolific	7.2	.0916	75	340	77	262	79	207	2,262	3,020	3	6
2	Early Murdock	7.0	.0916	78	340	79	269	81	218	2,381	3,054	2	4
3	Wisconsin No. 7	7.2	.0916	77	295	80	236	84	198	2,160	2,809	4	3
4	Gurney's Rainbow	6.0	.1221	88	400	83	332	77	256	2,098	2,380	7	1
5	Wimple's Yellow Dent.	7.0	.0916	87	335	79	265	81	215	2,248	2,472	6	5
6	Squaw	6.0	.0916	81	260	81	211	78	165	1,802	2,222	8	2
7	Champion White Pearl.	8.0	.0916	84	450	71	320	80	256	2,796	3,322	1	8
8	Northwestern Dent	10.0	.1221	79	475	67	318	80	254	2,082	2,640	5	9
9	Local Rainbow	6.0	.0916	92	305	77	235	77	181	1,977	2,148	9	7
	Season of 1926:												
1	De Wolf's Prolific	8.5	.0872	78	249	69	172	84	144	1,652	2,120	7	6
2	Early Murdock	7.0	.0872	78	270	73	197	83	164	1,881	2,415	4	5
3	Wisconsin No. 7	8.5	.0872	84	332	63	209	83	173	1,979	2,338	5	7
4	Gurney's Rainbow	6.5	.0872	92	336	82	276	79	218	2,500	2,720	3	1
5	Wimple's Yellow Dent.	8.0	.0872	58	257	77	198	85	168	1,930	3,323	1	2
6	Champion White Pearl.	7.0	.0872	64	253	76	192	85	163	1,870	2,923	2	3
7	Northwestern Dent	6.5	.0872	86	281	74	208	79	164	1,881	2,189	6	4

The varieties selected in 1924 were Rainbow, De Wolf's Prolific, Squaw, Early Murdock, Wisconsin No. 7, Wimple's Yellow Dent, Wisconsin No. 25, Minnesota No. 13, Rustler's White Dent, Oregon White Dent, and Golden Surprise. All these varieties, with the exception of Wisconsin No. 25 and Oregon White Dent, were obtained from North Dakota. Wisconsin No. 25 was from a crop grown locally the previous year, and Oregon White Dent was obtained from a commercial seed company.

These experiments were conducted on the ground belonging to the Churchill County High School and lent by that institution to the station as a demonstration plot. Table 7 shows the results. The plantings were made in blocks of four rows to each variety, with the exception of Minnesota No. 13, which had six rows. The order of planting and gross yield (column 6) of each variety are shown in the table.

In order to determine the stage of maturity of each variety at harvest time, 10 of the best ears of each were selected and accurately weighed. These were hung in a ventilated place until they were thoroughly air-dry—about three or four months—and then reweighed. The loss of weight was taken as loss of moisture. The difference between this weight and that obtained at harvest time was taken as the weight of dry corn in each case. Column 7 of Table 7, headed "Dry weight compared with harvested weight," gives the dry weight figured as a percentage of the gross harvested weight. The 10 ears of each variety were then shelled and the cobs weighed. From this weighing the shelling percentage was obtained.

This method of determining the maturity of the corn did not prove satisfactory. When the data for the three years were analyzed it was found that very fluctuating results were obtained. Probably the usual method of taking field notes on the general appearance of the maturity of each variety before harvesting is the better one to use.

The soil where these yearly tests were made is somewhat spotted. On account of this soil character and the loss of some hills by pheasants, the final stand of some varieties was as low as 74 per cent, ranging from that to 98 per cent. An endeavor was made to determine what the yield of each variety would have been had there been a 100 per cent stand. The figures in column 12 of Table 7 show the results of this computation. Column 13 gives the rank of the varieties in the order of their production calculated on the basis of a perfect stand.

Similar experiments were conducted on the same plot at the county high-school grounds in 1925 and 1926. In 1925 the varieties selected were six of the heavier producing varieties of the 1924 test, namely, Early Murdock, De Wolf's Prolific, Wisconsin No. 7, Wimple's Yellow Dent, Gurney's Rainbow, and Squaw, and three new varieties—Champion White Pearl, Northwestern Dent, and local Rainbow. Seed of the first six varieties was obtained from North Dakota, the White Pearl from Oregon, the Northwestern Dent from North Dakota, and the Rainbow was grown locally the previous year. The plantings were made in 3-row blocks, except that 4-row blocks were made for Gurney's Rainbow and Northwestern Dent.

Table 7 gives the results of these experiments. Notes similar to those of 1924 were taken, and the results were calculated in the same manner.

In 1926 seven of the better varieties grown in 1925 were again grown in a similar experiment on the county high-school grounds. The seed was obtained from the same source as in the previous years, and the same notes were taken and the same figures compiled as in the two preceding years. The varieties were planted in 4-row blocks. Table 7 gives the results of these tests.

During 1927 the experiment was carried on a fourth time, but because of a cold spring and rather unfavorable growing weather, none of the corn matured. The results were so irregular and unsatisfactory that no attempt was made to tabulate them.

Table 8 shows a comparison of those varieties that have been grown two or more years out of the three. The varieties that showed an actual production of more than a ton of shelled corn to the acre for two of three years were Early Murdock, De Wolf's Prolific, Wisconsin No. 7, and Wimple's Yellow Dent. However, when the yields are computed on the basis of a perfect stand the yearly production of all seven varieties is well over a ton per acre.

TABLE 8.—*Comparative yields of corn varieties grown at the Newlands Field Station in 1924, 1925, and 1926*

Variety	Acre yields of shelled corn (pounds)							
	1924		1925		1926		Average	
	Actual	Corrected to perfect stand	Actual	Corrected to perfect stand	Actual	Corrected to perfect stand	Actual	Corrected to perfect stand
Early Murdock	2,595	2,732	2,381	3,054	1,881	2,415	2,286	2,733
Gurney's Rainbow	2,768	3,009	2,098	2,380	2,500	2,720	2,455	2,703
Wimple's Yellow Dent	2,318	2,365	2,248	2,472	1,930	3,323	2,165	2,720
Northwestern Dent			2,082	2,640	1,881	2,189	1,981	2,418
Wisconsin No. 7	2,388	2,714	2,160	2,809	1,979	2,358	2,176	2,627
De Wolf's Prolific	2,803	2,890	2,262	3,020	1,652	2,120	2,239	2,677
Champion White Pearl			2,796	3,322	1,870	2,923	2,333	3,122

RYE

There are many acres of land in the Newlands project that lie on the border line between being worthless and partially productive. This unproductiveness in many cases is due not so much to the quantity of soluble salts present as it is to the impervious condition of the soil. The value of these areas for farming and the methods of cropping best suited to their improvement have received much consideration. One of the most promising methods so far tried has been to begin with a crop of rye followed by sweet clover, preferably used as a pasture, and finally to use the land for more valuable crops.

Prior to 1924 no data were available regarding this method of procedure. In the fall of 1924 some land on the station farm of the type that had failed to produce a crop of barley during the summer of that year was planted to winter rye. During the winter months a little pasture was obtained from this fall-planted grain. The crop was allowed to mature during the summer of 1925. It was cut and threshed late in June and produced 953 pounds of grain to the acre. During July of the same year sweet clover was drilled into the rye

stubble at the rate of 18 pounds of seed to the acre. A fair stand of sweetclover was obtained. In the following year and again in 1927 the sweetclover was cut for hay. Late in the summer of 1927 alfalfa was drilled into the sweetclover stubble. By late fall there appeared to be a good stand of alfalfa over the entire area with the exception of a few hard spots. Manure was applied to these spots, preparatory to reseeding them in 1928.

A similar plan was applied to some of the "cement" type of sandy soil on the station farm. This type of soil takes water fairly well, but on drying the surface becomes so hard that it is impossible for small seedlings to break through. This area was sown to fall rye, but after the crop was taken off the following year the ground was plowed, and sweetclover was planted with a drill. It was found to be impossible to obtain a stand with this method of seeding. Finally the sweetclover was sown broadcast and lightly harrowed. The field was irrigated very frequently, because it was found that the surface dried and became hard very quickly. This treatment resulted in a fair stand of sweetclover, which was pastured by dairy cows for two years. At the end of this period a mixture of grass and clover seed was broadcast into the stubble and lightly harrowed. The field was then top-dressed with fresh stable manure containing much straw from the bedding of the stalls. This was applied at the rate of 12 tons to the acre. Frequent irrigations were again given, and the following year a very good grass pasture resulted.

Yields of rye will be much better on good land than on these subnormal soils. An area at the station regarded as fair soil was planted to rye in the fall of 1924. When cut and threshed the following June the plot produced 2,395 pounds of grain to the acre. When it is known that fall-planted rye grows on rather poor soil, producing some fall pasture and a crop of grain late in June or early July of the following year, this crop may be worth considering as a means of returning a little revenue from these border-line areas. There is also the possibility of following the line of action taken on the station farm—finally devoting these lands to more profitable crops.

If rye is planted on the better soils, there still remains time after harvest to plant the same ground to some quick-maturing crop like millet. Millet matures under local conditions in about 60 days.

FERTILIZER EXPERIMENTS WITH CORN AND WHEAT

The results of experimental work conducted for 10 years at the Newlands Field Station with the use of fertilizer on wheat and corn are now available. These experiments are located on soil that is considered to be somewhat less than half as productive as that of the Stillwater section of the project, where most of the wheat is grown. The average yield of that district is about 1,500 pounds per acre, whereas the yields of the untreated plots in these experiments averaged 673 pounds per acre.

The experiments involved four plots, Nos. 1, 2, 3, and 4 in series E, each plot having an area of about 0.6 of an acre.

From 1918 to 1924, inclusive, the plan of cropping and fertilizing was as follows: Each year all four plots were treated with gypsum at the rate of 1,000 pounds per acre. In alternate years plots E–1 and E–3 were manured at the rate of 15 tons per acre. Plots E–2 and

E–4 did not receive manure. The application of manure was made in the fall previous to planting those plots to corn the following spring. An application of manure was first made to plot E–3 in the fall of 1917 and to E–1 in 1918.

In 1925 the experiment was modified. The plots that had been receiving manure the year corn was planted were given an application of 18 per cent superphosphate at the rate of 250 pounds per acre at the time the wheat was planted.

The first period of the experiments, 1918 to 1924, inclusive, during which two of the plots, E–2 and E–4, were not treated with manure, while E–1 and E–3 were manured each alternate year, showed an increase in yield of the manured over the unmanured plots. During this period four crops of wheat were harvested from plot E–2 and three crops of wheat from E–4, or seven crops in all. The average yield of wheat from the seven unmanured plots was 609 pounds per acre. There were six comparable yields of wheat following manured corn, the average yield being 844 pounds per acre. The use of manure in this case seemed to have caused an increase of 235 pounds of wheat to the acre—an increase of about 39 per cent.

Corn planted in this 2-year rotation during the period 1918 to 1924, inclusive, also showed an increase in yield. Three crops of corn were harvested from E–2 and three crops from E–4, or six crops in all. No yields were obtained on the corn in 1920, as the station farm was closed from July, 1920, to March, 1921. The average acre yield from the unmanured plots for the six years was 8,778 pounds of green corn. There were six comparable acre yields of corn on manured plots, the average yield being 10,331 pounds of green corn, an increase of 1,553 pounds, or about 18 per cent. Table 9 shows the effect of manure and superphosphate on the yields of wheat and corn.

TABLE 9.—*Effect of manure and superphosphate on the yields of wheat and corn in rotation at the Newlands Field Station during the 10-year period 1918 to 1927*

[Explanation of abbreviations in parentheses: Man.=manure applied in the fall previous to the spring when corn was planted; sup.=superphosphate applied at the time wheat was sown]

Year	Plot E–1		Plot E–2		Plot E–3		Plot E–4	
	Crop	Acre yield	Crop	Acre yield	Crop	Acre yield	Crop	Acre yield
		Pounds		*Pounds*		*Pounds*		*Pounds*
1918	Wheat	1,018	Wheat	617	Corn (man.)	10,474	Corn	6,398
1919	Corn (man.)	7,919	Corn	7,772	Wheat	864	Wheat	813
1920	Wheat	906	Wheat	542	Corn (man.)		Corn	
1921	Corn (man.)	14,068	Corn	12,640	Wheat	735	Wheat	546
1922	Wheat	769	Wheat	376	Corn (man.)	10,971	Corn	10,085
1923	Corn (man.)	9,140	Corn	6,991	Wheat	1,118	Wheat	1,040
1924	Wheat	671	Wheat	329	Corn (man.)	9,414	Corn	8,779
1925	Corn (man.)	22,955	Corn	12,333	Wheat (sup.)	1,846	Wheat	1,149
1926	Wheat (sup.)	1,171	Wheat	462	Corn (man.)[1]	6,224	Corn[1]	5,679
1927	Corn (man.)[1]	3,952	Corn[1]	2,794	Wheat (sup.)	1,676	Wheat	856

[1] Corn weighed as air-dried fodder.

The second period of the experiments, 1925 to 1927, inclusive, showed a further increase in the yield of the wheat due to the use of the superphosphate in addition to the manure. During this period one crop of wheat was harvested from plot E–2 and two crops of

wheat from E–4, making a total of three wheat crops from untreated plots. The average acre yield of wheat for the three crops was 822 pounds. There were three comparable yields of wheat following manured corn and the application of 250 pounds of superphosphate to the acre at the time of planting the wheat. The acre yields from these three plots averaged 1,564 pounds of grain, an increase of 742 pounds, or 90 per cent. It seems logical to conclude that the superphosphate was responsible for an added increase of 51 per cent more than was obtained in the previous years by the use of manure alone.

In 1926 and 1927 the corn was weighed as air-dried fodder. Until results covering a few more years have been obtained it will not be safe to draw any definite conclusions on any hold-over effect, if any, that the superphosphate may have on the corn crop planted the following year.

HORTICULTURAL CROPS

TOMATO VARIETIES

The length of the growing season on the Newlands project is rather short for tomatoes, so it is essential to select the earliest maturing varieties. Experiments have been conducted at the station for a number of years in an endeavor to determine the varieties that would be best adapted to local conditions. These tests were conducted in the years 1915 to 1917, inclusive, and 1921 to 1924, inclusive. The detailed account of these experiments prior to 1924 is given in earlier publications of this station covering the years mentioned.

The test of 1924 was conducted in practically the same manner as in the previous years. Ten varieties were included in the experiment during this year. They were planted in rows 4 feet apart and 32 plants to the row, spaced 4 feet apart. Transplanting was made on May 19 from plants in the greenhouse. The records show the date of the first picking of 5 pounds or more of ripe fruit, the loss due to tomato wilt, and the gross yield per plant. Table 10 shows the order of planting and the data gathered. A variety known as June Pink showed a higher average production per plant than any other variety on test in 1924. The first variety to produce was Burbank, but the total yield placed it fifth in rank. Ponderosa lost the greatest number of plants by wilt and Bonny Best the least. June Pink lost 18.8 per cent of the plants originally planted and ranked next in loss to Ponderosa.

TABLE 10.—*Variety test of tomatoes at the Newlands Field Station in 1924*

Order of planting	Variety	Rank based on yield	Date of first picking[1]	Gross number of plants	Lost by wilt		Net number of plants	Yield	Average yield per plant[2]
					Number	Per cent			
								Pounds	*Pounds*
1	Anne	4	Aug. 20	33	3	9.1	30	527	17.6
2	Chalk's Early Jewel	3	....do....	33	2	6.1	31	597	19.2
3	Perfection	6	Sept. 1	32	2	6.3	30	435	14.5
4	Burbank	5	Aug. 15	31	4	14.0	27	443	16.4
5	June Pink	1	Aug. 20	32	6	18.8	26	678	26.1
6	Globe	10	Sept. 1	31	3	9.7	28	261	9.3
7	Earliana	2	Aug. 20	32	2	6.3	30	611	20.4
8	John Baer	7	Aug. 25	33	5	15.2	28	390	13.9
9	Ponderosa	9	Aug. 27	33	7	21.2	26	286	11.0
10	Bonny Best	8	Aug. 25	32	1	3.1	31	367	11.8

[1] First picking of 5 pounds or over. [2] Yield per plant of those not killed by wilt.

In 1925 and 1926 two fertilizer experiments with tomatoes were conducted at the station. The fertilizers used were superphosphate, calcium nitrate, and potash. The plantings were so badly damaged by blight that the results were considered of little value. The disease known as yellows or western blight of tomatoes causes a heavy loss in some years. In the tomato-fertilizer experiment conducted in 1926 this loss ran as high as 75 per cent in several of the rows. Many farmers reported even higher losses in their gardens.

Recent investigations connect yellows with the curly-top disease of beets. It has been shown that the virus of the beet disease will cause blight in tomatoes and that the infection is spread by the leafhopper as in curly top. Those years in which the curly top of beets has been most severe have been years in which yellows gave the most trouble. So far no definite method of control has been found for combating this disease.

In an endeavor to obtain some variety that might be resistant to yellows, an experiment was conducted in 1927 with three varieties advertised as being particularly resistant. Plantings were made May 24 from plants started in the greenhouse. The rows were placed 6 feet apart and the plants 4 feet apart in the row. One row of each variety was planted, with alternate rows of the June Pink variety serving as checks. The experiment was located on ground that had been in grass pasture for the previous eight years. Table 11 gives the order of planting and the results obtained from this experiment. The average of all June Pink rows shows a 14.1 per cent loss, which is lower than that in any of the varieties sold as being yellows resistant.

TABLE 11.—*Test of tomato varieties for yellows resistance at the Newlands Field Station in 1927*

Variety	Number of plants	Plants wilted		Variety	Number of plants	Plants wilted	
		Number	Per cent			Number	Per cent
Morris	52	8	15.4	Marigold	52	16	30.8
June Pink	52	4	7.7	June Pink	52	11	21.2
Wilt Resistant	52	14	26.9				
June Pink	52	7	13.5	Average of all June Pink			14.1

As heretofore mentioned, several varieties of tomatoes have been grown on the station farm for a period of years in an endeavor to obtain data regarding their yields under local conditions. A summary showing the yields of some of the varieties grown during this time is shown in Table 12. June Pink was not included in this summary, as it was grown in variety test but one year (1924). In that experiment it produced more pounds of tomatoes to the plant than any other variety. The summary shows that Earliana was the heaviest producer for a number of years, having averaged 10.8 tons of tomatoes to the acre during six years. The average yields fell as low as 2.9 tons per acre for Dwarf Champion.

TABLE 12.—*Acre yields of tomato varieties at the Newlands Field Station in stated years*

Variety	Number of years grown	Acre yields (tons)								
		1914	1915	1916	1917	1921	1922	1923	1924	Average
Earliana	6	-------	3.5	5.7	3.7	7.6	18.5	-------	26.0	10.8
Perfection	7	6.3	5.4	3.9	4.4	-------	19.5	4.4	18.9	9.0
Ponderosa	6	6.0	1.0	-------	1.1	-------	-------	10.5	15.5	6.8
Globe	6	5.0	1.9	.4	1.0	-------	10.1	-------	11.4	5.0
Stone	6	4.5	1.9	.1	1.6	3.1	12.9	-------	-------	4.0
Golden Queen	5	3.7	1.2	-------	-------	-------	7.5	4.5	-------	4.2
Dwarf Champion	7	3.7	1.6	.3	1.8	2.2	6.5	4.3	-------	2.9

ONIONS

The soil and climatic conditions of the Newlands project seem to favor the production of onions. The high labor cost and uncertainty of the markets have been the chief factors preventing the more rapid development of this industry. Several years ago experiments were conducted on private farms, and yields running as high as 20 tons per acre were obtained. In 1926 and 1927 tests of several varieties were made at the station farm. The yields obtained were not as high as those of the earlier years conducted on private farms. This is largely due to adverse soil conditions in the field where the tests were located.

The varieties tested in 1926 were Mammoth Silver King, Yellow Globe Danvers, Red Wethersfield, and Mammoth Yellow Prizetaker. The seed was sown early in April in double rows 270 feet long and 3 feet apart. Three rows of each variety were planted. The entire crop was harvested on September 10 and allowed to cure in the field before the yields were determined. The Mammoth Yellow Prizetaker variety was the highest producing variety, yielding at the rate of 4.3 tons of dried onions to the acre. Mammoth Silver King produced 3 tons, Yellow Globe Danvers 2.3 tons, and Red Wethersfield 1.8 tons to the acre.

The varieties tested in 1927 were Yellow Globe Danvers, Mammoth Yellow Prizetaker, Red Globe, and Ohio Yellow Globe. These varieties were planted early in April in double rows 180 feet in length and 3 feet apart. Two double rows of each variety were planted. The crop was harvested September 23 and allowed to cure in the field. The yields this year were heavier than in 1926, owing to a change in garden site. They were grown on land that had been in pasture during the previous eight years. The yields, figured to an acre basis, showed that the Mammoth Yellow Prizetaker again produced more than the other varieties, with a yield of 10 tons. Yellow Globe Danvers yielded 5 tons, Red Globe 4.8 tons, and Ohio Yellow Globe 3.8 tons.

CUCUMBERS

All tests that have been made on the station farm tend to show that with a ready market the production of cucumbers should be a profitable undertaking. Records were kept in 1926 and 1927 on two varieties, namely, Evergreen Pickling and Davis Perfect. The plantings were made each year about the middle of May in single rows 6 feet apart, the hills being 6 feet apart in the rows. In 1926 the plantings were in rows 140 feet in length. The yields this year, figured on the basis

of 100-foot rows, placed Evergreen Pickling first with a yield of 255 pounds and Davis Perfect second with a yield of 204 pounds.

In 1927 the plantings were made in 200-foot rows. The recorded yields were Evergreen Pickling 190 pounds to the 100-foot row and Davis Perfect 126 pounds to the 100-foot row. If these tests had been made on some of the better soils of the project the yields would undoubtedly have been much greater.

CABBAGE

The data obtained from variety tests of cabbage in 1925 and 1927 strengthen the conclusions drawn from previous tests that very good yields can be obtained from cabbages when grown on the Newlands project. In 1925 five varieties were used in a variety test. The following varieties were planted in this order: All Season, Flat Dutch, Danish Iron Ball, Ideal Winter, and Jersey Wakefield. One 130-foot row of each variety was planted. The rows were 3 feet apart and the plants spaced 2 feet apart in the row. The plants were transplanted from coldframes May 11. The yields obtained per 100-foot row were as follows: All Season, 111 pounds; Flat Dutch, 89 pounds; Danish Iron Ball, 77 pounds; Ideal Winter, 63 pounds; Jersey Wakefield, 39 pounds.

In 1927 the plantings were made as in 1925 with the exception that the rows were 100 feet long. Single rows of each variety were planted, the plants being spaced 2 feet apart in the row. The varieties used and the order of planting were as follows: Ideal Winter, Sure Head, Jersey Wakefield, and Flat Dutch. Ideal Winter ranked the highest in yield, producing 146 pounds to the 100-foot row. Other yields in order were Flat Dutch, 125 pounds; Sure Head, 124 pounds; and Jersey Wakefield, 104 pounds.

Two insect pests have to be contended with during the growing season of cabbages. They are the cabbage worm and the green aphid. The worm can be controlled by using an arsenate spray and the aphid by the use of nicotine sulphate.

EXPERIMENTS WITH LIVESTOCK

The conditions existing on the Newlands project seem to warrant an increase in the production of pork. The climate is dry and temperate, with plenty of sunshine. Such conditions do not favor the spread of contagious diseases. As a result there is very little trouble from this source among the hogs at present on the project. The growing importance of dairying makes it advisable to find some means of profitably utilizing the skim milk remaining after the cream is sold. At present there are no cheese factories or condenseries; the only outlet for skim milk is to feed it to pigs, poultry, or calves. There still remains a large quantity of skim milk not being utilized in feeding such livestock. There also exists a large supply of cheap alfalfa, but no cheap grain feed. If pork production is to become a factor of importance on the Newlands project farms, methods of feeding must be adopted that will use this available skim milk and cheap alfalfa hay with a relatively small proportion of grain. With this problem in mind, several experiments have been conducted on the station farm during the last few years in an endeavor to find suitable combinations of alfalfa hay, skim milk, and grain as a pork-producing ration.

HOG-FEEDING EXPERIMENTS IN 1924

Experiments were conducted during 1924 to determine whether it is more economical (1) to pasture alfalfa or to feed dry alfalfa hay, and (2) to find the feeding value of skim milk as compared with barley when fed as a supplement with either pasture or hay.

Twenty pigs were divided into four lots, each having approximately the same initial weight, and these lots were rationed as follows:

Lot 1.—Alfalfa pasture plus 2 per cent barley.
Lot 2.—Alfalfa pasture plus 1 per cent barley plus 5 per cent skim milk.
Lot 3.—Alfalfa hay plus 2 per cent barley.
Lot 4.—Alfalfa hay plus 1 per cent barley plus 5 per cent skim milk.

A 2 per cent barley ration means that each pig was given 2 pounds of barley daily for each 100 pounds of live weight, i. e., a lot of pigs weighing 200 pounds would receive 4 pounds of barley. The pigs receiving the skim-milk ration were given 5 pounds of skim milk daily for each 100 pounds of live weight, but their barley ration was cut to 1 per cent.

At the beginning of the experiments the pigs weighed 40 to 50 pounds each. In computing the results of these experiments and those conducted in 1926 and 1927, barley is charged at $2 per hundredweight. Hay is priced at $10 a ton in the stack and alfalfa is charged at $17 an acre as pasture. It was estimated that 1 acre would carry 20 pigs through the growing period.

There were two periods to the experiments. The first period dealt with the pigs from weaning time (40 to 50 pounds each) until they had reached an average weight of about 100 pounds. When they had reached this weight, each lot was given free access to rolled barley in a self-feeder. They were kept on this ration until they had reached an average weight of 200 pounds.

TABLE 13.—*Record of the first (growing) period of the hog-feeding experiments at the Newlands Field Station in 1924*

Items of comparison	Pigs on pasture		Pigs on alfalfa hay	
	Lot 1, 2 per cent barley	Lot 2, 1 per cent barley plus 5 per cent skim milk	Lot 3, 2 per cent barley	Lot 4, 1 per cent barley plus 5 per cent skim milk
Number of pigs	5	5	5	5
Length of test—days	105	105	105	105
Weight of pigs per lot:				
Initial—pounds	220	221	246	236
Final—do	572	506	539	489
Gain, total—do	352	285	293	253
Gain, daily per head—do	.67	.54	.56	.48
Barley fed per lot—do	797	372	738	349
Skim milk fed per lot—gallons	0	217	0	203
Value of barley at 2 cents	$15.94	$7.44	$14.76	$6.98
Value of alfalfa	4.25	4.25	6.25	6.25
Value of barley and alfalfa	20.19	11.69	21.01	13.23
Value of grain at 8 cents	28.16	22.80	23.44	20.24
Profit above grain and hay fed	7.97	11.11	2.43	7.01
Profit of milk-fed lots over those receiving no milk	----------	3.14	----------	4.58
Value of skim milk per hundredweight	----------	.18	----------	.28

EXPERIMENTS WITH PIGS ON LIMITED RATION OF BARLEY

The chief point of interest in experiments of this nature is not the cost of producing 100 pounds of pork, but the profit to be obtained from a given number of hogs during a certain period of feeding. In this experiment (Table 13) it required 105 days to bring pigs from an average weight of 40 to 50 pounds at weaning time to an approximate weight of 100 pounds per pig. It was found that the profit over the cost of the alfalfa and barley for the five pigs in lot 1 during this period was $7.97, lot 2 showed a profit of $11.11; lot 3, one of $2.43; lot 4, one of $7.01. In each case the pigs on alfalfa pasture showed a greater profit than those receiving the same grain or grain and milk ration plus alfalfa hay.

The value of the milk in the ration depends upon the price received for the pork. In this case the value of the pork was placed at 8 cents a pound. The difference in profits between lots 1 and 2 was $3.14. Between lots 3 and 4 the difference was $4.58. Lot 2 received 217 gallons of skim milk, which in this case would be valued at $3.14, being 1.45 cents a gallon. Lot 4 received 203 gallons of skim milk, valued at $4.58, or 2.26 cents a gallon. If the price of pork had been higher and the value of the alfalfa and barley had remained unchanged the profit from the skim milk would have been less. For example, with pork 10 cents a pound the 217 gallons of skim milk fed to lot 2 would have had a value of $1.80, or 0.83 cent a gallon, and the 203 gallons fed to lot 4 would have had a value of $3.78, or 1.86 cents a gallon. If this were figured on the basis of 12-cent pork the skim milk would have still less value.

The reason for this apparent anomaly lies in the fact that the pigs fed the heavier barley ration (lots 1 and 3) made the larger gains, and as these gains increase in value the apparent value of the skim milk diminishes. On the other hand, if the value of the gains remained the same and the value of the barley changed, then the value of the skim milk would increase with increasing values of the barley. Thus in the case of lots 1 and 2 in Table 13 with the value of the gains at 8 cents a pound and with barley at 1.5 cents, the skim milk would be worth $1.01, but with barley at 2.5 cents the skim milk would be worth $5.27.

It can be readily seen that skim milk when fed in a ration with alfalfa hay is worth more than when fed with alfalfa pasture. Moreover, with a limited grain ration milk becomes worth more as the price of pork is reduced. Therefore, to obtain the greatest profit the grain ration should be increased as the price of pork rises above 8 cents. (Fig. 2.)

EXPERIMENTS WITH PIGS ON SELF-FED BARLEY RATIONS

The second period of the experiments related to the gains and cost of the gains that pigs would make when self-fed with rolled barley. This grain was used because it is the most readily obtained and is cheaper than corn. Most of the corn is shipped in, whereas about 900 acres of barley are grown on the project. The barley was fed from the time the pigs had reached an average weight of about 100 pounds to the time they each weighed 175 to 200 pounds.

When the pigs in the first part of this experiment had reached an average weight of about 100 pounds, they were placed on self-feeders which supplied them with all the rolled barley they could eat. The same roughage was continued, i. e., alfalfa pasture for lots 1 and 2

and alfalfa hay for lots 3 and 4. It was noted that the quantity of roughage eaten during this period was negligible. The feeding of skim milk on the same percentage basis as heretofore was continued with lots 2 and 4.

The results of this period of the experiments showed that it required 35 days on self-feeders to bring the pigs to the desired weight of 175 to 200 pounds each. During this time the lots on alfalfa pasture made more profit per pig than the lots on alfalfa hay. The value of the skim milk in this case was less than 1 cent a gallon. Table 14 gives the detailed data recorded for this period.

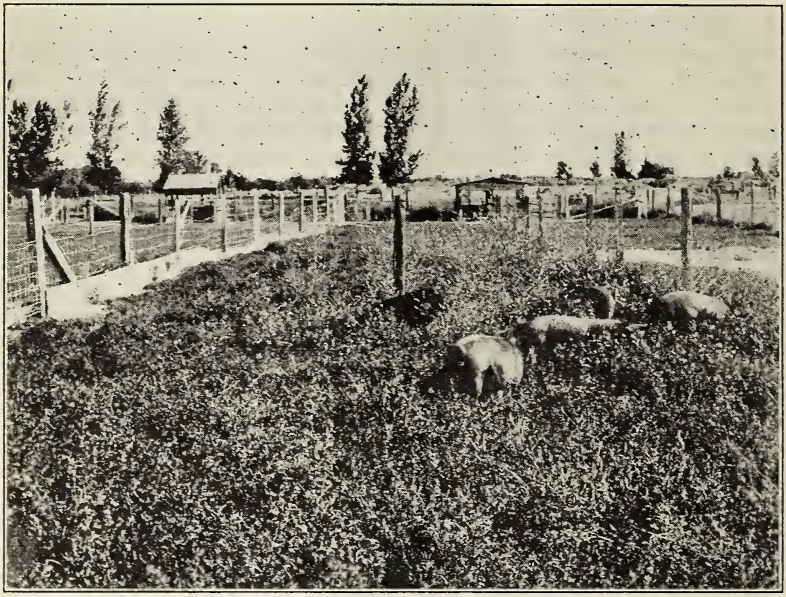

FIGURE 2.—Hogs on alfalfa pasture, Newlands Field Station

TABLE 14.—*Record of the second (self-feeder) period of the hog-feeding experiments at the Newlands Field Station in 1924*

Items of comparison	Pigs on pasture		Pigs on alfalfa hay	
	Lot 1, self-fed barley	Lot 2, self-fed barley plus 5 per cent skim milk	Lot 3, self-fed barley	Lot 4, self-fed barley plus 5 per cent skim milk
Number of pigs	5	5	5	5
Length of test—days	35	35	35	35
Weight of pigs per lot:				
Initial—pounds	572	506	539	489
Final—do	979	910	903	868
Gain, total—do	407	404	364	379
Gain, daily per head—do	2.3	2.3	2.1	2.2
Barley fed per lot—do	1,423	1,366	1,432	1,456
Skim milk per lot—gallons	0	98	0	76
Value of barley at 2 cents	$28.46	$27.32	$28.64	$29.12
Value of pork gains at 8 cents	32.56	32.32	29.12	30.32
Profit per lot	4.10	5.00	.48	1.20
Profit per pig over grain cost	.82	1.00	.09	.24
Value of skim milk per hundredweight		.11		.12

HOG-FEEDING EXPERIMENTS IN 1926

In cooperation with the department of farm development of the Nevada Agricultural Experiment Station, further pig-feeding experiments were conducted in 1926 and 1927. The results of the experiments in 1924 showed the possibility of producing cheaper gains by increasing the quantity of the skim milk fed.

In the spring of 1926 15 pigs were divided into three lots of 5 each and fed as follows:

Lot 1.—Alfalfa pasture, no skim milk, 2 per cent rolled barley.
Lot 2.—Alfalfa pasture, 10 per cent skim milk, 2 per cent rolled barley.
Lot 3.—Alfalfa pasture, 20 per cent skim milk, 1 per cent rolled barley.

Until the pigs of each lot had reached an average of 100 pounds, they were fed the rations indicated above, after which they were given an unlimited grain ration of rolled barley in self-feeders. Lots 2 and 3 received skim milk throughout both the growing and self-feeder periods. All lots had access to alfalfa pasture throughout both periods, but the quantity of alfalfa eaten during the second period of the experiments was negligible.

Table 15 shows the results of these experiments through both the growing and fattening periods. The grain consumed per pound of gain during the growing period decreased with the increase in the quantity of skim milk fed, 1.85 pounds having been required by lot 1 with no skim milk, 1.43 pounds by lot 2 with 10 per cent skim milk, and 0.74 pound by lot 3 with 20 per cent skim milk. On self-feeders the quantity of grain required was also reduced by increasing the skim-milk supply, but the saving in grain by the use of skim milk was less than during the growing period. Those lots receiving the heaviest ration of skim milk produced the greatest profit per pig during the growing and fattening periods, more profit being made during the growing period than during the self-feeder period.

HOG-FEEDING EXPERIMENTS IN 1927

The results of the pig-feeding experiments in 1924 and 1926 indicated that further information was needed regarding (1) the value of skim milk in a ration of alfalfa pasture or hay and rolled barley, and (2) whether the value of the skim milk really increased as the percentage of skim milk in the ration increased. In order to obtain accurate information on this matter, it was decided to feed varying proportions of skim milk with a fixed quantity of rolled barley to two groups of pigs, one on alfalfa pasture and the other receiving alfalfa hay. The two groups were each divided into three lots of five pigs each, and these were fed through the growing period as follows:

Lot 1.—Alfalfa pasture, 2 per cent barley, no skim milk.
Lot 2.—Alfalfa pasture, 2 per cent barley, 5 per cent skim milk.
Lot 3.—Alfalfa pasture, 2 per cent barley, 10 per cent skim milk.
Lot 4.—Alfalfa hay, 2 per cent barley, no skim milk.
Lot 5.—Alfalfa hay, 2 per cent barley, 5 per cent skim milk.
Lot 6.—Alfalfa hay, 2 per cent barley, 10 per cent skim milk.

At the beginning of the experiment the average weight of each pig was about 30 pounds. It was decided to bring the hogs to an average weight of 140 to 150 pounds before they were put on self-feeders. It was thought that such a method of handling might result in more rapid gains during the fattening period, with the use of less barley. The length of time required to bring the pigs from an average weight of 30 pounds to the required 140 to 150 pounds varied in each case.

The time ranged from 133 days in the case of lots 3 and 6 to 196 days in the case of lot 4. During the fattening period the pigs in all cases had access to a self-feeder of rolled barley. All lots with the exception of lot 4 remained on self-feeders for three weeks. Lot 4 required one week longer before the pigs averaged 200 pounds in weight.

In computing the results the same values were given to the alfalfa, the barley, and the pork as in the previous experiments. Table 16 gives the detailed data obtained from this experiment. It would appear from this experiment that when pork is worth 8 cents a pound it is most profitable to feed 5 per cent, or a little more, of skim milk in the ration. A comparison of the alfalfa-hay-fed groups with those on alfalfa pasture shows that skim milk in the ration is of much more value to those pigs in dry lot than to those on pasture.

TABLE 15.—*Record of pigs on alfalfa pasture with varying milk and barley rations at the Newlands Field Station in 1926*

Items of comparison	Lot 1, 2 per cent grain and no skim milk			Lot 2, 2 per cent grain plus 10 per cent skim milk			Lot 3, 1 per cent grain plus 20 per cent skim milk		
	Growing period	Fattening period	Both periods	Growing period	Fattening period	Both periods	Growing period	Fattening period	Both periods
Number of pigs	5	5	5	5	5	5	5	5	5
Test begun	June 5	Sept. 4	June 5	June 5	Aug. 21	June 5	June 5	Aug. 21	June 5
Test ended	Sept. 4	Oct. 23	Oct. 23	Aug. 21	Oct. 9	Oct. 9	Aug. 21	Oct. 9	Oct. 9
Length of test—days	91	49	140	77	49	126	77	49	126
Weight of pigs per lot:									
Initial—pounds	198	477	198	184	511	184	203	527	203
Final—do	477	950	950	511	949	949	527	1,001	1,001
Gain:									
Total—do	279	473	752	327	438	765	324	474	798
Daily—do	3.06	9.65	5.37	4.25	8.94	6.07	4.21	9.67	6.33
Do—per cent	0.99	1.4	1.14	1.34	1.27	1.32	1.25	1.32	1.28
Grain fed per lot:									
Total—pounds	515	1,875	2,390	466	1,650	2,116	238	1,650	1,888
Per pound of gain—do	1.85	3.95	3.18	1.43	3.76	2.76	.74	3.48	2.38
Milk fed per lot:									
Total—do				2,324	1,684	4,008	4,858	3,563	8,421
Per pound of gain—do				7.1	3.9	5.2	15.0	7.5	10.6
Gain at 8 cents per pound	$22.32	$37.84	$60.16	$26.16	$35.04	$61.20	$25.92	$37.92	$63.84
Value of grain at 2 cents per pound	10.30	37.50	47.80	9.32	33.00	42.32	4.76	33.00	37.76
Value of pasture per lot	4.25		4.25	4.25		4.25	4.25		4.25
Profit:									
Above grain and pasture, per lot	7.77	.34	8.11	12.59	2.04	14.63	16.91	4.92	21.87
Per pig	1.55	.07	1.62	2.52	.41	2.93	3.38	.98	4.33
Net income from milk				4.82	1.70	6.52	9.14	4.58	13.72
Value of milk per cwt				.21	.10	.16	.19	.13	.16

CONCLUSIONS FROM HOG-FEEDING EXPERIMENTS

An analysis of the results of the pig-feeding experiments for the three years leads to some obvious conclusions. When pigs are fed under local conditions on a ration of alfalfa hay or pasture, barley, and skim milk, and the value of pork exceeds 8 cents per pound, and the grain remains at 2 cents per pound, it pays to increase the grain in the ration and keep the skim milk at 5 or 10 per cent. As the price of pork drops, the quantity of the grain fed should be reduced and cheaper feeds should be used; that is, an increase should be made in the skim milk. When pork is worth 12 cents a pound the pigs should go on self-feeders as soon as possible. Soon after weaning time would not be too early to commence such means of feeding.

Another conclusion to be drawn from these experiments is that skim milk in the ration has a far greater value when pigs are fed alfalfa hay in the dry lot than when the skim milk is fed to pigs running on alfalfa pasture.

TABLE 16.—*Record of pigs on alfalfa pasture and alfalfa hay with varying milk rations at the Newlands Field Station in 1927*

PIGS ON ALFALFA PASTURE

Items of comparison	Lot 1, 2 per cent barley and no skim milk			Lot 2, 2 per cent barley plus 5 per cent skim milk			Lot 3, 2 per cent barley plus 10 per cent skim milk		
	Growing period	Fattening period	Both periods	Growing period	Fattening period	Both periods	Growing period	Fattening period	Both periods
Number of pigs	5	5	5	5	5	5	5	5	5
Test begun	May 10	Oct. 25	May 10	May 10	Sept. 20	May 10	May 10	Sept. 20	May 10
Test ended	Oct. 25	Nov. 15	Nov. 15	Sept. 20	Oct. 11	Oct. 11	Sept. 20	Oct. 11	Oct. 11
Length of test—days	168	21	189	133	21	154	133	21	154
Weight of pigs:									
Initial—pounds	145.5	705.0	145.5	146.0	681.0	146.0	146.0	738.0	146.0
Final—do	705.0	924.0	924.0	681.0	877.5	877.5	738.0	943.0	943.0
Gain—									
Total—do	559.5	219.0	778.5	535.0	196.5	731.5	592.0	205.0	797.0
Daily—do	3.32	10.40	4.12	4.02	9.37	4.75	4.45	9.77	5.17
Do—per cent	0.95	1.30	1.00	1.17	1.22	1.18	1.26	1.18	1.22
Grain fed:									
Total—pounds	1,295.7	915.0	2,210.7	998.9	735.0	1,733.9	1,062.1	740.0	1,802.1
Per pound of gain—do	2.32	4.18	2.84	1.87	3.74	2.37	1.79	3.61	2.25
Milk fed:									
Total—do				2,496.9	795.2	3,292.1	5,293.4	1,733.2	7,026.6
Per pound of gain—do				4.67	4.05	4.50	8.94	8.45	8.82
Gain at 8 cents per pound	$44.76	$17.52	$62.28	$42.80	$15.72	$58.52	$47.36	$16.40	$63.76
Value of grain at 2 cents per pound	25.91	18.30	44.21	19.98	14.70	34.68	21.24	14.80	36.04
Value of pasture	4.25		4.25	4.25		4.25	4.25		4.25
Profit:									
Above grain and pasture	14.60	[1]−.78	13.82	18.57	1.02	19.59	21.87	1.60	23.47
Per pig	2.92	[1]−.16	2.76	3.71	.20	3.92	4.37	.32	4.69
Net income from milk				3.97	1.80	5.77	7.27	2.38	9.65
Value of milk per cwt				.16	.23	.18	.14	.14	.14

PIGS ON ALFALFA HAY

Items of comparison	Lot 4, 2 per cent barley and no skim milk			Lot 5, 2 per cent barley plus 5 per cent skim milk			Lot 6, 2 per cent barley plus 10 per cent skim milk		
	Growing period	Fattening period	Both periods	Growing period	Fattening period	Both periods	Growing period	Fattening period	Both periods
Number of pigs	5	5	5	5	5	5	5	5	5
Test begun	May 10	Nov. 22	May 5	May 17	Oct. 18	May 17	May 17	Sept. 27	May 17
Test ended	Nov. 22	Dec. 20	Dec. 20	Oct. 18	Nov. 8	Nov. 8	Sept. 27	Oct. 18	Oct. 18
Length of test—days	196	28	224	154	21	175	133	21	154
Weight of pigs:									
Initial—pounds	146.0	674.0	146.0	148.0	705.0	148.0	147.0	726.5	147.0
Final—do	674.0	916.0	916.0	705.0	949.5	949.5	726.5	916.0	916.0
Gain—									
Total—do	528.0	242.0	770.0	557.0	244.5	801.5	579.5	189.5	769.0
Daily—do	2.7	8.6	3.4	3.6	11.6	4.6	4.3	9.0	5.0
Do—per cent	0.79	1.10	0.83	1.02	1.43	1.07	1.21	1.11	1.20
Grain fed:									
Total—pounds	1,412	1,285	2,697	1,168	883	2,051	1,008	805	1,813
Per pound of gain—do	2.7	5.3	3.5	2.1	3.6	2.6	1.7	4.2	2.4
Milk fed:									
Total—do				3,175	832	4,007	5,042	1,656	6,698
Per pound of gain—do				5.7	3.4	5.0	8.7	8.7	8.7
Gain at 8 cents per pound	$42.24	$19.36	$61.60	$44.56	$19.56	$64.12	$46.36	$15.16	$61.52
Value of grain at 2 cents per pound	28.24	25.70	53.94	23.36	17.66	41.02	20.16	16.10	36.26
Value of hay	5.10		5.10	3.80		3.80	2.32		2.32
Profit:									
Above grain and hay	8.90	[1]−6.34	2.56	17.40	1.90	19.30	23.88	[1]−.94	22.94
Per pig	1.78	[1]−1.27	.51	3.48	.38	3.86	4.78	[1]−.19	4.59
Net income from milk				8.50	8.24	16.74	14.98	[2]5.40	20.38
Value of milk per cwt				.27	.99	.42	.30	.33	.30

[1] Loss.

[2] Although the value of gain was less than the cost of feed, the milk had a feeding value of $5.40 over the lot with no milk.

DAIRY FEEDING EXPERIMENTS

Practically all the dairy cows on the Newlands project in the past have received a ration of alfalfa hay without any feed of grain. It has been the opinion of some dairymen and others interested in the dairy farming on the project that as the production of the individual cows increased, owing to the use of better herd sires, it might be advantageous to feed some form of concentrates.

In the fall of 1925 the Nevada Agricultural Experiment Station made arrangements with the Department of Agriculture to conduct some feeding experiments with dairy cows. The dairy herd on which these experiments were to be made was to be located on the station farm. The State of Nevada purchased 21 head of dairy cows and a purebred bull and provided all the necessary equipment such as labor, barns, milk houses, corrals, and implements. The work was to be under the supervision of the Newlands Field Station.

The work as outlined in October, 1925, called for the following grouping and feeds:

Group 1.—Ration A—alfalfa hay throughout the year, 5 cows.
Group 2.—Ration B—alfalfa, barley, and wheat bran[2] throughout the year, 5 cows.
Group 3.—Rations A and B—in alternate months, 5 cows.
Group 4.—Silage (while available) and alfalfa in alternate months. In summer alfalfa hay and pasture in alternate months, 3 cows.
Group 5.—Ration like Group 4, but cows to receive the grain mixture according to quantity of milk given by individual cows, 3 cows.

The objects of the dairy experiment may be stated as follows:

(1) To find under what conditions the feeding of grain is profitable.
(2) Effect of lifelong feeding of alfalfa hay upon the health, breeding ability, and productiveness of cows.
(3) Relation, if any, between kind of rations fed and shy breeding.
(4) Effect of silage, pasture, roots, and other roughages upon milk flow and under what conditions their use is profitable.

The general plan of the experiments has remained unaltered since it was first planned, except that the cows of Group 3, which were to receive the grain mixture in alternate months, are now fed so as to receive grain in alternate lactation periods. When not receiving grain their only roughage is alfalfa hay. It was found that after the results from this group had been compiled for the first year there was little significant difference in milk production during the alternate months when they received grain and when they did not receive grain. Evidently the carry-over effect interfered with any noticeable change in production. In the future it will be possible to compare the production of the individual cows of this group for the lactation periods without grain with the production when they do receive grain. When a number of years of such comparisons are available it should be possible to calculate very accurately the effect of grain on milk production and the economy of its use in the ration.

During the first seven months the groups receiving the grain mixture were fed rations calculated from tables of nutrient requirements, but this called for such a heavy grain ration that digestive troubles and bloat frequently resulted, and it was obviously unprofitable.

[2] The barley and bran mixture was 1 part wheat bran by weight to 2 parts barley.

The ration was modified in September, 1926, to a ratio of 1 pound of the grain mixture to every 5 pounds of milk produced.

Accurate records are kept on all feeds consumed by the various groups. The hay to each group is weighed, and the orts remaining are weighed back so that the net weight of hay consumed may be calculated. It has been found that the quantity of grain fed does not very materially reduce the weight of hay actually eaten. Groups 4 and 5, which receive silage in winter and pasture in summer, contained originally only three cows each, and it has happened that a large proportion of the cows of these groups have been removed by death or because of sterility, so that their records are of little value up to this time. In each of Groups 1, 2, and 3, however, there have been four cows each with records for two full years. It has been deemed advisable not to publish results from these tests until at least four full years of experimentation have been completed, but it may be stated at this time that results indicate little or no ill effect from continuous feeding of alfalfa as a sole ration, and that

FIGURE 3.—Cows on grass pasture, Newlands Field Station

grain feeding in addition to alfalfa is profitable only when certain price ratios of butterfat, hay, and grain exist. What these price ratios are will be brought out as the experiment continues.

This dairy experiment has afforded an opportunity to study the cost of producing veal calves. The initial weight of each calf dropped is obtained and the gains in weight found for various methods of feeding. Although the results are not ready for publication, it has become clear that it is decidedly profitable to raise Holstein bull calves to vealing age when rations are used calling for a minimum requirement of whole milk. (Fig. 3.)

LEACHING IMPERVIOUS SOIL

The portion of the Newlands station farm bordering on its south line is a rather flat area which previous to 1923 had a water table within 3 or 4 feet of the surface. In some places during the irrigation season the underground water rose still higher. In 1908 about

10 acres of this land was leveled and seeded in an attempt to get a stand of alfalfa, but the attempt was a failure. The soil proved to be impervious and the salt content too high in most places to permit the growth of alfalfa. In many places the irrigation water would not penetrate to a depth greater than 6 inches. During the years from 1908 to 1922 numerous attempts were made to remedy these soil conditions. Applications of manure, gypsum, and sulphur were made at different times to some of these plots, and sulphuric acid was applied in the irrigation water to others. An endeavor was made to lower the high water table by the construction of a 5-inch tile drain running the full length of alternate plots and emptying into a large 10-inch tile which had an outlet in an open drain east of the station farm.

These plots were cropped intermittently during the period 1908 to 1922. Some improvement was obtained through the various treatments, but the improvement was not marked. The crop yields from these plots during this period did not equal the yields currently obtained from other plots similarly cropped on the station farm.

In 1922 steps were taken to study the water conditions and structure of the soil underlying this area. Wells were installed at 80-foot intervals on the north and south sides of a portion of this area. The wells were cased to a depth of 8 feet. Weekly measurements were made of the ground-water elevations, and the total salt content of the water in each well was determined. It was found that underlying this entire area there were alternate layers of sand and adobe varying in thickness from 2 or 3 inches to 2 feet. In many cases the adobe came close to the surface. This accounted for the lack of penetration of irrigation water found in some places and also the irregularity in elevation of the underground water. This irregularity was found to exist when weekly measurements were made. The difference in elevation amounted to as much as 1 foot in a distance of 80 feet during the winter months when no irrigation water was flowing in the canals. During the irrigation season this measured difference was as high as 2½ feet.

A difference was noticeable not only in the height of the underground water but also in the concentration of the solution. This varied from about 500 parts per million to 10,000 parts per million in wells 80 feet apart. The total salts in solution increased or decreased from time to time during the irrigation season but remained fairly constant in each well during the time the irrigation water was out of the distributing canals.

About this time experiments being conducted in the laboratories in Washington and at the Newlands Field Station showed that alum would greatly improve the permeability of many refractory soils. A deposit of low-grade alum-bearing ore was found near the Lahontan Dam. Several tons of this ore was sacked and hauled to the station and applied to four of the worst plots of this area on the south side of the farm. This resulted in a great improvement of the perviousness of the soil and made it possible to obtain a fairly uniform stand of alfalfa. The growth was not satisfactory, however. The crop

attained a height of only 5 or 6 inches and required frequent irrigations to prevent wilting. It was concluded that in order to reclaim this area it would be necessary to lower the underground water table and that the outlet for this water should be such that irrigation water could be used in large quantities so as to leach the root zone.

In the spring of 1923 the Reclamation Service constructed a large open drain along the west side of this area, connecting it with the project's drainage system. During the months following there was a noticeable drop in the underground water. This drop occurred regardless of the fact that irrigation water was being used rather abundantly over this entire area. During four months of the summers of 1923 and 1924 weekly irrigations were given. Each plot was covered to a depth of about 4 inches. This water remained on the plot until it had disappeared either by penetrating the soil or by evaporation. Since 1924 the practice has been to irrigate every 12 or 14 days, draining off the surplus water after it has stood about two hours. A comparison of the water levels taken in December previous to the construction of the drain and those taken four years later show that the average decrease in water-table elevation for the whole area has been 1.4 feet. There has been a decrease not only in the elevation but also in the salt content, this average decrease being about 250 parts per million.

The improvement in the conditions of the subsoil in which the plant roots must live and obtain water is reflected in the increase in tonnage of alfalfa hay cut from this area. A comparison on the basis of tons per acre of the average yield of all alfalfa plots on this area with the average yields from the remaining alfalfa plots on the farm shows an increase ranging from 97 per cent in 1923 to 123 per cent in 1926.

Table 17 shows the acre yields of these nine plots of alfalfa for the 5-year period 1923 to 1927 as compared with the average alfalfa yields of the farm. The yields in 1927 were materially decreased by the presence of aphids, portions of this area being badly damaged by this pest. Inasmuch as some parts of the farm were comparatively free from the infestation, the yields of hay on this series as compared with the other areas of the farm show a lower average than in any previous year.

TABLE 17.—*Acre yields of alfalfa on Y plots 2 to 10, inclusive, at the Newlands Field Station for the 5-year period 1923 to 1927*

Year	Acre yields (tons)											Ratio of yields to farm average (as percentage)
	Plot 2	Plot 3	Plot 4	Plot 5	Plot 6	Plot 7	Plot 8	Plot 9	Plot 10	Average		
										Plots 2 to 10	Farm	
1923	1.64	3.43	2.26	1.62	2.33	2.47	2.28	3.02	2.33	2.37	2.45	97
1924	2.22	3.33	2.47	2.33	3.25	3.06	2.19	2.14	2.19	2.57	2.57	100
1925	3.69	5.54	4.62	3.33	5.00	5.01	3.36	4.26	4.38	4.36	3.73	117
1926	4.97	7.00	5.91	4.00	5.56	5.72	4.14	5.37	5.46	5.35	4.35	123
1927	3.36	3.48	3.34	2.13	2.86	2.77	2.16	3.08	2.97	2.91	3.33	87

The results of the experimenting that has been done on this area lead to the conclusion that the application of chemical treatments to an impervious alkaline soil will be of little benefit if there exists a high underground water table high in salt content. It first becomes necessary to lower the water table by drainage. After means of drainage have been established, the subsoil must be thoroughly leached by the copious use of irrigation water. If the drainage system is adequate there should be no rise in the water table from this procedure, and in time, with frequent irrigations, the root zone should become fairly well leached and better crop growth result on the area thus treated. (Fig. 4.)

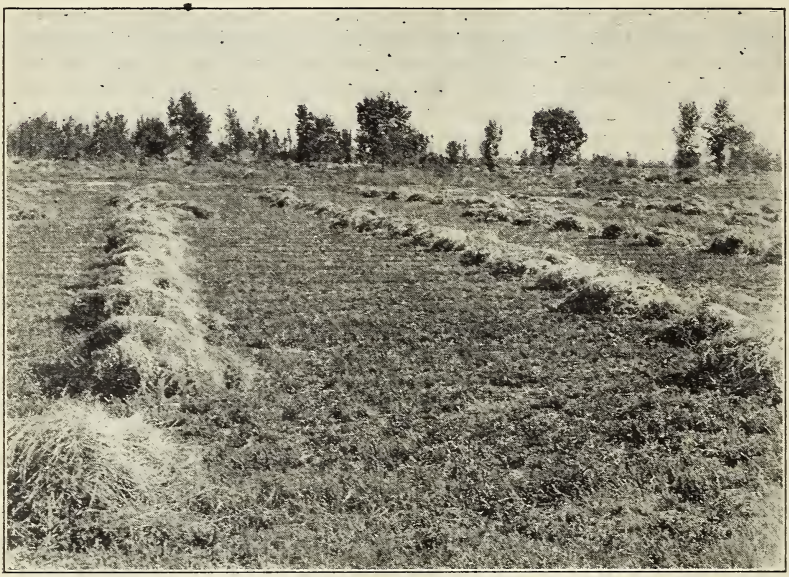

FIGURE 4.—Second crop of alfalfa on a portion of the reclaimed area of the Y series, Newlands Field Station, August, 1925

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