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FACTORS THAT INFLUENCE PROFITS ON IRRIGATED FARMS

By L. A. Moorhouse, R. T. Burdick and J. B. Hutson.

In Cooperation with Division of Farm Management and Costs,
Bureau of Agricultural Economics, U. S. D. A.

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FACTORS THAT INFLUENCE PROFITS ON IRRIGATED FARMS

By L. A. Moorhouse, R. T. Burdick and J. B. Hutson

To obtain accurate information regarding farm organization and management problems, including farm practices and enterprise combinations, a detailed study was undertaken in the irrigated districts of Northern Colorado during the years 1922, 1923, 1924 and 1925. The route method of study was used; that is, about 25 farms were visited at regular intervals each year and the farmers were assisted in keeping careful and complete records of all farming operations. These farms are located chiefly in Weld County. Data showing the man labor, horse work, seed, fertilizer and other materials used in growing crops, and the feed, man labor, horse work and miscellaneous cash cost in producing livestock and livestock products were obtained from thirteen farms for the entire four-year period, two other farms for three years, ten other farms for two years and seven additional farms for one year.[1] The crop yields and livestock production were obtained in all cases. The study was undertaken jointly by the Department of Economics and Sociology of the Colorado Agricultural Experiment Station and the Bureau of Agricultural Economics of the U. S. Department of Agriculture.[2]

In the original selection of these farms an attempt was made to secure farms typical of the region. Our study and observations in this irrigated area have led us to believe that this group of farms has produced results that are considerably better than the average. Men who are interested enough in their farm business to keep this kind of a record systematically thru a period of years are not average farmers. These men were primarily interested in securing some suggestions which would enable them to increase their profits. Those who did not have this viewpoint dropped out after keeping one or two years' records. The average farmer gives little or no attention to the matter of keeping records, therefore it would appear to be a safe conclusion that these men were better than the average and the results bear out this conclusion.

In this bulletin some of the results of this study are presented. First, a brief summary is given of the agricultural development of the irrigated section of Northern Colorado, of which the farms studied in Weld County are typical in many respects. Second, data showing the financial returns obtained on these farms are shown and the reasons for the variations in returns are discussed. Systems of farming illustrating features responsible for profits are shown . Unusually effective

1 Data from farms for which records were available for only one year are not presented in this bulletin.

2 Work is being continued in this area during 1926 and 1927 for the purpose of observing further the results on farms following systems and practices in line with the conclusions presented. Financial records are also being obtained on a large number of additional farms.

A modern home lends contentment to farm life.

methods and practices are pointed out. Third, the details of a few systems of farming that were unusually profitable during the years of the study are presented.

DESCRIPTION OF THE AREA

Location.—The farms represented in this study are located within a triangular area northwest of Greeley. One group is immediately adjacent to Severance; another group clusters around Eaton; and the balance will be found close to Greeley and Windsor. Severance and Windsor are situated about 15 miles north and west of Greeley.

Railway transportation was provided for this area thru the construction of the Denver Pacific which united the main line of the Union Pacific railroad with Denver. This development furnished the necessary incentive for the settlement of the agricultural land in this region and for the construction of an irrigation system which has been improved from time to time thru the accumulation and use of scientific information concerning the application of water.

The Union colony was organized in 1870. From the latter date to 1890 the attention of farmers in this general area was directed toward the production of wheat, potatoes and alfalfa. Sugar beets were introduced at the beginning of the twentieth century and soon became an important enterprise on these farms. The farm-organization plans of this region at the present time are built around such staple crops as alfalfa, potatoes, sugar beets and small grains, including wheat, barley and oats.

Soils†.—There are two types of soil in this general region which deserve special mention. These are the Colorado fine sandy loam and the Billings loam. The Colorado fine sandy loam extends to the depth

† Soil survey of the Greeley area 1904, U. S. D. A.

of three feet and has under it a heavy, fine, sandy loam to a depth of six feet or more. This is the most extensive type in the region. The Colorado fine-sandy loam is well suited to the production of such crops as alfalfa, potatoes, sugar beets and small grains. The Billings loam occurs in small, narrow strips bordering the streams that flow across the Colorado fine sandy loam. The Billings loam consists of a loam usually from two to five feet deep which rests upon a gritty or gravelly loam, or in some instances on sand or sandy loam. This type is usually considered somewhat stronger than the Colorado fine sandy loam. It is, however, adapted to about the same crops as the latter. Sugar beets do particularly well on this type.

In topography the region varies from rough, hilly and rolling uplands to slightly undulating plains, sloping gently towards the streams. This permits a ready and even distribution of water and at the same time affords opportunity for excellent natural drainage.

Rainfall.—The climate of this district is distinctly semi-arid. The mountains to the west serve as a barrier to the moisture-laden winds originating on the western slope, and they are responsible for the relatively low precipitation of this region. A review of the weather-bureau records which have been maintained at Greeley for a period of 30 years or more, shows an annual average precipation of about 13 inches for the first ten-year period; approximately 15 inches for the second period; and close to 12 inches for the decade ending with the calendar year 1925. This means an average for the 30 years of slightly better than 13 inches per year. The greater part of this rainfall occurs during the growing season. The highest average monthly rainfall comes in May; the lowest occurs during the winter months. Rather wide variations from these averages may be observed from year to year. In the course of this study two exceptional years were experienced. In 1923 the total annual precipation was approximately one and one-half times the normal rainfall, while the growing season of 1925 was reported as one of the driest years in the history of the district. As a matter of fact the dry period began in the fall of 1924 and continued well into the crop-growing season of 1925.

Growing Season.—The growing season lasts approximately five months. The average date of the last killing frost in the spring occurs about April 30, while the earliest date for the first killing frost in the autumn comes about September 25. In the four years, 1922 to 1925 inclusive, killing frosts were reported for three years in succession as late as the middle of May. In 1925 a killing frost did not occur in the autumn until October 9, which was about 15 days later than normal. December, January and February are the coldest months of the year. The warmest period comes in June, July and August. There is a relatively high percentage of clear days. It is usually bright and hot during the middle of the day but the nights are invariably cool. The average normal temperature for the summer months is not far from 70 in the Greeley district. Climatic and soil conditions are very favor-

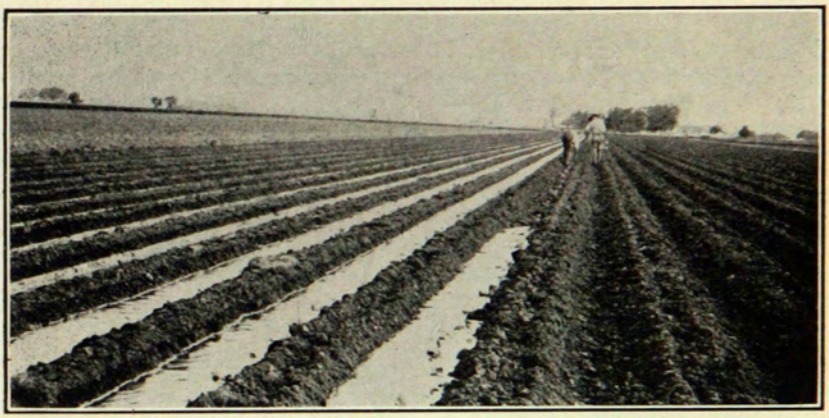
able to the production of such crops as potatoes and sugar beets which require a cool climate.

Irrigation.—It has been stated that the Union colony was organized about 1870. One of the first pieces of work undertaken by this group was the construction of Greeley Canal No. 3 which was used to water the town site and lands adjoining. Work was started on Greeley Canal No. 2 in 1870 and water was run in this canal the following spring. This well-known ditch is conspicious for the fact that it was the first large canal, built thru community cooperation and effort, to supply water to extensive areas of bench lands. The ultimate success

Greeley No. 2 is one of the oldest ditches in this district.

of this enterprise led to the development of other large canals in this area. By 1882 practically all of the large canals of the area had been built. During the past 40 years canal extensions have been projected, reservoirs have been constructed and the supply of water in this general drainage basin has been supplemented by drawing upon the headwaters of the Michigan and Laramie rivers which are located on the western side of the divide between the watersheds of the North and South Platte.

There is quite a wide variation in irrigation practice with respect to handlng the staple crops in this region. The number of applications of water applied to the respective crops will depend upon, first, the natural rainfall and the amount of water in storage; second, the ditch which brings water to the farms of the region will govern the number of applications since those holding early appropriations have access to more water in the season, and farmers who possess these rights will utilize more water by increasing the number of irrigations. The number of rights of water per farm, generally speaking, has been reduced to a minimum. There has been a tendency in later years to irrigate alfalfa once to twice, with a few irrigating three times; sugar



Water is applied immediately in setting cabbage plants

beets are irrigated four to five times; potatoes are watered four to six times, or every ten days when every row is irrigated, or every seven days when alternate rows are irrigated. The first irrigation of potatoes varies somewhat but normally this occurs about the 15th or 20th of July. Wheat, oats and barley will average one to one and one-half irrigations per season. The row method of irrigation is practiced with such crops as beans, potatoes and sugar beets, while the flood system of irrigation is employed with alfalfa and grain.

Crops.—The major crops in this area are alfalfa, potatoes, sugar beets and grain which includes wheat, barley and oats. Prior to the census period of 1900, the acreage devoted to alfalfa and the total production of alfalfa hay were not reported separately. The alfalfa acreage in 1900 for the entire county was approximately 53,000 and a total production of 149,000 tons was reported which gives an average of about 2.8 tons per acre. This acreage had increased to 96,000 by 1920 with a reported production of 232,000 tons, or a return of 2.4 tons per acre. According to the state statistical report, Weld County had 131,000 acres in alfalfa during the year 1925.

The potato acreage in this county has fluctuated widely during the past 40 years. The census of 1890 indicated about 13,000 acres in potatoes with a production around 627,000 bushels. In 1910, 39,000 acres were planted and 5,858,000 bushels were harvested that season. The year 1919 witnessed a very heavy decline in acreage as compared with the preceding census period. The state statistical report of 1925 showed about 20,000 acres in potatoes with a yield of slightly more than 3,000,000 bushels for Weld County.

Sugar beets were introduced into this region about 1902. The census of 1910 reported close to 35,000 acres with a total yield for the county of 392,000 tons. This area was extended to 57,000 acres in 1920 with a reported yield of 565,000 tons. In 1924 the beet acreage

for this county had expanded to essentially 73,000 acres with a total yield of about 1,000,000 tons. This expansion was checked perceptibly in 1925 on account of a severe drouth early in the season, but a substantial gain is noted for the harvest of 1926. The sugar beet constitutes an important source of income on these farms and is an essential part of the cropping system.

Wheat has long been a leading cash crop in this region. The census figures which are given for the county as a whole include both irrigated and non-irrigated land. At the present time the proportion of winter wheat on irrigated as compared with non-irrigated land stands about even. The yield per acre, of course, is much larger under irrigation than on non-irrigated lands. The census of 1880 reported close

Potatoes are irrigated by the furrow method.

to 15,000 acres of wheat in Weld County, having a yield of 315,000 bushels. This acreage was more than doubled in the succeeding census period and the total yield was trebled. A further increase was shown in 1900 when the total acreage approximated 76,000 and the yield was close to 2,000,000 bushels. The year of 1910 brought a reduction in acreage and total yield for the county as a whole but this was changed again in 1920 when the reported acreage increased to 155,000 and a total yield of nearly 2,000,000 bushels was secured. More recently there has been a decline in the acreage planted to wheat but the total production has been maintained. Since approximately half of the wheat acreage is found in dry-farming districts, the climatic factor is responsible for rather wide variations in the total yield and the return per acre.

Oats and barley are grown largely as feed crops in this region. In the early development of farming in this county, the oat crop occupied a larger area than barley, but recently the barley acreage has been more extensive than the oat acreage. This change may be explained in part by the general use of barley in feeding operations. In 1919

there were 16,500 acres planted to barley in contrast with 14,000 acres in oats. The total production for that year was 343.000 bushels of barley and 338,000 bushels of oats. In 1920 Weld County farmers had slightly more than 30,000 acres in barley with a reported total production of 840,000 bushels. This average was increased to 51,000 in 1925 and the total yield was slightly better than 1,500,000 bushels. In contrast with these figures, the oat acreage in 1920 was 26,679 with a production of 874,000 bushels. In 1925 the oat acreage on irrigated and non-irrigated land approximated 24,000 acres with a total production of 847,000 bushels.

Within the past ten years the dry-bean acreage has expanded considerably in this county. According to the census of 1910, 409 acres were planted to dry beans and this area gave a total yield of 4,200 bushels. In 1920 the acreage in this crop had increased to essentially 11,000 with a total production approximately 72,000 bushels. The state report for 1925 credits Weld County with a total of 84,000 acres of dry beans.

Livestock.—Livestock has always taken a conspicious place on the farms of Weld County. Prior to the settlement of this region and the division of prairie lands into farms, the open range furnished pasture for herds and flocks. Even with agricultural development and the closing of much of the range area, the business of producing cattle and sheep under range conditions has not been eliminated entirely. Within recent years an extensive feeding business has grown up on the irrigated farms of this county. This enterprise includes the feeding of lambs and cattle. The census of 1880 credited Weld County with 28,000 cattle. These were classified mostly as beef cattle. By 1920 this number had increased to approximately 107,000. These can be classified roughly as one-third dairy cattle and two-thirds beef cattle. These numbers have decreased slightly during the past five years, due largely to the unfavorable price situation from the standpoint of beef production.

In 1880 there were in round numbers 54,000 sheep, exclusive of spring lambs, in the county. This number increased to 81,000 in 1900, receded to 22,000 in 1910 and advanced to 325,000 in 1920. These figures are for farm sheep and do not give a true picture of the importance of the sheep-feeding industry.

The Northern Colorado irrigated area has been one of the leading areas in the United States in feeding sheep. Every autumn from one million to one and one-half million feeder lambs are brought into Northern Colorado and put on intensive feed for a period of three to five months. These lambs use up the surplus feed crops and sugar-beet by-products and constitute an important source of income on about one thousand farms in the area. A fairly large percentage of this lamb-feeding enterprise will be found in the irrigated districts of Weld County.

The swine industry has also expanded during the past 45 years. The 1880 census shows a total of 905 hogs in the county. This enter-

prise has grown constantly from decade to decade. In 1920 there were 37,000 hogs reported in the agricultural census. The number indicated for 1924 is essentially the same as 1920.

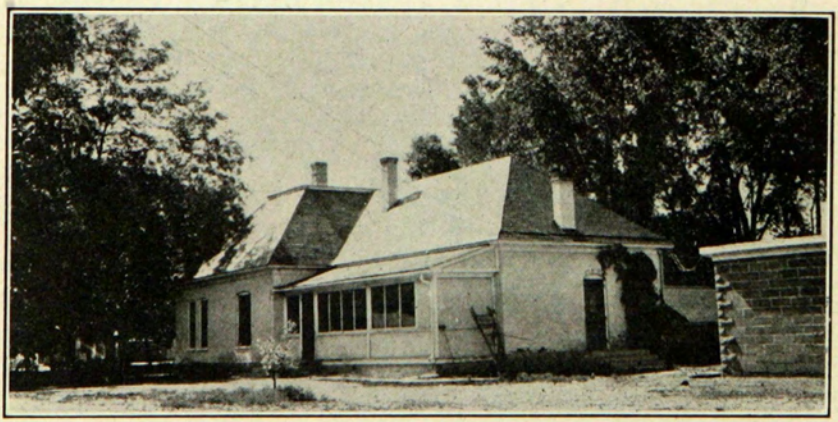
Poultry is found on most farms. In 1880 there were 11,000 chickens in the area as compared with 300,000 in 1920. Most of these may be assigned to farm flocks altho a few commercial poultry flocks have been developed in the region.

Farm power is supplied largely in this region by horses and mules. The rapid increase in the number of farms has necessitated a constant increase in the number of mules and horses. There were 5,000 horses and mules reported by the census of 1880. This number had expanded to 22,000 in 1890 and to 44,000 by 1920. The recent depression in the agricultural industry has brought about a slight decline so that the number shown for 1924 was approximately 37,000.

DESCRIPTION OF FARMS STUDIED

At the beginning of this study, so far as possible, farms were secured representing the common-sized groups. There were five farms approximating 80 acres in size, five more approximating 120 acres in size, eight around one-quarter section, and three larger farms that completed the first year's work. The average area of all these farms completing the first year's work was 140 acres. Surveys of many irrigated farms in this area show that the average size is close to 120 acres, but the most common single unit is 160 acres.

There has been some adjustment as the study has progressed. Some farms dropped out and new ones were taken in their places. Several farmers have bought or rented more land so that they have moved to the higher-sized groups. The average for the farms studied shows approximately 160 acres per farm with nine of the 25 farms in the 160-acre group, nine below that group and seven above.



Shade trees make the farm home more attractive.

About 90 percent of the entire farm area is in crops. There has been little change in this percentage during the four years. Very few farms have much waste land not tillable. Farm 24 had only 66 percent tillable which is exceptional, and for this reason the farm is not used in some of the following comparisons, as this operator has natural handicaps not found on the other farms.

Livestock on these farms was mostly feeder cattle and sheep. Seventeen men out of the twenty-five studied here fed either lambs or cattle or both. Two men had seven cows each, the other farms kept one to three cows for the purpose of supplying the household with milk. Two men had small farm flocks of 50 to 100 sheep. Swine were not an important class of livestock on most farms. Three or four men sold enough hogs to make it an important source of income. In no case were hogs, farm sheep or dairy cows the chief source of income. The same is true of poultry, altho two men kept fairly large flocks of poultry.

The principal sources of income on the farms studied were from feeding lambs and cattle, sugar beets, potatoes, wheat, beans and a few minor items as mentioned above, such as farm sheep, hogs, dairying, poultry and the growing of cabbage and peas.

The heaviest expense items on feeder farms are the purchase of feeder lambs and cattle and feed for the same. Other than this special expense, labor is the largest single expense item. Other important expenses are real estate tax, water tax, crop expenses, maintenance of machinery and equipment, and maintenance of auto.

FINANCIAL RETURNS OF FARMS STUDIED

The financial returns secured on the different farms are shown in Table 1. Deducting the cash expenses, reasonable charges for depreciation on buildings and equipment, and the value of all family labor except that of the operator, at farm-wage rates, from the cash receipts, the average amounts left as the yearly income on the different farms ranged from minus $659 to $12,187. Deducting the value of the operator's labor at regular farm-wage rates, the returns from the total investment ranged from a minus 3.8 percent to 16.1 percent, with an average for all farms of 5 percent. That is, during the period one farm showed an average yearly loss of 3.8 percent on the investment while another farm showed an average yearly profit of 16.1 percent. The other farms studied showed returns fairly well distributed between these two.[1]

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1 In Table 1 the farms are arranged on the basis of the percentage return on the total investment beginning with the highest. Thruout this bulletin where data relative to all farms are presented, the farms are arranged in the same order.

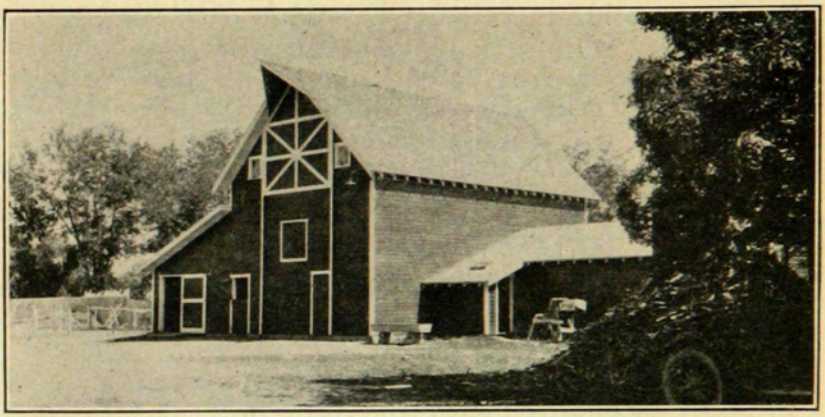
Table 1. Financial returns, average for the period studied.

Farm No.	Years studied	Area	Value land only per farm acre	Total investment 1	Farm receipts	Farm expense 2	Farm income.	Value of operator's labor.	Percent on investment.
1.....	4	336	$151	$67,922	$44,795	$32,608	$12,187	$1,272	16.1
2.....	4	198	121	30,317	28,352	24,172	4,180	979	10.6
3.....	3	230	226	65,841	33,894	27,308	6,586	898	8.6
4.....	4	135	243	48,340	21,459	17,016	4,443	927	7.3
5.....	4	118	200	34,360	16,421	13,058	3,363	991	6.9
6.....	4	159	236	48,987	18,925	14,849	4,076	1,034	6.2
7.....	4	79	160	19,137	4,104	2,246	1,858	851	5.3
8.....	2	161	125	29,798	29,061	26,605	2,456	969	5.0
9.....	2	157	266	46,000	18,524	15,346	3,178	981	4.8
10.....	4	111	176	27,289	4,499	2,618	1,881	575	4.8
11.....	4	318	162	76,093	34,959	31,179	3,780	826	4.0
12.....	3	185	124	28,256	11,215	9,164	2,051	910	4.0
13.....	4	154	190	46,128	14,729	11,919	2,810	1,101	3.7
14.....	4	147	183	43,159	6,405	4,370	2,035	584	3.4
15.....	2	63	146	17,112	3,106	1,902	1,204	665	3.2
16.....	2	160	227	48,287	30,448	29,828	620	75	1.1
17.....	2	138	254	44,340	16,089	14,640	1,449	954	1.1
18.....	2	154	229	42,738	10,130	9,094	1,036	832	0.5
19.....	2	206	211	56,406	28,689	27,611	1,028	835	.3
20.....	2	93	166	33,116	25,661	24,629	1,032	991	.1
21.....	4	81	136	16,840	2,479	2,333	146	153	— .04
22.....	2	153	197	41,420	3,704	3,244	460	967	—1.2
23.....	4	122	216	32,746	4,859	4,660	199	630	—1.3
24.....	4	112	49	12,464	3,055	2,363	692	936	—2.0
25.....	2	181	127	26,853	13,469	14,128	—659	354	—3.8
Av.....78		160	179	39,353	16,837	14,066	2,771	822	5.0

1 Includes value of residence which averaged $2,602 for all farms.
2 Includes cash paid for feeders.

These farms are in the same general area and have access to the same or similar markets. The differences in the fertility of the soil and the amount of water available are reflected in land values and in the total investment. If data were available from a larger number of farms in the area it is likely that wider variations would be evident. For the most part the cooperators belonged to the more successful group of farmers. At the beginning these men took an active interest in this project, and with the majority of these farmers this interest was maintained during the period of this study. Undoubtedly if data from more farmers had been obtained larger losses would be evident and undoubtedly a lower average return for the group would be shown.

In this study, expenses include only farm expenses, and include no household and personal items except taxes and repairs on the residence. The value of the residence is included in the total investment along with all other real estate, equipment, livestock, feeds and supplies at local market values. If the value of the residence were excluded from the total investment and the taxes and repairs on residence excluded from expenses, the average return on the remainder of the investment would be about 0.4 percent higher than that shown. In addition to the cash returns indicated, the farms furnished the family with



Paint adds to the life of farm buildings.

meats, garden, dairy and poultry products and miscellaneous items, which, when valued at farm prices, would average about $340 for each farm for each year. If the value of these items were added to the cash receipts, the average return on the investment would be increased about 0.9 percent. However, if these adjustments were made, the relative standings of the different farms would be approximately the same, and the difference in returns would be about as striking.

CAUSES FOR VARIATIONS IN RETURNS

One of the most significant facts in connection with the financial returns shown in Table 1 is the wide variation in returns on the investment. Some farmers were able to take a given set of resources and make good returns on the investment one year with another, while other farmers using similar resources were getting large losses. By carefully studying the organization of these farms and the results obtained over a period of years and making comparisons of various points, many of the causes of these variations may be determined. In this study such an analysis was made and among the factors that stand out as important are the following:

1. Selection of the enterprises.
2. Cost and utilization of man labor and horse work.
3. Crop yields and cropping practices.
4. Feeding practices.
5. Knowledge of values in buying and selling.
6. Adjustments in farm plans due to price changes.
7. Size of business.
8. Managerial ability of farm operator.

In most cases several of these factors are jointly responsible for the variations in returns between two farms. This is because each part of the farming problem is closely related to every other part of it. The

cost and utilization of man labor and horse work will be influenced by the selection of the enterprises; the kind and amounts of man labor and horse work available will influence the practices used in growing crops; feeding practices will depend to a considerable extent upon the crops grown; the importance of a knowledge of values in buying and selling will depend largely upon the amount of feeding done; the selection of the enterprises and the methods and practices largely determines the size of the business; one's knowledge of and ability to anticipate prices will influence most other decisions; and managerial ability is the directing force finally responsible for all decisions. Perhaps the best justification for a division of this kind is that it gives opportunity to direct attention to particular phases of the farming problem.

Selection of Enterprises

Farmers differ widely in their judgments as to the kinds and amounts of the different crops and classes of livestock to combine into

Saving labor by permitting lambs to harvest crop of corn.

a system of farming at a particular time. The differences in the crops and livestock selected help to explain some of the differences in returns.

Major Enterprises.—On the basis of normal yields, prices and production requirements, there are crops and classes of livestock for which the irrigated districts of Northern Colorado are particularly well adapted. The returns from the land, man labor, horse work and other resources devoted to these enterprises usually are larger than the returns from similar resources expended upon other enterprises. They may be called the major enterprises.

The area studied is well adapted to the production of alfalfa, sugar beets and potatoes. With the exception of potatoes these crops are adapted to the entire Northern Colorado irrigated area. The soil over

much of this area is too heavy for potatoes. On many farms, lamb and cattle feeding provides the best means of disposing of the alfalfa. Generally the most profitable systems of farming are built around these enterprises. Any farmer in the area should consider carefully the advantages of these enterprises for his farm as compared with enterprises that will displace one or more of them.

Minor Enterprises.— In addition to alfalfa, sugar beets, potatoes and feeders, other crops and livestock are necessary to provide a balanced system of farming. A nurse crop is needed for the alfalfa and a grain for the sheep, cattle and work stock. A few cows are needed to provide milk, cream and butter for the family and use feed and pasturage that would otherwise not be utilized fully. Hogs and poultry likewise use certain products to better advantage than they would be utilized without them, and also provide products for the home. Such crops and livestock often use man labor, horse work and equipment when they are not needed by the major enterprises. They are generally called minor enterprises but often they make important direct contributions to the income.

Table 2. Proportion of crop land in important crops, average period studied.

Farm No.	Alfalfa	Sugar Beets and potatoes	Beans and wheat	Barley & oats
	(percent)	(percent)	(percent)	(percent)
1	29.3	42.3	11.6	7.9
2	37.9	24.8	4.2	32.9
3	35.3	29.2	12.8	12.4
4	32.0	37.7	22.4	7.9
5	33.1	31.4	24.6	11.5
6	31.6	31.3	18.9	8.8
7	38.2	27.1	5.5	15.6
8	43.0	26.3	7.2	16.1
9	33.6	44.7	. . .	21.7
10	45.3	28.6	16.9	. . .
11	30.8	41.7	. . .	30.3
12	31.6	38.4	14.9	11.6
13	29.1	35.9	11.9	20.8
14	47.8	22.2	11.0	12.9
15	33.9	24.8	18.1	. . .
16	38.7	18.5	. . .	19.7
17	20.1	45.6	. . .	32.1
18	37.6	19.0	28.4	. . .
19	47.9	30.8	13.3	4.0
20	37.1	32.6	.6	25.8
21	30.8	26.6	45.2	10.0
22	31.0	26.5	12.8	20.0
23	31.4	18.6	16.2	17.0
24	25.1	23.2	16.3	21.9
25	38.2	14.2	18.6	5.4
Av.	38.2	14.2	18.6	5.4

Crops and Livestock on Farms Studied.— The percentage of the crop area in the different crops on the farms studied is shown in Table 2. The number of the different classes of livestock per 100 acres of crops is shown in Table 3. The similarity of the crops grown and livestock kept on the most profitable farms as compared with the wide variations on the least profitable farms is significant. For example, on

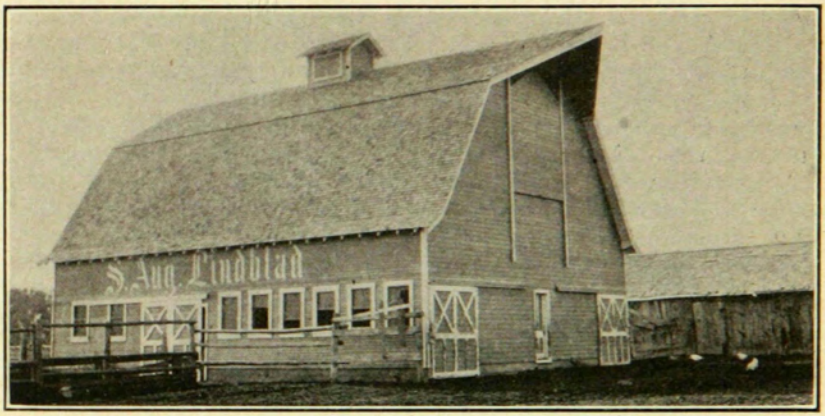
farm 19, about 33 percent of the crop area was planted to the four cash crops—sugar beets, potatoes, wheat and beans, whereas on farm 20, about 72 percent of the area was in the same crops. On farm 19 there were 100 animal units per 100 acres in crops and on farm 20, 10 animal units per 100 acres in crops. There was a poor balance between the crops and livestock on both of these farms and poor returns resulted.

Table 3. Relation of important classes of livestock to crop area, average period studied.

Farm No.	Number per 100 acres of crops.				
	lambs Feeder	Feeder cattle	cattle Dairy	Cwt. pork sold	Total animal units
1	577	11.8	0.88	2.61	36.6
2	720	37.0	0.80	2.43	57.6
3	869	...	.91	.13	55.6
4	...	92.0	4.20	2.04	55.7
5	652	19.5	3.10	1.91	25.5
6	476	25.9	1.82	4.41	43.3
7	....	...	4.60	...	23.8
8	1201	...	0.60	13.30	53.9
9	785	...	0.70	4.58	40.8
10	....	...	1.34	0.98	9.2
11	1103	...	0.48	....	59.3
12	....	35.2	1.94	0.50	22.8
13	494	....	4.95	75.80	57.1
14	....	...	1.57	42.35	24.2
15	....	...	1.69	....	11.1
16	1338	...	1.34	3.67	82.9
17	771	...	1.66	54.18	51.1
18	519	...	1.04	....	29.5
19	809	13.3	2.70	1.26	52.3
20	2102	...	2.80	28.99	100.2
21	....	...	3.16	....	10.1
22	....	...	2.08	42.95	20.1
23	....	6.1	3.98	66.63	21.3
24	....	...	9.15	51.04	29.0
25	493	8.4	0.90	10.97	22.1
Av.	515	12.9	2.11	14.35	42.2

On the other hand, on four of the five farms with the highest net returns, from 40 to 60 percent of the crop area was kept in the cash crops—beets, potatoes, beans and wheat, with about two-thirds of this area in beets and potatoes. On each of the four, from 30 to 35 percent of the crop area was in alfalfa and from 8 to 12 percent in barley and oats. During this four-year period, lambs or cattle or both were fed on each of these four farms each year. Cattle only were fed on farm 4. On the other three farms lambs were fed each year. In each case enough cattle and lambs or other livestock was kept to consume practically all the alfalfa grown and aftermath pasturage and other waste products. These systems were well balanced and good returns were received.

On farm 2, the other of the five high income farms, about 38 percent of the crop area was kept in alfalfa and about 33 percent in the feed grains, barley and oats, with only about 29 percent in the four cash crops. It is possible that the crops grown and livestock kept on



A well constructed barn increases the capital invested in the farm, but it affords shelter for livestock and furnishes storage space for hay.

this farm resulted in larger returns than would have been obtained from the combination of crops and livestock used on the other four farms in the high, net return group. The operator of farm 2 was an exceptionally successful feeder and, because of this, perhaps he obtained larger returns from a relatively large acreage in feed crops and a correspondingly large amount of feeding than he would have obtained from a larger acreage of cash crops. Variations from a seemingly well-adapted system often will be advisable because of unusual ability along particular lines. Then, too, it is possible that the period during which the data were obtained was favorable to lamb feeding as compared with other periods. Perhaps even with his unusual ability as a feeder, the operator of farm 2 would not have found it advisable to grow quite so large an acreage of feed crops and feed so heavily during more normal periods.

Comparison of Selected Farms.—In order to illustrate desirable and undesirable crop and livestock combinations the details of two farms are shown. A good selection of enterprises is illustrated by farm 5 and a poor selection by farm 23. The crops grown and livestock kept on these farms are shown in Table 4. These farms were of about equal size, with similar soil and with similar irrigation systems. There were about equal amounts of man labor, horse work, equipment and other resources to produce with, on the two farms. According to local market values the total investments were approximately the same. On farm 5 the average farm income during the four-year period was $3,363, while the average farm income on farm 23 during the same period was $199. Deducting the value of the operator's labor at farm-wage rates, the returns on the total investments were 6.9 percent and minus 1.3 percent respectively. It appears that a large part of this difference in returns was due to the crops and livestock selected.

The crops and livestock on these two farms are shown in Table 4. The alfalfa acreage was about the same on the two farms. On farm 5, 20.7 acres of small grain were grown in 1922, 20 acres in 1923, 15.1 acres in 1924 and 33.1 acres in 1925. Barley, oats and wheat were grown each year except barley in 1923 and wheat in 1925. On farm 23 no small grain except oats was grown and no oats in 1925. Approximately the same acreages of potatoes and beans were grown on the two farms each year. On the average, 12.8 acres of sugar beets were grown on farm 5. No beets were grown on farm 23. As a substitute for beets and a part of the grain, about 20 acres of miscellaneous crops were grown each year on farm 23. In the main these were crops that required careful attention at critical times. They were crops which proved to be unprofitable during this period.

Table 4. Comparison of crops grown and livestock kept on selected farms, average period studied.

Farm Nos.	5	23
Item	Amount	Amount
Total acres	117.6	121.6
Total investment	$34,360	$32,746
Farm income	3,363	199
Return on investment	6.9%	—1.3%
Total crop area, acres	112.6	97.9
Alfalfa hay	37.2	30.7
Beans	17.7	15.8
Sugar beets	12.8	.....
Potatoes	20.2	18.2
Barley	5.7	.....
Oats	7.0	16.6
Wheat	9.9	.....
Miscellaneous	2.1	16.6
Pasture	....	17.5
Farmstead and waste	5.0	6.2
Average number of livestock—		
Dairy cows	3.6	4.9
Sows	1.1	7.1
Poultry	67.0	49.0
Feeder sheep	750.0	.....
Feeder cattle	21.5	6.2
Work stock	8.8	7.9

On farm 5, from 500 to 900 lambs and about 30 head of cattle were fed each year except 1925. Only lambs were fed in 1925. From one to two brood sows were kept. No lambs and only 25 head of cattle were fed on farm 23 during the four-year period. The principal class of livestock on farm 23 was hogs. On the average about seven sows were kept. Hogs consume grain principally. Lambs or cattle in consuming grain also use considerable hay and large quantities of non-marketable products. A combination of lamb feeding or cattle feeding and hogs is better for this area than hogs without them. On farm 5 all pasturage, including aftermath pasturage, and practically all the non-marketable products, were utilized by livestock. On farm 23 all of the regularly provided pasturage was not used and many non-marketable products were lost entirely.

Ridging is usually the first step in potato growing.

Summing up these differences, on farm 5, there was a larger acreage of the better-adapted cash crops, a better selection of small-grain crops, in that barley in some respects is a better feed crop for the area than oats, and livestock enterprises better adapted to the area, than on farm 23.

Cost and Utilization of Man Labor and Horse Work

Table 5. Cost of man-labor, yearly average for period studied.

Farm No.	Hired labor	Contract labor	Total cash labor	Labor expense other than cash			Total non-cash labor	Total labor
				Operator's labor	Board hired labor	Family labor		
1	$2,923	$1,797	$4,720	$1,400	$435	$ 31	$1,866	$6,586
2	898	1,035	1,933	1,040	375	180	1,595	3,528
3	2,350	1,700	4,050	898	459	24	1,381	5,431
4	1,135	715	1,850	1,025	183	95	1,303	3,153
5	500	467	967	1,170	102	186	1,458	2,425
6	826	604	1,430	1,120	324	371	1,815	3,245
7	52	291	343	1,070	9	146	1,225	1,568
8	1,261	429	1,690	960	238	247	1,445	3,135
9	1,002	595	1,597	1,080	338	19	1,437	3,034
10	504	144	648	755	71	208	1,034	1,682
11	2,195	1,026	3,221	1,185	412	28	1,625	4,846
12	1,027	982	2,009	1,080	228	158	1,466	3,475
13	946	645	1,591	1,170	569	121	1,860	3,451
14	470	174	644	793	119	466	1,378	2,022
15	91	229	320	875	58	42	975	1,295
16	1,872	642	2,514	630	191	36	857	3,371
17	793	523	1,316	900	158	6	1,064	2,380
18	469	180	649	1,000	153	7	1,160	1,809
19	1,234	914	2,148	1,140	601	139	1,880	4,028
20	655	283	938	1,000	58	21	1,079	2,017
21	530	4	534	151	429	...	580	1,114
22	345	205	550	900	234	11	1,145	1,695
23	215	214	429	655	56	515	1,226	1,655
24	330	264	594	930	215	101	1,246	1,840
25	721	221	942	435	123	154	712	1,654
Av.	938	590	1,528	946	252	148	1,346	2,874

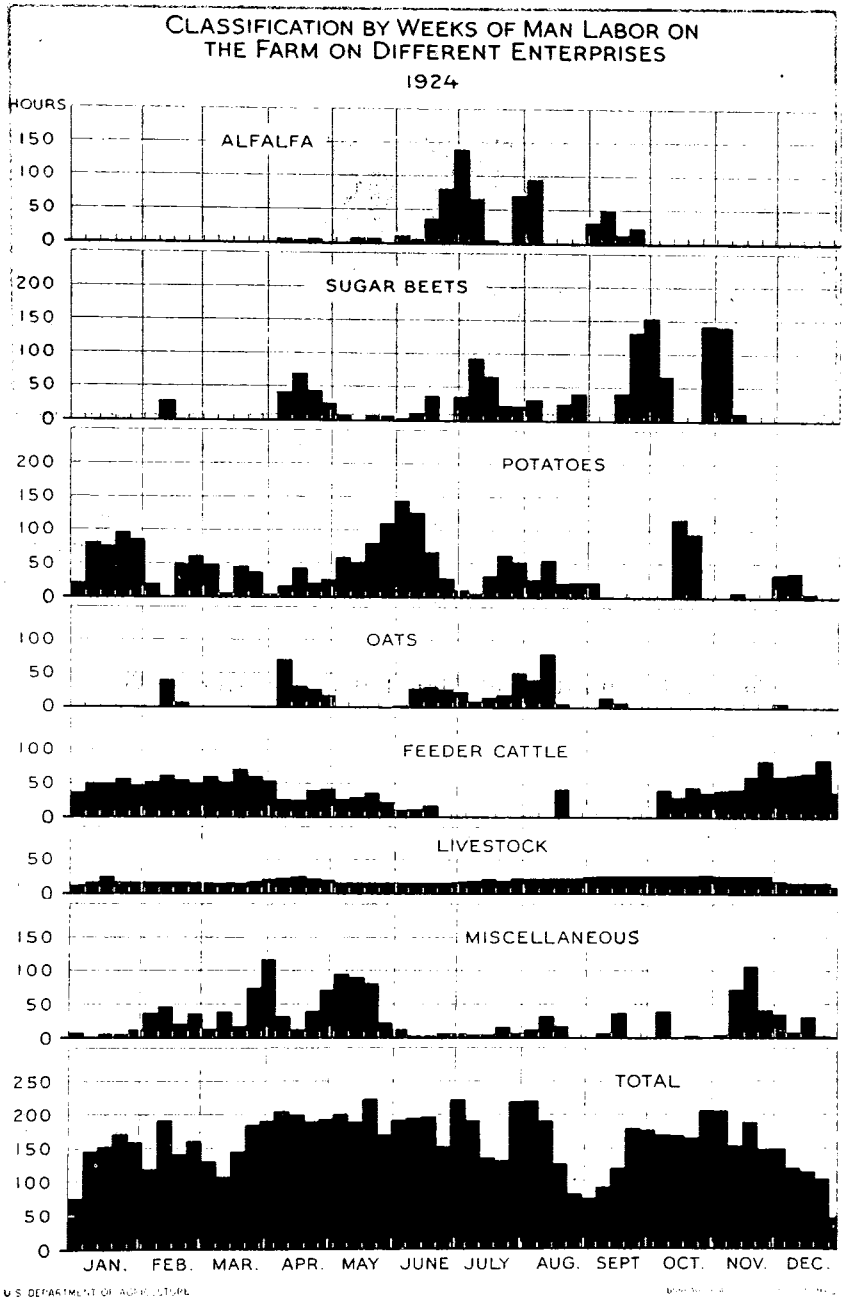


Fig. 1—Man-labor on Farm 4

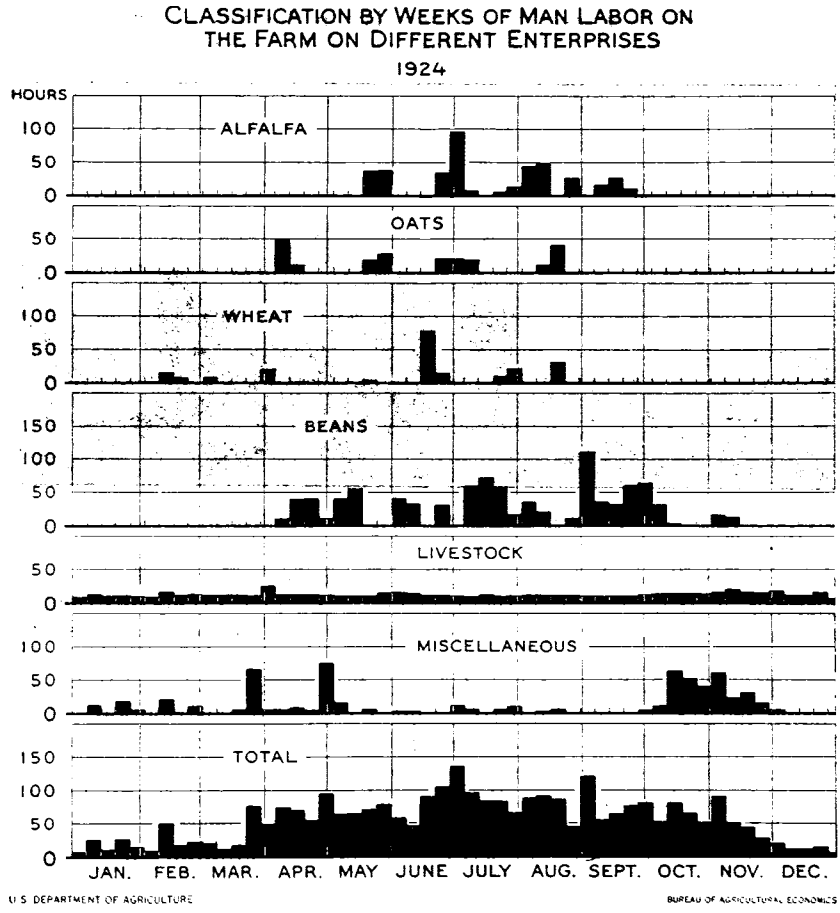
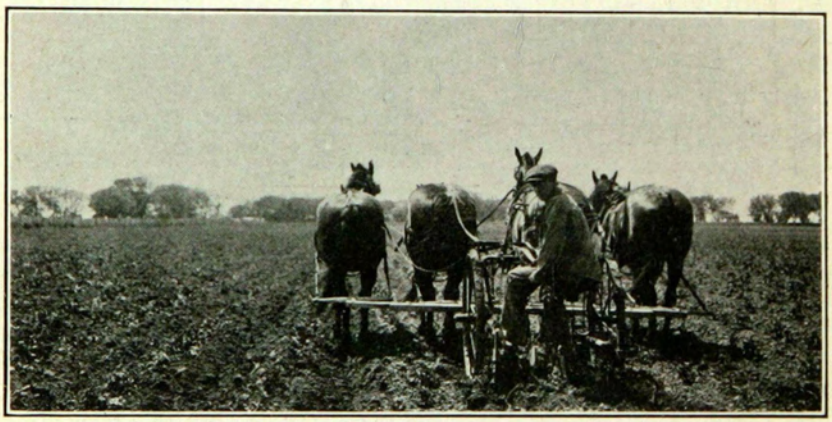


Fig. 2—Man-labor on Farm 21

Man Labor.—One of the most important problems in farming is the effective utilization of the man labor on the farm as it is available. This man labor may consist only in the labor of the operator but generally it also includes the services of one or more other members of the family and often one or more regular hired men. The nature and extent of the labor costs are shown in Table 5.

Some farmers plan the work so that there is something profitable for each available worker to do each day in the year. Others plan poorly so that there is a considerable part of the year when little can be



Adequate horse-power saves man-labor.

done that will result in profit. That is, on some farms the work is planned so that the labor requirements are fairly evenly distributed thruout the year, whereas on other farms, the labor requirements are unevenly distributed.

The hours of man labor done on farm 4 by weeks in 1924 are shown in Fig. 1. This illustrates good man-labor distribution. The hours of man labor done on farm 21 by weeks in 1924 are shown in Fig 2. This illustrates poor man-labor distribution. The crops grown and livestock kept on farm 21 were such as to require a great deal of man labor at some seasons and very little at other seasons.

The system followed on farm 4 included alfalfa, sugar beets, potatoes, oats and feeders. The system followed on farm 21 included alfalfa, wheat, beans and oats. Instead of potatoes, beets and feeders, farm 21 had wheat and beans. There are more conflicts between the enterprises on farm 21 than on farm 4. If either potatoes or beets had been grown or feeders kept on farm 21, a better distribution of the man labor needs and perhaps an increase in returns would have resulted.

The problem of hiring and using extra day-labor is slightly different from utilizing regular farm labor. In the case of labor that costs little more if idle or at work, it is the question of finding the most profitable use of all the alternatives available, and if nothing appears

better than even five or ten cents per hour return, the profits for the year will be increased by its use. In the case of extra hired labor that is paid for only when used, it is a question of whether the extra labor in the particular use to which it would be put will cause an increase in returns of more than its cost. In the former case it is a question of the best use of all the alternative uses and in the latter it is a question of whether or not the product resulting from the added labor will more than pay for its cost.

Horse Work.—The cost and use of horse work is shown in Table 6. There is a wide difference between the use made of horses on the least profitable farms as compared with the most profitable farms. The average cost per hour of horse work was 12.3 cents on the five most profitable farms and 17 cents on the five least profitable. On the former the horses were worked on the average of 1,124 hours and on the latter 674 hours per year. This poor utilization of horse-work on the low-income group was due partly to the small number of acres of crops handled per horse, i. e., 13.9 compared to 20.4 on the high income farms. In addition, the horses were used more in caring for other livestock on the high-income farms than on the low-income farms.

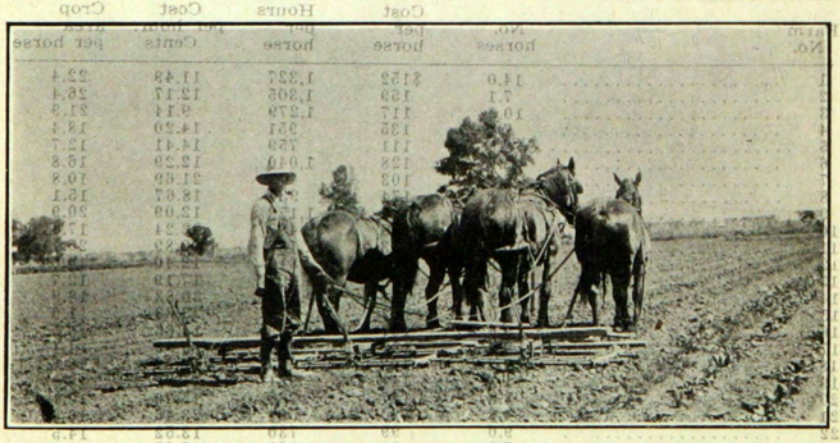
Table 6. Cost and use of horse hours, average for period studied.

Farm No.	No. horses	Cost per horse	Hours per horse	Cost per hour. Cents	Crop area per horse
1	14.0	$152	1,327	11.49	22.4
2	7.1	159	1,305	12.17	26.4
3	10.0	117	1,279	9.14	21.9
4	7.1	135	951	14.20	18.4
5	8.8	111	759	14.41	12.7
6	9.0	128	1,040	12.29	16.8
7	7.0	103	473	21.69	10.8
8	10.1	174	934	18.67	15.1
9	6.8	113	1,152	12.09	20.9
10	6.0	108	487	22.24	17.4
11	10.3	153	1,186	12.89	20.1
12	11.8	100	810	12.40	14.0
13	11.0	139	1,008	17.19	12.7
14	6.8	111	532	20.83	18.9
15	5.0	112	473	23.63	11.9
16	9.6	167	1,139	14.66	15.5
17	9.5	127	980	12.99	14.1
18	7.8	103	557	18.57	18.6
19	11.1	141	921	15.26	16.9
20	8.8	117	768	15.23	10.1
21	4.8	120	509	23.46	16.0
22	9.0	99	730	13.52	14.5
23	7.9	81	460	17.65	12.3
24	7.9	98	481	20.37	9.7
25	3.2	160	1,203	13.27	51.3
Av.	8.4	121	879	14.37	19.1

The proportion of the total crop land used to produce feed for work stock is shown in Table 7. The average area per farm used for this purpose was 19 acres or 2.26 acres for each head of work stock. The proportion of the total crop area used ranged from 6 percent to 23.1 percent, the average being 13.4 percent.

Table 7. Proportion of crop area used to feed work horses, average period studied.

Farm No.	Crop area used to produce feed for work stock	
	Average	Percent of total crop area
1	35.91	11.5
2	23.87	12.7
3	17.91	8.2
4	17.26	13.3
5	13.12	11.6
6	18.63	12.3
7	15.25	20.2
8	19.20	12.6
9	15.61	11.0
10	8.95	8.6
11	22.64	10.9
12	36.43	22.1
13	32.24	23.1
14	16.51	12.9
15	7.77	13.1
16	21.72	14.6
17	18.89	14.2
18	17.32	12.0
19	28.37	15.1
20	14.84	6.0
21	10.65	14.0
22	24.06	18.5
23	13.23	13.5
24	10.45	13.6
25	18.45	11.1
Av.	19.05	13.4



Harrowing potatoes after planting to control weeds.

The number of days during which all and different numbers of horses were worked on farms 3 and 7 in 1924 is shown in Table 8. Farm 3 illustrates effective and farm 7 ineffective utilization of horse work. Seven work horses were kept on farm 7, and 10 on farm 3. All horses were used 59 days, and 8 or more 93 days on farm 3, where as on farm 7 all the horses were not at work at the same time once during the year and five or more were worked at the same time on 17 days only. On farm 3 each horse was worked on the average of 122

ten-hour days and on farm 7 the equivalent of only 45 days. The cost of horse work per hour was 9.8 cents on farm 3 and 24.1 cents on farm 7.

Table 8. Number of days during year 1924 that horses worked on two farms.

No of horses at work	Number of days that horses worked. Farm 3	Farm 7
10	59	
9	5	
8	29	
7	1	...
6	24	17
5	1	...
4	21	56
5	5	13
2	171	54
1	...	...
None	50	226
Av. hours per horse *	1216	450
Cost per hour, cents. *	9.8	24.1
Ave. number horses *	10	7
Av. cost per horse **	$117	$103

* For year 1924 only.
**For period studied.

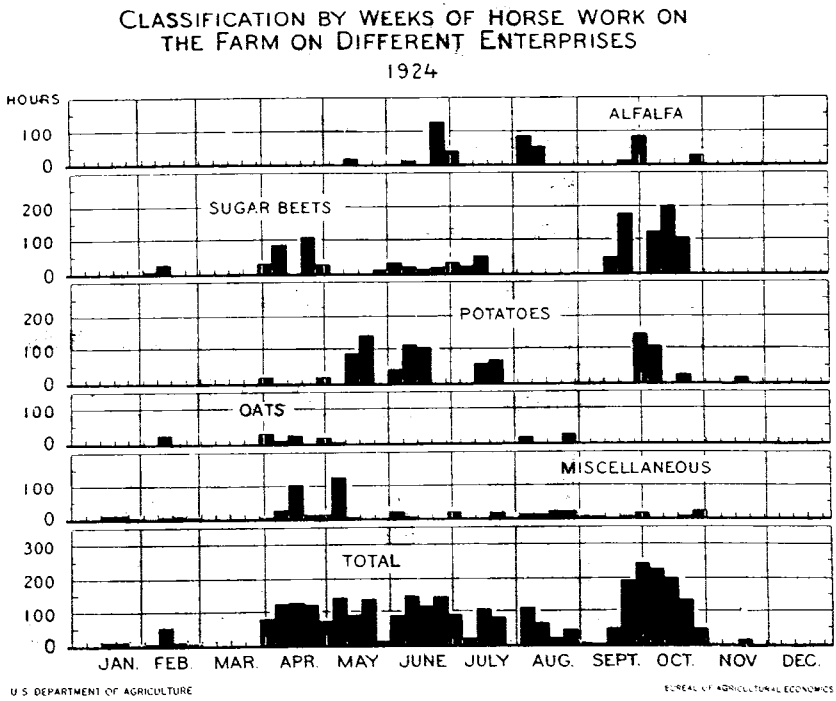


Fig. 4—Horse-work on Farm 7

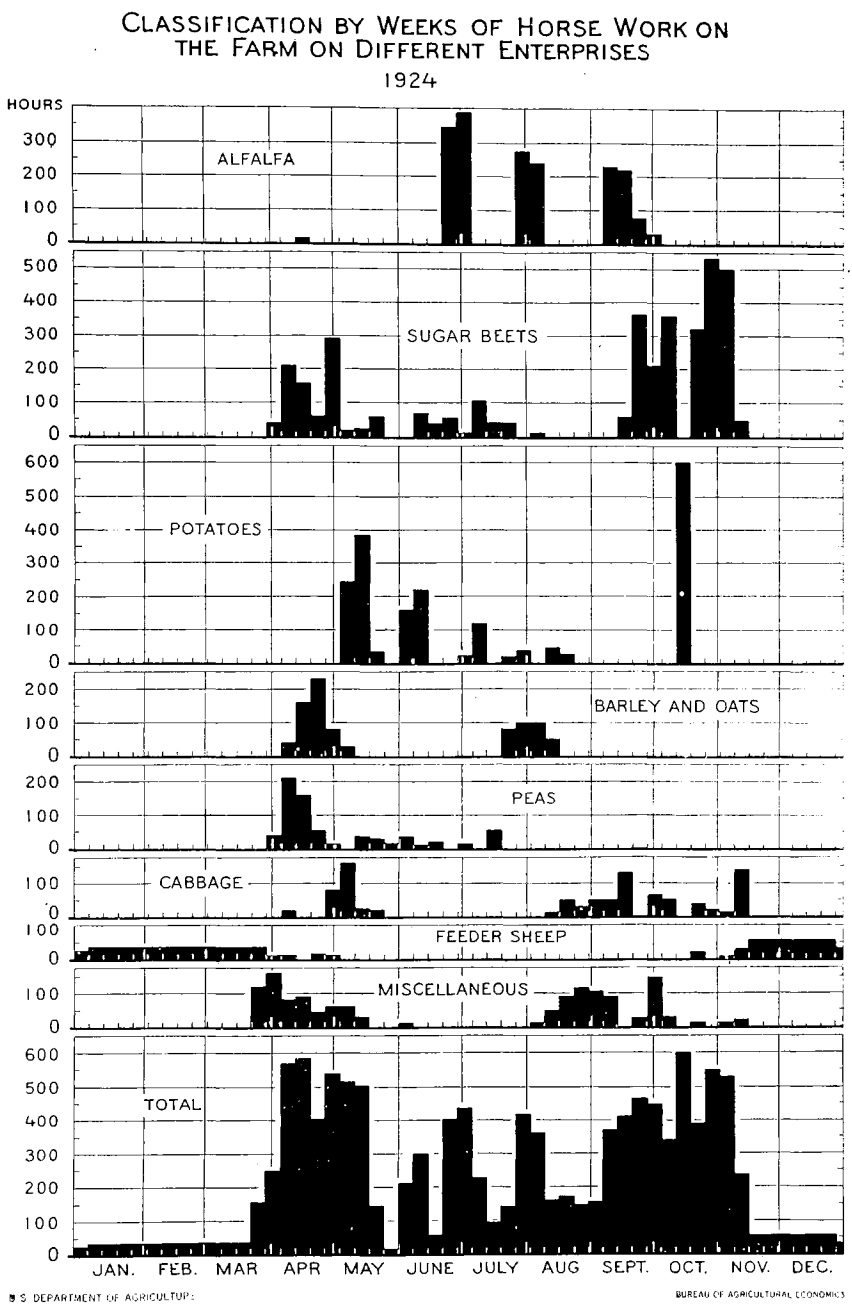


Fig. 3—Horse-work on Farm 3

The distribution of horse work on farms 3 and 7 is shown in Fig. 3 and 4. It will be seen that there was much more slack on farm 7 than on farm 3 during the seasons when horses are normally kept at work. If the work had been planned more carefully and an effort made to anticipate the horse-work needs more accurately on farm 7, more acres of crops could have been handled or else the number of work stock reduced. Either change would have resulted in increased returns.

Crop Yields and Practices

The differences in methods and practices used in growing the principal crops on the different farms were responsible for a part of the variations in returns. These differences are reflected to a considerable extent in the yields obtained and the amounts of man-labor and horse-work used per acre and per unit of product. These items for the most important crops are shown in Tables 9 to 17.

As a rule the farms with the largest net returns obtained larger yields than farms with lower returns. Generally more man labor and often more horse-work per acre was used on the farms with the lower farm returns than on the farms with the larger returns. As a result the man-labor and horse-work requirements per unit of product were generally greater on the farms with the lower returns.

Sugar Beets.—The hours of man labor and horse work used per acre and per ton of beets are shown in Table 9. Taking the five farms growing beets with the largest net returns, the average yield during the period was 15.6 tons, while on the five farms with the lowest net returns the average yield was 13.9 tons. On the former group of farms, 34.8 hours of man labor and 76.2 hours of horse work per acre were used, while on the latter group 41.6 hours of man-labor and 80.4 hours of horse-work were use. [1]

On the average 2.2 hours of man labor and 4.6 hours of horse-work were used for every ton of beets on the high-income farms as compared with 3.0 hours of man labor and 5.9 hours of horse work per ton on the low-income group. Thirty-four percent more man-labor and twenty-seven percent more horse-work were used in growing a ton of beets on the latter than on the former.

A comparison of the man labor and horse work used in growing beets on farms 5 and 13, with the yields obtained, is shown in Table 10. It will be seen that 2.05 hours of man-labor and 5.38 hours of horse-work were used for each ton of beets obtained on farm 5, whereas 3.45 hours of man labor and 6.73 hours of horse work were used on farm 13. On the average 305.5 tons of beets were produced each year on farm 13. If man-labor and horse-work had been used as effectively in growing this quantity of beets on this farm as on farm 5,

1 Farms 24 and 25 are excluded from this and similar comparisons—farm 24, because of a soil less fertile than the other farms and more difficult to till, and farm 25, because of unusual crop failures. The net returns on farm 25 are the lowest and on farm 24 next to the lowest in the group. The farms compared generally have similar types and irrigation systems.

Table 9. Sugar beets, acres, yield, man-labor, horse-work, average period studied.

Farm No.	No. Years	Av. area	Av. yield	Hours per acre Man	Hours per acre Horse	Hours per ton Man	Hours per ton Horse
1	4	51.0	14.6	27.7	68.8	1.90	3.73
2	4	39.2	14.9	40.7	71.3	2.74	4.79
3	3	34.8	16.1	40.0	90.0	2.48	5.40
4	3	31.5	16.0	31.9	61.6	2.00	3.86
5	3	17.0	16.6	33.6	89.2	2.05	5.38
6	3	15.6	18.9	49.3	124.3	2.61	6.57
7	1	16.9	14.0	36.1	66.9	2.58	4.78
8	2	33.9	14.1	67.9	81.2	4.81	5.74
9	2	21.7	13.4	34.1	65.2	2.54	4.85
10	2	13.0	15.9	34.1	63.0	2.11	3.97
11	2	40.4	17.8	34.4	75.8	1.94	4.27
12	3	48.7	12.0	34.8	81.4	2.90	6.78
13	4	24.7	12.4	42.7	83.2	3.45	6.73
15	1	11.2	16.8	46.1	64.3	2.75	3.83
16	1	54.9	14.4	33.7	85.2	2.34	5.59
17	2	22.0	11.3	35.8	96.4	3.16	8.50
18	2	34.4	13.5	45.2	66.3	3.36	4.92
19	2	9.7	13.4	47.0	89.7	3.49	6.68
24	3	14.3	10.9	45.1	76.3	4.15	7.01
25	1	20.6	2.0	17.6	31.2	8.62	15.31
Av.	48	29.1	14.3	37.8	77.0	2.65	5.38

428 fewer hours of man-labor and 412 fewer hours of horse-work would have been necessary.

A study of the irrigation practices helps to explain this difference. In 1924 the beets were irrigated five times on farm 5 and only three times on farm 13. The yield during that year was 10.4 tons per acre larger on farm 5 than on farm 13. Another factor is that more labor was used in performing the operations necessary in growing and harvesting beets on farm 13 than on farm 5. That is, in performing the different operations, more was accomplished per hour of work on the latter than on the former.

A uniform stand of beets means high yield per acre.

Table 10. A comparison of the man-labor and horse-work used in growing beets on two farms, average period studied.

	Farm 5	Farm 13
Return on investment	6.9%	3.7%
Estimated value of land without buildings	$200	$190
Average beet area, acres	17.04	24.7
Average yield per acre, tons	16.56	12.37
Average hours man-labor used per ton	2.05	3.45
Average hours horse-work used per ton	5.38	6.73

The late irrigation of potatoes is frequently made in alternate rows.

Potatoes.—The hours of man-labor and horse-work used per acre and per 100 pounds in growing potatoes on the different farms are shown in Table 11. The average yield on the five farms with the largest net returns growing potatoes was 11,918 pounds, while the average yield on the five farms with the lowest returns was 11,377 pounds. On the first group of farms 53 hours of man-labor and 85.4 hours of horse-work per acre were used, as compared with 56.2 hours of man-labor and 81.3 hours of horse-work on the low-income group. The latter group used 6 percent more man-labor and 3 percent less horse-work for each 100 pounds of potatoes produced than did the former.

A comparison of the man-labor and horse-work used in growing potatoes on farms 4 and 13 with the yields obtained is shown in Table 12. It will be seen that 2.4 hours of man-labor and 2.7 hours of horse-work more were used in producing 1000 pounds of potatoes on farm 13 than on farm 4. About 283 thousand pounds of potatoes were produced each year during the period on farm 13. If man-labor and horse-work had been used as effectively in producing potatoes on farm 13 as on farm 4, 679 fewer hours of man-labor and 764 fewer hours of horse-work would have been used. The following suggests some of the differences in practices in growing potatoes on these two farms.

In planting, a one-row, man-drop planter was used on farm 4 and a self-picker planter on farm 13. It is claimed by users of the first-named planter that its use insures a better stand of potatoes. The

Table 11. Potatoes: Acres, yield, man-labor, horse-work, average period studied.

Farm No.	No. Years	Av. Area	Av. Yield	Hours per acre Man	Hours per acre Horse	Hours per cwt. Man	Hours per cwt. Horse
1	4	81.4	12,528	45.6	84.4	.36	.67
2	2	14.7	9,671	36.3	71.4	.37	.74
3	3	29.2	9,245	63.4	105.2	.68	1.14
4	4	25.5	13,574	55.7	70.6	.41	.52
5	4	20.2	14,570	63.9	95.6	.44	.66
6	4	35.5	12,054	56.4	85.0	.47	.71
7	4	16.3	10,851	40.8	75.4	.37	.69
8	1	12.3	11,476	95.3	97.7	.83	.85
9	2	42.0	11,199	55.2	83.6	.43	.75
10	4	20.8	10,321	55.9	61.9	.54	.60
11	4	66.7	9,588	34.8	62.9	.36	.66
12	3	14.6	9,998	67.0	98.9	.67	.99
13	4	25.0	11,328	72.9	98.7	.65	.79
14	4	23.1	11,603	63.6	67.9	.55	.58
15	2	9.2	10,316	40.6	74.7	.45	.72
16	2	40.8	8,534	32.2	88.4	.38	1.03
18	2	27.5	12,740	42.3	64.1	.33	.50
19	2	23.6	10,883	52.1	79.5	.48	.73
20	2	19.1	8,330	38.5	70.5	.39	.85
21	2	5.3	12,105	64.6	58.4	.53	.48
22	2	33.9	11,144	60.2	98.4	.55	.89
23	2	17.6	14,427	65.7	99.9	.46	.69
24	2	13.0	13,093	50.4	75.5	.38	.58
25	1	14.5	6,813	34.4	52.3	.50	.78
Av.	67	28.8	10,761	51.0	79.9	.47	.74

Table 12. A comparison of man-labor and horse-work used in growing potatoes on two farms, average period studied.

	Farm 4	Farm 13
Return on investment	7.3%	3.7%
Estimated value of land without buildings	$243	$190
Average potato area, acres	25.53	24.98
Average yield per acre, pounds	13,574	11,328
Average hours man labor used per 1000 lbs.	4.1	6.5
Average hours horse-work used per 1000 lbs.	5.2	7.9

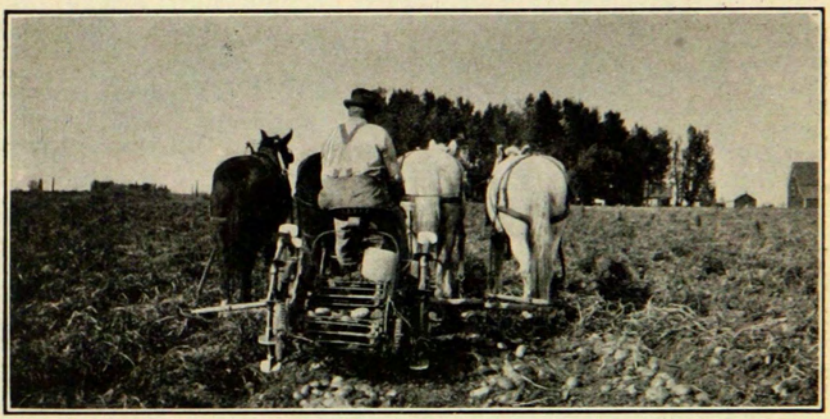
crop was irrigated eight times on farm 4 and only four times on farm 13. The differences in the stand and the irrigation practice, together with the slightly sandier soil on farm 4, probably are responsible for the difference in yield.

In preparing the land for planting and in cultivating, considerably less man-labor and about the same amount of horse-work were used on farm 4 as on farm 13, the principal cause for the difference being the use of larger machinery and teams on farm 4.

Slightly more labor was used in performing the other operations on farm 13. For example, with a smaller yield, one hour more man-labor was used in digging an acre of potatoes on farm 13. Eighty-four sacks were sorted per ten-hour day on farm 4 and sixty-five sacks per day on farm 13. Seed and potatoes were sorted at the same time on farm 4 whereas special labor was reported for sorting seed on farm 13.

Alfalfa.— The hours of man-labor and horse-work used in producing alfalfa per acre and per ton are shown in Table 13. Since fewer operations are necessary in producing alfalfa than in growing the cultivated crops, the variations in requirements are not so large.

However, on the five farms with the lowest farm returns 24 percent more man-labor and 12 percent more horse-work were used in harvesting a ton of alfalfa than on the five farms with the largest returns.



Plenty of horse-power is required in harvesting potatoes.

Table 13. Alfalfa: Acres, yield, man-labor, horse-work, average period studied.

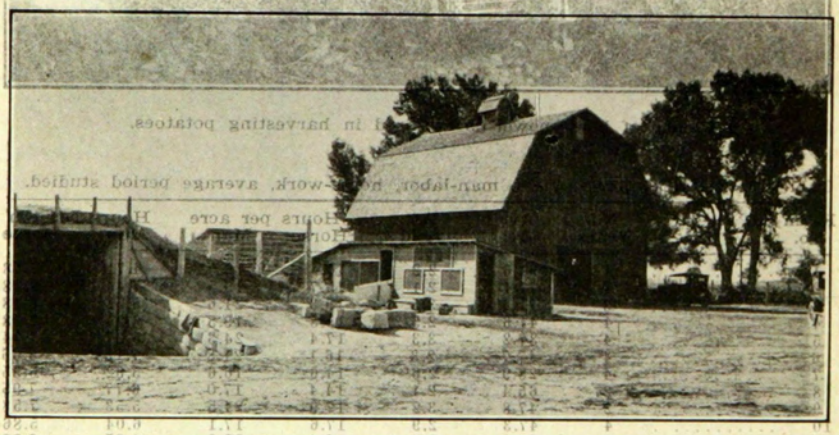
Farm No.	No. Years	Av. area	Av. yield	Hours per acre Horse	Hours per acre Man	Hours per ton Man	Hours per ton Horse
1	4	91.6	2.2	10.4	16.0	4.71	7.43
2	4	71.1	2.1	15.7	19.5	7.44	9.28
3	3	77.4	3.5	19.3	21.6	5.52	6.18
4	4	41.6	2.5	15.8	19.5	6.25	7.23
5	4	37.2	3.3	17.4	24.3	5.27	7.34
6	4	47.7	2.3	16.1	21.8	7.13	9.66
7	4	28.9	2.6	14.6	16.6	5.62	6.35
8	2	65.4	2.1	14.4	17.0	6.77	7.95
9	2	47.8	3.2	17.9	24.5	5.53	7.58
10	4	47.3	2.9	17.6	17.1	6.04	5.86
11	4	64.0	3.4	16.4	23.3	4.85	6.89
12	3	52.3	1.4	10.8	13.4	7.62	9.52
13	4	40.5	3.1	17.3	25.4	5.64	8.30
14	4	61.0	2.2	13.0	13.7	5.92	6.26
15	2	19.5	2.3	18.9	17.2	8.23	7.46
16	2	57.4	2.2	16.7	20.9	7.48	9.30
17	2	27.4	3.2	22.2	27.7	7.03	8.76
18	2	53.7	2.2	12.8	15.3	5.88	7.02
19	2	90.0	2.4	15.0	19.9	6.26	8.35
20	2	32.8	3.1	17.9	24.7	5.76	7.94
21	4	23.5	2.8	21.0	23.3	7.37	8.20
22	2	40.3	2.1	14.0	18.1	6.65	8.58
23	4	30.7	2.0	20.2	18.7	10.17	9.41
24	4	18.6	3.1	15.9	22.2	5.15	7.18
25	2	63.9	1.0	13.3	13.6	12.75	13.03
Av.	78	48.7	2.5	15.6	19.4	6.20	7.70

A comparison of the man-labor and horse-work used in harvesting one ton of alfalfa on two farms, together with the yield obtained, is shown in table 14. It will be seen that 1.55 hours of man-labor and .92 hours of horse-work more were used in harvesting a ton of alfalfa on farm 19 than on farm 1. On farm 19, 215.2 tons of alfalfa were produced on the average each year of the study. If man-labor and

horse-work had been used as effectively in harvesting a ton of alfalfa on farm 19 as on farm 1, 333.6 fewer hours of man-labor and 198 less hours of horse-work would have been used in handling each crop. The following suggests some of the reasons for these differences on these two farms.

Table 14. A comparison of man-labor and horse-work used in growing alfalfa on two farms, average period studied.

	Farm 1	Farm 19
Return on investment	16.1%	0.3%
Estimated value of land without buildings	$151	$211
Average alfalfa area, acres	91.59	90.03
Average yield per acre, tons	2.15	2.39
Average hours of man-labor per ton	4.71	6.26
Average hours of horse-work per ton	7.43	8.35



Potato cellars are a common part of the farm building investment.

Less man-labor and horse-work were used in mowing, raking and putting up an acre of alfalfa on farm 1 than on farm 19. There appears to be no reason for the difference in mowing and raking other than faster work on farm 1. In putting up alfalfa, an over-shot stacker was used on farm 1 whereas sleds and slings were used on farm 19 and it is generally believed that the former will put up more hay in a given time than the latter.

Wheat, Barley and Beans.—The amounts of man-labor and horse-work used in growing an acre and hundredweight of wheat, barley and beans are shown in Tables 15, 16 and 17. Because of the smaller labor requirements and the small acreage of these crops, the variations do not have as much effect on the net returns as do variations for the crops previously discussed. However, practices used in growing these crops often have considerable effect on the net returns.

Table 15. Wheat: Acres, yield, man-labor, horse-work, average period studied.

Farm No.	No. Years	Av. area	Av. yield in lbs.	Hours per acre Man	Hours per acre Horse	Hours per cwt. Man	Hours per cwt. Horse
1	1	54.2	1253	12.6	17.8	1.01	1.42
3	2	30.6	1268	14.1	21.6	1.03	1.58
4	3	20.2	1425	11.2	16.5	.78	1.16
5	3	13.2	1984	14.3	20.2	.72	1.02
6	3	25.9	2817	14.0	22.0	.50	.78
7	1	16.5	1431	13.4	16.3	.94	1.13
8	2	35.2	1998	12.0	11.9	.60	.59
12	3	22.6	1303	12.3	17.7	.95	1.36
13	2	20.6	1742	13.1	25.8	.75	1.48
14	1	42.6	1718	14.8	15.1	.86	.88
15	2	10.7	1679	14.9	14.1	.89	.84
18	2	41.0	1576	9.5	13.4	.60	.85
19	1	21.3	663	7.6	13.1	1.14	1.97
21	4	12.4	1817	14.2	15.0	.78	.83
22	2	16.7	2382	16.4	25.7	.69	1.08
24	1	16.8	709	8.2	12.4	1.16	1.75
25	2	26.4	1384	7.2	5.9	.52	.43
Av.	35	23.1	1991	12.3	17.0	.77	1.06

Table 16. Barley: Acres, yield, man-labor, horse-work, average period studied.

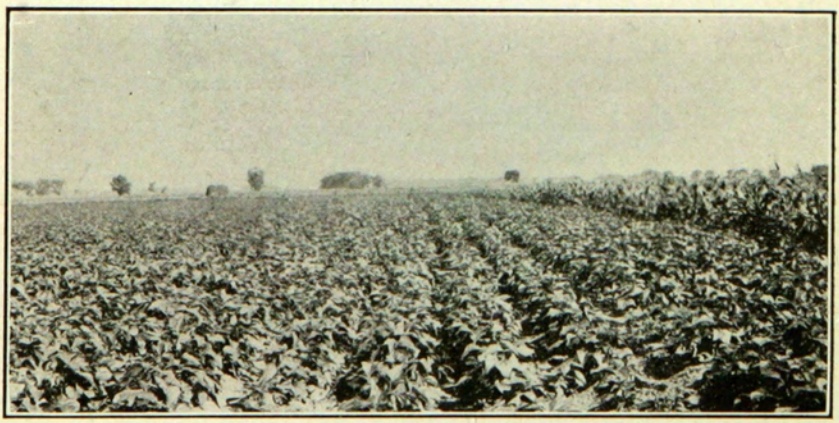
Farm No.	No. Years	Av. area	Av. yield	Hours per acre Man	Hours per acre Horse	Hours per cwt. Man	Hours per cwt. Horse
1	4	38.3	2325	15.9	22.6	.68	.97
2	4	53.0	2569	11.8	12.9	.46	.50
3	3	22.7	2831	12.5	21.5	.44	.76
5	3	7.5	2339	12.3	19.6	.53	.83
6	3	17.6	2898	13.8	23.8	.48	.82
7	2	9.6	2331	13.0	19.5	.56	.84
8	2	20.2	2019	17.9	25.8	.89	1.28
9	2	27.6	2567	9.5	14.9	.37	.60
11	4	56.7	2047	15.0	26.6	.74	1.29
12	3	17.8	1797	16.6	27.7	.93	1.54
13	4	14.5	1682	10.5	19.5	.62	1.16
14	3	10.9	1837	12.6	23.2	.68	1.27
16	2	29.2	2605	12.7	21.9	.49	.84
17	2	42.7	1799	10.5	24.0	.58	1.33
20	2	22.8	2134	13.6	20.4	.63	.96
22	2	17.1	1543	13.7	24.1	.89	1.56
24	4	18.2	1689	13.0	20.9	.77	1.24
25	1	5.7	1304	4.3	5.3	.33	.40
Av.	50	25.8	2218	13.4	21.3	.60	.96

Table 17. Beans: Acres, yield, man-labor, horse-work, average period studied.

Farm No.	No. Years	Av. area	Av. yield	Hours per acre Man	Hours per acre Horse	Hours per cwt. Man	Hours per cwt. Horse
1	1	8.8	1227	29.3	46.6	2.39	4.79
2	3	13.8	487	30.9	42.4	6.34	8.72
3	2	7.6	1395	30.5	44.9	2.18	3.21
4	2	28.0	1035	30.2	37.3	2.92	3.59
5	4	17.6	745	26.0	42.9	3.49	5.76
6	2	18.3	1671	35.8	43.2	2.13	2.59
8	1	21.8	702	54.7	39.1	7.80	5.60
12	1	6.0	370	46.0	51.0	12.43	13.76
13	1	25.2	1217	43.5	32.1	3.57	2.64
19	1	28.5	842	33.3	19.7	3.95	2.34
20	1	1.1	1217	40.4	42.1	3.32	3.46
21	4	22.2	904	40.1	48.8	4.43	5.39
23	4	15.8	292	25.7	32.4	8.81	11.09
24	2	15.8	551	23.7	21.2	4.29	3.84
25	1	9.5	863	15.7	12.4	1.63	1.24
Av.	29	17.2	857	32.7	38.3	3.81	4.47

The hours of man-labor and horse-work used in growing one ton of alfalfa, one ton of sugar beets, 1000 pounds of potatoes and one hundredweight of barley are shown in Table 18. There are 17 farms growing these crops. In growing the quantities stated of these four crops, 13.2 hours of man-labor and 20.5 hours of horse-work were used on the average on the five farms with the highest net returns, and 15.3 hours of man-labor and 23.9 hours of horse-work on the five farms with the lowest net returns. Sixteen percent more man-labor and 17 percent more horse-work were used in growing the same volume of product on the latter farms than on the former. Stated another way, it may be said that a given amount of man-labor and horse-work used on the five farms with the larger net returns resulted in from 16 to 17 percent more product than the same amount on the farms with the smaller returns. The estimated value of the land without buildings for the former group was $188 per acre and for the latter, $193 per acre. A 16 percent increase in the products marketed with only a small increase in expenses often will change poor net returns to good net returns.

Use of Tractor.— In the preceding discussion the hours of tractor labor have not been included. They are given here in Table 19 for the farms that had tractors. Farm 2 is included in the most profitable five farms averaged in the previous discussion and farm 19 is included in the least profitable group. A comparison of farms 2 and 19 shows that the relative standing of the two groups would not be materially changed by including tractor hours or their equivalent in horse hours in the analysis.

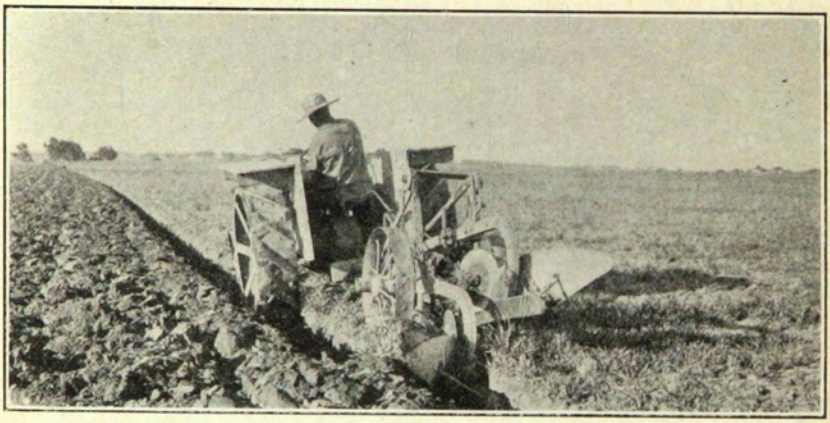


Seed beans are a minor source of income on many farms.

Table 18. Man-labor and horse-work used in growing one ton of alfalfa, one ton of beets, 1000 lbs. potatoes and 100 lbs. of barley. average perlod studied.

Farm No.	No. Years	SUGAR BEETS Hrs. for one ton Man	SUGAR BEETS Hrs. for one ton Horse	POTATOES Hrs. for 1000 lbs. Man	POTATOES Hrs. for 1000 lbs. Horse	ALFALFA Hrs. for one ton Man	ALFALFA Hrs. for one ton Horse	BARLEY Hrs. for 100 lbs. Man	BARLEY Hrs. for 100 lbs. Horse	Total Hours Man	Total Hours Horse	Land Value
1	4	1.90	3.73	3.60	6.70	4.71	7.43	.68	.97	10.89	18.83	$151
2	4	2.74	4.79	3.70	7.40	7.44	9.28	.46	.50	14.34	21.97	121
3	3	2.48	5.40	6.80	11.40	5.52	6.18	.44	.76	15.24	23.74	226
4	4	2.00	3.86	4.10	5.20	6.25	7.73	.72	1.02*	13.09	17.81	243
5	4	2.05	5.38	4.40	6.60	5.27	7.34	.53	.83	12.25	20.15	200
6	4	2.61	6.57	4.70	7.10	7.13	9.66	.48	.82	14.92	24.15	236
7	4	2.58	4.78	3.70	6.90	5.62	6.35	.56	.84	12.46	18.87	160
8	2	4.81	5.74	8.30	8.50	6.77	7.95	.89	1.28	20.77	23.47	125
9	2	2.54	4.85	4.30	7.50	5.53	7.58	.37	.60	13.47	20.79	266
10	4	2.11	3.97	5.40	6.00	6.04	5.86	.95	1.36*	14.50	17.19	176
11	4	1.94	4.27	3.60	6.60	4.85	6.89	.74	1.29	11.13	19.05	162
12	3	2.90	6.78	6.70	9.90	7.62	9.52	.93	1.54	18.15	27.74	124
13	4	3.45	6.73	6.70	9.90	7.62	8.30	.62	1.16	16.21	24.09	190
15	2	2.75	3.83	4.50	7.20	8.23	7.46	.89	.84*	16.37	19.33	146
17	2	3.16	8.50	3.80	10.30	7.03	8.76	.58	1.33	14.57	28.99	254
19	2	3.36	4.92	4.80	7.30	6.28	8.35	1.14	1.97*	15.58	22.58	211
20	2	3.49	6.68	3.90	8.50	5.76	7.94	.63	.96	13.78	24.08	166
Av.		2.66	5.38	4.70	7.30	6.26	7.84	.61	.97	14.33	21.49	176

* No barley grown, data on wheat used.



Deep fall plowing insures an early mellow seedbed.

Table 19. Tractor hours per acre, average period studied.

Farm No.	Sugar beets	Potatoes	Alfalfa	Wheat	Barley	Beans
2	2.99	2.51	0.68	. . .	2.15	1.59
11	.43	2.79	. . .	. . .	0.56	1.59
17	.59	0.15	. . .	. . .	0.35	. . .
19	3.80	2.46	0.03	. . .	. . .	. . .
25	6.51	3.24	0.77	1.02	1.23	1.05

Feeding Practices

There is a wide variation in the results obtained by different farmers in feeding livestock. Some of the farmers in this study got larger gains or more production with a given quantity of feed or the same production at lower costs than others. This is largely because some used better judgment than others in selecting the most economical ration at a particular time. One should remember that low costs will have the same influence on profits as high sale prices. It is seldom that a farmer with poor results from the feeding operations gets a high return from the entire farm.

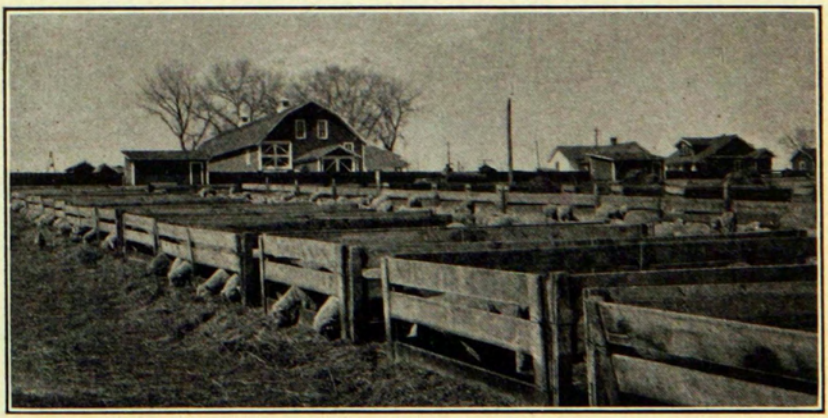
Lamb Feeding.— The average results obtained from feeding lambs on the different farms is shown in Table 20. The efficiency of the different farmers in lamb feeding is reflected in the percentage of death loss, gain per head, feed per pound of gain and cost per pound of gain. The lowest death loss was on farm 6 and the highest on farm 18. The largest gain in pounds per head was obtained on farm 2 and the next largest on farm 1. The lowest feed cost per pound of gain with records for four years was on farm 2. Economical feeding was also done on farms 5 and 6 as shown by the feed costs on these farms.

Table 20. Results, lamb feeding, average for the period studied.

Farm No	Years included *	No. Lambs purchased	Av. weight	Price per cwt.	Percent death loss	Gain Per head	Actual feeding margin	Per 100 lbs. gain: Concentrates	Per 100 lbs. gain: Roughage	Feed cost per lb. gain
			lbs.			lbs.		lbs.	lbs.	cents
1	D	1,805	66.36	$13.13	2.18	28.15	$2.46	537	1,062	13.63
2	A	1,348	58.03	13.43	3.65	32.53	0.87	564	727	10.49
3	B	1,904	60.14	12.51	2.31	25.12	3.08	463	894	11.61
5	A	750	60.34	13.41	2.10	27.25	0.58	461	738	11.56
6	B	958	56.97	12.09	1.22	24.53	3.63	445	1,262	11.54
8	E	1,827	69.11	12.62	2.19	24.21	1.92	454	1,818	14.11
9	C	1,118	69.18	11.25	4.65	24.32	3.11	466	925	12.28
11	A	2,294	65.28	12.74	2.06	23.53	1.80	525	1,292	13.81
13	B	918	53.15	12.21	3.85	27.31	3.03	461	1,348	13.33
16	E	1,987	69.37	12.68	2.84	22.42	1.53	230	1,902	15.92
17	G	1,024	62.00	11.77	2.10	28.00	3.60	495	762	9.80
18	G	1,498	67.00	11.26	8.14	14.90	1.44	74	508	10.80
19	E	1,520	64.71	12.81	3.03	24.40	1.49	525	1,252	15.61
20	C	1,874	65.11	12.33	1.25	22.69	1.47	531	375	8.96
25	F	821	66.33	13.07	5.36	19.34	0.69	553	1,320	14.21
Av.		1,451	63.51	12.65	2.73	25.20	2.00	499**	1,053**	12.72

Years	Year	Feed cost per lb. gain	Per 100 lbs. gain: Concentrates	Per 100 lbs. gain: Roughage
*A—1, 2, 3, 4	1—1922-23	10.16c	494 lbs.	729 lbs.
B—1, 2, 3	2—1923-24	10.55c	455 lbs.	1021 lbs.
C—1, 2,	3—1924-25	13.44c	430 lbs.	1570 lbs.
D—2, 3, 4	4—1925-25	15.10c	568 lbs.	1056 lbs.
E—3, 4				
F—2, 4				
G—2				

**Not including farms 16 and 18 where considerable corn fodder was fed and it was impossible to secure the proportion of grain corn included in the weight of the corn fodder.



Panel construction is used on this farm in feeding alfalfa hay to lambs.

Comparison of Selected Farms.—The results obtained in feeding lambs on farm 5 and farm 25 are shown in Table 21. On farm 5 lighter lambs were bought than on farm 25. As a rule, the heavier the lambs the less the gain for a given amount of feed. On farm 5 the feeding was done by an operator who makes a careful study of sheep feeding, whereas on farm 25 most of the feeding was done by a hired man. On farm 5 the lambs were put on full feed with less than one-third the death loss shown for farm 25. A better ration was fed on farm 5 than on farm 25 because farm 25 used too much roughage in relation to concentrates. As a result of these differences the feed cost per 100 pounds of gain was $10.93 on farm 5 and $25.93 on farm 25.

Table 21. Comparison of the results obtained in feeding sheep on two farms, 1925-26.

	Farm 5	Farm 25
Percent return on investment *	6.9	—3.8
Purchase weight per head, lbs	62.4	70.
Percent death loss	2.2	7.2
Gain per head, lbs	31.9	12.3
Feed cost per pound of gain, cents	10.93	25.63
Feed per 100 pounds gain:		
Alfalfa, lbs	639	1430
Barley, lbs	27	
Corn, lbs	384	828
Bran, lbs	4	
Corn Fodder, lbs		840
Oil Meal, lbs	8	

*Average for period studied.

Cattle Feeding.—The results obtained on the different farms in feeding cattle are shown in table 22. Generally the operators of the farms with the higher returns got larger gains in pounds or gains at lower costs, or both, than the operators with the lower farm returns. The lowest feed cost per pound of gain was obtained on farm 2. The largest gain per head was on farm 3 and the next largest on farm 1.

Table 22. Results, cattle feeding, average for the period studied.

Farm No.	Years included *	No. Cattle purchased	Av. weight	Price per cwt.	Percent death loss	Gain per head	Actual feeding margin	Per 100 lbs. gain: Concentrates	Per 100 lbs. gain: Roughage	Feed cost per lb. gain
			lbs.			lbs.		lbs.	lbs.	cents
1	E	74.5	805	$5.21	0.67	259	$2.46	558	3,860	12.60
2	A	84.2	832	5.85	0.89	207	1.76	212	5,126	8.29
4	A	121	672	6.83	0.62	339	2.95	607	2,384	12.41
5	B	29	945	6.65	0.23	217	2.19	456	2,986	9.16
6	D	52	792	6.52	. . .	232	1.78	212	2,103	11.28
12	B	58	929	6.11	. . .	242	2.38	310	3,801	9.72
19	M	70.5	953	5.65	0.71	196	1.44	378**	1,988**	8.82
Av.		71	800	6.29	0.73	259	2.18	361	2,958	10.96

Years: *A—1, 2, 3, 4; B—1, 2, 3; D—2, 3, 4; E—3, 4; M—2, 3

**One year only. The other year no feed used except beet-top pasture.

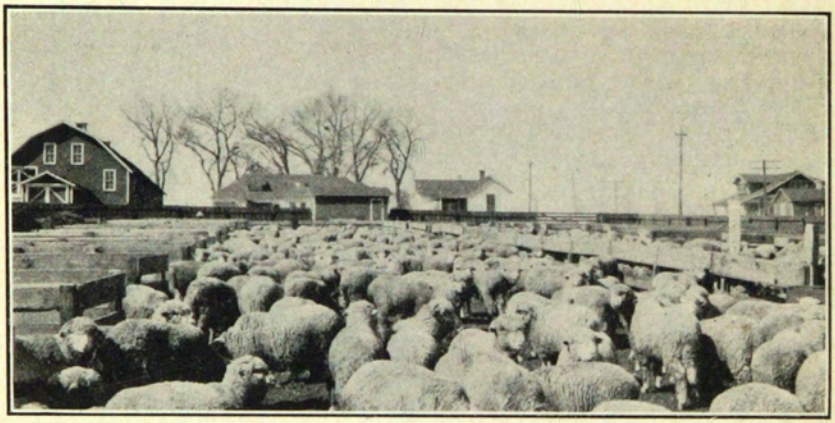
This group of white faces is ready for market.

Relation of Feeding to Profits.—The percentage of return on the investment on farms with and without feeding is shown in Table 23. Only data for farms operated by owners are shown. During three of the four years feeders made larger returns than non-feeders. Considering the four-year period the feeders made 5.9 percent return and the non-feeders 2.1 percent. In the 1925 feeder group, three farms are included, the data for which are not shown in previous tables. Records were kept on these three farms only in 1925 and in all other tabulations the one-year records are omitted.

Table 23. Comparison of feeder and non-feeder owner farms, percent on investment by years.

	Feeders	Non-Feeders
1922:		
No. owners	6	6
Percent on investment	0.2	—1.4
1923:		
No. owners	6	7
Percent on investment	10.2	—1.3
1924:		
No. owners	8	5
Percent on investment	9.9	3.9
1925:		
No. owners	9	6
Percent on investment	3.3	7.4
Four years:		
No. owners	29	24
Percent on investment	5.9	2.1

Based upon this four-year record, one would be justified in emphasizing feeding as an important cause of increased profitableness on some farms, but there is nothing in the details to justify one in forgetting the other features of good farm organization and giving all the credit to feeding for the profits secured. It is the combination of a proper amount of feeding with cash crops that gives diversification and ensures a good return on the investment.



Lamb feeding is an important enterprise on many of these farms.

Knowledge of Values in Buying and Selling

An important factor in influencing farm profits is the proper disposal of crops and livestock. The ability to pick out a "good buy" and select the best time and market on which to sell is often responsible for profits. This is especially true in feeding operations in which large numbers of livestock are bought and sold. This is illustrated in the case of feeding lambs in which the initial cost of the lambs generally is about twice the cost of fattening them. A good buy may mean the difference between a profit or a loss.

Often there is a wide variation in the price that farmers get for products of similar quality. For example, in 1925 one farmer received an average of $2.50 per hundred for his potatoes whereas another farmer in the same community got on the average only $1.47. The price received by different farmers for the bean crop in 1925 ranged from $3.25 to $5.75 per hundredweight. In 1924 one farmer received $4.16 per hundredweight margin on the lambs fed while another farmer got only 40 cents per hundredweight.

The average margin received by the five lamb feeders making the largest farm returns was $2.12 per hundredweight whereas the average for the five feeders making the lowest farm returns was $1.78 per hundredweight. The average margin received by the four cattle feeders making the largest farm returns was $2.34 per hundredweight whereas the average for the three feeders with the lowest returns was $1.83 per hundredweight.

When such variations are seen it appears that a farmer is justified in his interest in price movements and trends, and anything which will improve his judgement as to prices and values, or help him to avoid selling or buying at a disadvantage is certain to have a decided influence upon his profits. Such an analysis as this can only call attention to the possibilities along this line. A thoro appreciation of values

is possible only after a careful study of the facts influencing and likely to influence the market. Usually this requires long experience together with careful observation.

Adjustments in Farm Plans Due to Price Changes

Closely associated with judgements as to values is the problem of adjusting production on the basis of prospective prices. Some farmers in this study followed a fairly definitely established system of farming thruout the period. Others made radical changes in the acreages and kinds of crops and in the numbers and kinds of livestock from year to year. Among those who made radical yearly changes some adjusted production plans so as to have the largest amounts of the different products to sell when they were relatively highest in price whereas others made changes that more often resulted in large production of the products relatively low in price.

Farm 12, 6 and 8 illustrate these different types. The acreages of the crops grown and the numbers of the principal classes of livestock fed on these three farms are shown in Table 24. Fairly uni-

Table 24. Illustrations of farms with uniform production, with production adjusted to relatively high prices and with production adjusted away from relatively high prices.

	Year	Price for year*	Farm 12	Farm 6	Farm 8
Alfalfa, acres—	1922	$11.91	60.25	46.24	....
	24	7.50	47.52	18.35	43.55
	25	6.00	....	11.40	24.19
Small grain, acres—	1922	1.13**	42.79	32.09	....
	23	1.11	43.72	45.09	....
	24	1.56	38.58	21.34	30.44
	25	1.50	....	31.78	18.62
Beans, acres—	1922	3.86	....	....	....
	23	4.70	5.99	....	....
	24	4.64	....	18.16	....
	23	10.65	47.29	46.24	....
	24	14.87	49.29	51.34	66.23
	25	13.83	....	46.98	64.58
Potatoes, acres—	1922	.39	15.81	59.27	....
	23	.80	15.12	28.00	....
	24	.75	13.00	26.81	12.26
	25	2.40	....	27.85	....
Sugar beets, acres—	1922	7.88	45.79	....	....
	23	8.19	52.63	17.10	....
	25	4.39	....	18.51	21.76
Corn, acres—	1922	1.35	....	12.82	....
	23	1.26	....	14.32	....
	24	2.33	16.35	14.75	....
	25	1.51	....	14.23	21.68
Feeder lambs, number—	1922	1.64***	....	1,115	....
	23	3.49	....	1,058	....
	24	3.15	....	700	1,802
	25	—.74	....	....	1,852
Feeder cattle, number—	1922	1.66***	62	....	....
	23	2.08	56	34	....
	24	2.82	56	50	....
	25	1.91	....	73	....

* Prices shown are per cwt. except beets and alfalfa which are per ton.
** Prices of barley.
***Actual feeding margin.

form production of both crops and livestock was maintained on farm 12 during the period. Most of the changes were in the acreages of the minor crops. The acreage of beets, potatoes and small grain was approximately the same during each of the three years. About the same number of cattle were fed each year. No lambs were fed and practically no pork sold.

On farm 6 more yearly changes were made in production plans and, considering all changes made during the period, it appears that larger returns were obtained than if uniform production had been maintained. The changes in the crops grown seem to have been made largely with the idea of improving the combination of crops. However, crop changes resulted in increases in the products relatively low in price as often as they resulted in increases in products relatively high in price. The largest acreage of potatoes was grown the year they were lowest in price. The same is true in the case of small grain.

Much non-marketable pasture and roughage is utilized by lambs purchased for the feedlot during fall and winter months.

It is in the livestock enterprises that the adjustments were made that resulted in the large increase in returns. Here it appears that almost uncanny judgment was used in shifting between lambs, cattle and hogs. No cattle were fed in 1922, no hogs in 1922 or 1923 and no lambs in 1925. These were the years of lowest returns for these different products. Late 1924 and 1925 were times of high hog prices and all the pork sold from farm 6 during the period was marketed at that time. Nineteen hundred twenty-five was an unprofitable year for both cattle and lambs but much poorer for lambs than cattle. No lambs were fed on this farm in 1925 and the cattle increased only slightly over previous years. The heaviest feeding was done during 1923 and 1924.

Records were kept on farm 8 only during 1924 and 1925. The acreages of the different crops planted were radically different each year and practically every change was a shift away from the crops which later proved to be relatively highest in price. Potatoes were grown only in 1924 and potatoes sold for more than twice as much per hundredweight in 1925 as 1924. The small-grain acreage was about 64 percent larger in 1924 than in 1925. The farm prices in this area of both barley and wheat were slightly higher in 1924 than in 1925. About 4000 pounds of pork were sold from this farm in 1924 and none in 1925 and pork was considerably higher in 1925 than in 1924. Approximately the same number of lambs was fed each year.

Many of these changes were made because the price of some product was high or low at planting or breeding time. It seldom pays to make adjustments on this basis. By keeping informed as to conditions influencing production and prices, often adjustments are made that result in increased returns. Such changes are made most advantageously only after carefully studying all information available relating to the probably prices of the different products when they are to be ready for the market.

It is the opinion of many who are well acquainted with this area that in the long run a farmer will be ahead if he grows a rather uniform acreage of such crops as alfalfa, feed grains, and crops for which there are contract prices that do not vary greatly from year to year such as sugar beets, seed beans or canning factory peas, and limit the changes to the more speculative crops such as potatoes and cabbage. In the feeding of livestock, sentiment is swinging to adapt the number of lambs fed to the available feed supply and reduce the large speculative feeding. All these work in the direction of eliminating risk and stabilizing income.

Often production changes are necessary because of permanently changed conditions. Reduced crop yields due to a depleted condition of the soil, and insects and weed pests sometimes are responsible for crop changes. Adjustments in the cropping system often influence livestock changes. In some cases permanent changes in prices due to changes in consuming centers and other production areas make the expansion of some lines of production and the contraction of other lines advisable. Adjustments may also be advisable because of increases or decreases in the amount of family labor, land, equipment or work stock available.

Size of Business

The size of the farm business is an important factor affecting profits. With a profitable system generally the profits increase as the size of the business increases; with an unprofitable system usually this relationship is reversed. It follows that the ability of the farm operator is important in determining the size of the business likely to be most profitable. However, there are size units that seem to have advantages for particular types of farming. For example, more acres are

needed for a profitable system of alfalfa and grain farming than for a profitable system of truck farming.

It will be seen as shown in Table 1 that in this study the largest net return was made on the largest farm. However, larger net returns were made on nine farms than on the one next largest in size. On farm 1 it was a case of superior management on a large farm. More extensive studies in this same area indicate that the 160-acre unit has some advantages for the system of farming generally followed. The economic unit, however, will vary with the system of farming and management.

Managerial Ability of the Farm Operator

The deciding influence closely correlated with the other factors discussed is the managerial ability of the operator of the farm. Managerial ability depends upon experience, training and special aptitudes.

Potatoes are graded and sacked in the field.

Other things being equal, one will usually do better with the enterprises or farming systems with which he has had experience. The successful non-irrigation farmer will not always succeed equally well in the irrigated districts. One who has been successful with one system of irrigation farming will not always succeed equally well with another system. Often individuals with special aptitudes and qualifications will find specialty enterprises profitable. Other individuals similarly located with different aptitudes may try the same enterprises and suffer disastrous results. However, in farming in any area, one should use care lest his training, experience, likes and dislikes take him too far from the staple enterprises best adapted to the region.

Illustrations of Profitable Systems of Farming

As already pointed out the returns from a particular farm are not due to a single factor but to a combination of factors. Some of the

farms studied were strong enough along the different lines to justify a consideration of the system as a whole. Important facts concerning three such farms are shown in Tables 25, 26 and 27. While these data include only a small part of the records available for these farms, the selection has been made in such a manner as to show the essential organization features. Three typical farm sizes are represented. In tillable area farm 5 is slightly larger than the 80-acre farm which is common in this region. Farm 6 corresponds to the quarter-section unit which is the dominant-sized group for this area, and farm 1 illustrates the half-section type of which there are also many.

On farm 5 approximately one-third of the tillable land was kept in alfalfa during the four years. Potatoes and sugar beets constitute the two most important sources of income, with the one exception,

When potatoes are low in price they are sometimes fed to fattening stock.

1925. The latter was an extremely dry season and sugar beets were lost on this account. The bean crop served as an excellent substitute and source of cash income in this particular instance. Nine work horses were used on this farm. Sheep were fed all four years; cattle were included three years. One of the large items of expense, the purchase of feed, is directly associated with these enterprises. This farm was previously used to illustrate good man-labor distribution and good practices in producing potatoes.

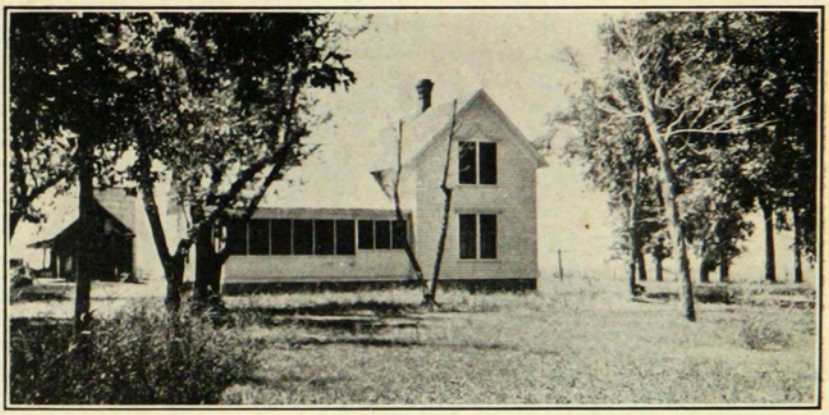
Farm 6 contains about a quarter section of land. Approximately one-third of the total area was kept in alfalfa. The potato acreage was considerably above normal in 1922 when the price was low. Sugar beets were omitted this particular season. Wheat was grown as a cash crop three years out of four. Beans appear twice in the four crop years. Nine horses were required to do the work on 159 acres, in contrast with nine horses on farm 4 with 118 acres. Sheep were fed the first three years of the period; cattle were included the last three

years. The feed expense was relatively high the first three years and comparatively low the last year. Hired labor is an important item of expense. This farm was used previously to illustrate good practices in sugar-beet production. This operator adjusted production successfully in response to changes in conditions affecting prices.

Farm 1 belongs to the half-section group. Practically 100 acres were devoted to the production of alfalfa the first two years. This area was reduced to 82 acres the last two years of the period. The potato acreage was increased considerably in 1925 due to a favorable price outlook. Wheat appears as a cash crop only one year in four. Barley and oats are grown for feeding purposes. The surplus hay and feedable grain produced on this farm were utilized in connection with feeder sheep, with feeder cattle included for two years. Feed and labor constituted the two most important items of expense. This farm was used previously to illustrate good man-labor distribution, also to illustrate good practices in growing and handling alfalfa.

Table 25. Business summary, 118-acre farm (5) by years.

	1922	1923	1924	1925
Investment:	Dollars	Dollars	Dollars	Dollars
Land	23,522	23,522	23.522	23,522
Buildings	6,765	6,374	5,982	5,638
All other	3,741	4,077	4,271	6,503
Total	34,028	33,937	33,775	35,663
Crops:	Acres	Acres	Acres	Acres
Alfalfa	36.9	36.2	41.9	34.0
Potatoes	22.9	19.3	21.3	17.4
Sugar beets	16.0	14.8	20.3	. . .
Barley	5.8	. . .	8.9	7.9
Oats	2.0	5.2	6.3	14.4
Wheat	12.9	15.8	. . .	10.8
Beans	14.9	19.9	12.8	23.3
Corn	. . .	. . .	. . .	3.5
Livestock:	Numbers	Numbers	Numbers	Numbers
Work stock	9	9	9	8.4
Feeder sheep	921	478	700	901
Feeder Cattle	29	27	30	. . . .
Dairy cows	3	3.5	3	4.5
Farm Receipts	Dollars	Dollars	Dollars	Dollars
Feeder-sheep increase	2,047	2,444	2,556	2,677
Feeder-cattle increase	692	849	1,308	. . . .
Other livestock increase	65	4	16	75
Potato Sales	804	1,499	1,848	3,008
Sugar-beet sales	1,193	1,777	3,302	. . . .
Miscellaneous	663	979	1,040	4,053
Total	5,464	7,552	10,070	9,813
Farm Expenses:	Dollars	Dollars	Dollars	Dollars
Feed	1,559	1,192	2,136	1,858
Labor hired	567	920	1,290	1,059
Family labor	383	295	157	292
Taxes, real estate	432	391	362	362
Miscellaneous	1,058	1,446	2,087	1,600
Total	3,999	4,244	6,032	5,171
Farm income	1,465	3,308	4,038	4,642
Operators's labor	990	990	990	990
Return on investment	475	2,318	3,048	3,652
Percent return on investment	1.4	6.8	9.0	10.2



A modest but comfortable farm home in this region.

Table 26. Business summary, 159-acre farm (6) by years.

	1922	1923	1924	1925
Investment:	Dollars	Dollars	Dollars	Dollars
Land	37,604	37,604	37,604	37,604
Buildings	6,346	6,023	5,711	5,333
All other	4,514	4,415	4,969	7,873
Total	48,464	48,042	48,284	50,810
Crops:	Acres	Acres	Acres	Acres
Alfalfa	46.2	46.2	51.3	47.0
Potatoes	59.3	28.0	26.8	27.8
Sugar beets	. . .	17.1	18.4	11.4
Barley	. . .	17.8	21.3	13.6
Wheat	32.1	27.2	. . .	18.2
Beans	. . .	. . .	18.2	18.5
Corn	12.8	14.3	14.8	14.2
Livestock:	Numbers	Numbers	Numbers	Numbers
Work stock	8.1	9.1	8.9	9.8
Feeder sheep	1,115	1,058	700	
Feeder cattle	. . .	34	50	73
Dairy cows	3	4	2	2
Farm Receipts	Dollars	Dollars	Dollars	Dollars
Feeder-sheep increase	4,007	6,600	3,630	. . . .
Feeder-cattle increase	. . . .	1,297	2,477	1,190
Other livestock increase	189	321	. . . .	. . . .
Potato sales	2,328	2,235	38	3,587
Sugar-beet sales	. . . .	2,514	2,274	1,727
Miscellaneous	701	835	1,433	6,451
Total	7,225	13,802	9,852	12,965
Farm Expenses:	Dollars	Dollars	Dollars	Dollars
Feed	2,203	2,222	1,769	394
Labor hired	1,183	1,376	1,431	1,875
Family labor	981	1,363	38	83
Taxes, real estate	542	638	510	510
Miscellaneous	2,330	2,725	2,480	2,930
Total	7,239	8,324	6,228	5,702
Farm income	—14	5,478	3,624	7,263
Operator's labor	1,034	1,034	1,034	1,034
Return on investment	—1,048	4,444	2,590	6,229
Percent return on investment	—2.2	9.3	5.4	12.2

Table 27. Business summary, 336-acre farm (1) by years.

	1922	1923	1924	1925
Investment:	Dollars	Dollars	Dollars	Dollars
Land	50,474	50,474	52,309	52,309
Buildings	7,526	7,656	7,097	6,714
All other	5,544	7,599	10,767	13,219
Total	63,544	65,729	70,173	72,242
Crops:	Acres	Acres	Acres	Acres
Alfalfa	103.6	98.7	82.1	82.1
Potatoes	76.8	75.2	78.4	95.0
Sugar beets	55.2	49.3	59.0	39.9
Barley	11.9	42.6	47.5	51.2
Oats	...	29.5	44.8	21.0
Wheat	54.2	...	...	...
Beans	...	...	...	8.8
Livestock:	Numbers	Numbers	Numbers	Numbers
Work stock	13	15	15	12.8
Feeder sheep	1,791	2,200	1,365	1,857
Feeder cattle	...	...	48	101
Dairy cows	2.5	2.5	3.5	2.5
Farm Receipts	Dollars	Dollars	Dollars	Dollars
Feeder-sheep increase	5,808	13,982	9,350	2,897
Feeder-cattle increase	....	....	2,484	2,725
Other livestock increase	70	142	....	734
Potato sales	709	2,685	9,024	15,165
Sugar-beet sales	3,445	6,331	7,832	4,594
Miscellaneous	2,115	968	2,043	13,887
Total	12,147	24,108	30,733	40,002
Farm Expenses:	Dollars	Dollars	Dollars	Dollars
Feed	3,156	3,477	4,801	6,968
Labor hired	3,489	4,583	6,893	6,812
Family labor	....	12	50	61
Taxes, real estate	797	680	649	648
Miscellaneous	2,980	2,947	4,092	5,219
Total	10,422	11,699	16,485	19,639
Farm income	1,725	12,409	14,248	20,363
Operator's labor	1,272	1,272	1,272	1,272
Return on investment	453	11,137	12,976	19,091
Percent return on investment	0.7	16.9	18.5	26.4

CONCLUSIONS

An historical background has been presented for the systems of farming found in the irrigated area in the vicinity of Greeley, Colorado. The returns obtained on a few farms during the period from 1922 to 1925 have been shown. Some of the causes for the variations in returns have been discussed. Systems and practices that resulted in good returns during the period of the study have been pointed out.

On the most profitable farms well-balanced systems were followed. The systems were built around staple enterprises adapted to the area. Crops and livestock were selected that fitted together and contributed to each other. The man-hour and horse-work needs were distributed thruout the year. The non-marketable products such as straw, beet tops and pasturage were utilized to good advantage. Good practices were followed. These things make for economical production.

The operators of the most profitable farms were generally regarded as good buyers and sellers. They knew values. They were informed as to conditions likely to result in favorable prices for some products and unfavorable prices for others. Such things, along with economical production, make returns possible.

Much that is of value can be gained from a study of such systems. However, the results of such studies must be interpreted in the light of conditions on particular farms. Conditions are seldom uniform from farm to farm. The farm resources usually are different. The yields and production requirements are different. Often differences in the quality of products result in differences in prices. Individual aptitudes differ greatly. For these reasons the results obtained on other farms are only suggestive.

Furthermore, the planning of a system of farming is a forward-looking undertaking and the results of the past should be interpreted in the light of new conditions. The production and price relationships likely to prevail during the years just ahead constitute the basis for decisions. On the one hand judgments are formed as to the amounts of the various products that may reasonably be expected with one system or another, and on the other, decisions are reached as to probable costs and prices which may be expected for farm products.

This involves a knowledge of changes in yields, production requirements and prices and the conditions responsible for these changes. This seldom means radical changes in the systems of farming but it does necessitate a gradual adjustment to the conditions of the time. In making these adjustments often the point considered is whether or not a little more or a little less of some particular enterprises or group of enterprises will likely result in increased returns.