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BY

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AND

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INTRODUCTION

Montana is the third largest state in the Union and ranks fourth among states in acreage under irrigation. The total area is 93,523,840 acres of land with 44,659,152 acres or 48 per cent in farms and ranches. Twenty-seven per cent of the farms and ranches are either wholly or partially irrigated and there is a total of 1,594,912 acres which is classed as irrigated. This is 1.7 per cent of the total land area. Of the total people on farms, 33 per cent are on irrigated farms or ranches. In 1930, the value of all land in farms, including buildings, was \$527,610,002 while the irrigated land in farms, including buildings, was valued at \$190,057,936, or 36 per cent of the total value of all land in farms. Thus while irrigated land makes up but 1.7 per cent of the area of the state, irrigation is used on 27 per cent of all farms. Again, about 33 per cent of our farm people are on irrigated farms, which are valued at 36 per cent of the value of all farm lands in the state.

Irrigation development in Montana was started by individual farmers who diverted water directly from the streams to their farms through ditches of their own construction. When large areas were to be irrigated, however, construction costs proved beyond the resources of the individual farmer. Irrigation companies were then formed by groups of farmers who cooperated in constructing the larger irrigation systems. When yet larger developments were undertaken, costs became still greater. Irrigation districts were then formed and the land bonded to finance the construction of the canal system. Some of the larger and still more costly irrigation projects were constructed by the Department of the Interior through the Bureau of Reclamation. Projects of each type are now operating successfully in Montana. There are yet additional areas

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in the state which may be developed for irrigation farming. Some of these are now partially developed while on others practically nothing has been done.

Much has been written about the benefits of irrigation to farmers, while very little has been said of the broader community, state, and national benefits. It is the purpose of this study to point out some of the most important social aspects, as well as the economic aspects of irrigation development. No attempt will be made to show all the interrelationships of agriculture and other enterprises but merely to point out the close interdependence of all economic activities.

Economic society today is a closely knit and integrated set-up, with every producing group in the community dependent upon the status of other groups. The development of an irrigated area, therefore, has a broad effect upon nearly all other economic activity, as will be illustrated in this brief analysis.

Yellowstone County is used as a basis for most of the analysis because more information is available for this area than for others. Certain counties have little or no irrigated land, but those where the information was available are used for comparison. The dry-farmed areas chosen are also similar to Yellowstone County in latitude and rainfall, in types of soil and crops produced under dry-farming methods. Differences in results are due to irrigation.

A question may be raised regarding the choice of the dry-land areas used for the comparisons in that they are not the best in the state. It should be pointed out, however, that the significance of the analysis lies in calling attention to the possible results from irrigation development even in low yielding dry areas and also in showing the social implications from such development. A very good dry-land area need not depend on irrigation to produce successfully certain crops in any case.

IMPORTANCE OF IRRIGATION IN STABILIZING AGRICULTURAL PRODUCTION AND INCOME IN MONTANA

Underlying all economic activity is the desire for security; viz, a home, food, clothing, and other comforts of life. There are two major factors which determine the degree of economic security which the farmer expects in an agricultural area. One is the amount and annual stability of production. In this respect, consistently fair yields generally are more important than high but fluctuating yields.

tuating yields. In an area where yields are high occasionally, with nothing at other times, the farmer's economic position is generally difficult. Fairly good but consistent yields, on the other hand, permit more accurate planning of operations and, within limits, of expenditures.

The second factor determining security is the farm price level. Here again it is not so much the extent as the stability which is significant. For the individual farmer, the price level is largely beyond his control; collectively, however, farmers are a significant influence in price making, in that they determine total supply.

Prices are influenced considerably by the stability of agricultural production. This stability of production, in turn, is largely a function of climate and especially of rainfall. With a given consistency of climatic conditions in all producing areas, the number of gluts and short crops now experienced periodically would be reduced materially. This is especially true of many of our cash crops. It would seem desirable, therefore, to adopt programs which might lead toward greater stability in production.¹

Since 1911, Montana's total wheat production has ranged from about 80 million bushels in 1927 and 1928 to less than 10 million bushels in 1919. The average yield per acre has ranged from about 25 bushels to less than 3 bushels during the same period. The average annual precipitation for the state has ranged from over 20 inches to about 10 inches. For individual stations, (for example, at Miles City,) the precipitation for 1934 was less than 6 inches. Without artificial moisture, such as might be supplied through irrigation, it is clear that with such low and variable precipitation there can be no stability in crop production nor any economic security. Certain limited areas in Montana appear to have some assurance of a reasonably stable rainfall but a large proportion of the state, if it continues to be used for wheat production, is likely to experience difficulties in the future similar to those of the past 20 years.

It is not assumed in this study that the only solution for the instability of these large wheat areas is irrigation development, as no doubt other solutions will, in time, be worked out. Rather, the intent is, first to show some of the problems arising from fluctuations in agricultural production; and secondly, to show some of

¹It is recognized that climate is not the only factor influencing yields.

the broader economic implications involved in stabilization through irrigation development.

It is recognized also that success has not been the destiny of all the farmers on the irrigation projects which have been developed in Montana in the past 30 years, as financial failure has been somewhat commonplace on many of them. However, this is not necessarily a condemnation of irrigated agriculture as such. Farm failures have been frequent during the same period in all types of agriculture and in all sections of the nation. Also, it is probable that some of this earlier irrigation development may have been in part misguided and that the farm organizations developed have been inadequate and poorly adjusted to cope with the various economic situations which have had to be met.

It should also be pointed out that stability in agriculture implies something broader than a high farm income for each individual farmer. Social and political stability likewise are important, as is also the building up of the agricultural resource for the future. Moreover, it must be realized that it takes a long time and much effort to develop raw land to a high and stable state of productivity even if ample irrigation water is available. The problems of best land use and farm organization on irrigated land are necessarily important adjuncts to irrigation development.

However, there are significant phases of irrigation development and of much broader implications which are dealt with briefly in this study. An individual farmer may not show a large cash income at the end of the year, but if he has obtained a good living from the farm and has improved the production possibilities for the future, some success has been achieved. In addition, his farm enterprises may have provided considerable income to other economic groups, in which case he has been a community asset.

Crop Failures on Dry and Irrigated Land.—Table 1 and figure 1 show a comparison of crop failure on dry and irrigated land in Yellowstone County for 1929.²

It will be noted that over 80 per cent of the crop failures were on dry land. This in part may be attributed to poor farming. However, since 61.4 per cent of the crops harvested came from irrigated

²Nineteen twenty-nine was used since it probably represents an average year from the standpoint of climate and also since more data are available for this period.

farms, it may be assumed that irrigation is of major importance in preventing crop failure for the county as a whole.

TABLE 1.—CROP FAILURE ON DRY AND IRRIGATED LAND IN YELLOWSTONE COUNTY, 1929*

	Acres harvested	Per cent of total	Acres failure	Per cent of total
Irrigated	140,224	61.4	3,393	19.4
Dry	88,039	38.6	14,074	80.6
Total	228,263 ^b	100.0%	17,467	100.0%

*Source, U. S. Census of Agriculture, 1930.

^bThe wheat acreage threshed in 1934 in Yellowstone County was 42,766 acres, or about one-fifth of 1929 according to the U. S. Census of Agriculture of 1935.

Not only does irrigation insure greater stability in yields from year to year, but the yields generally are much higher than on dry land of corresponding quality. Average yields in Yellowstone County for dry and irrigated lands are shown in table 2.

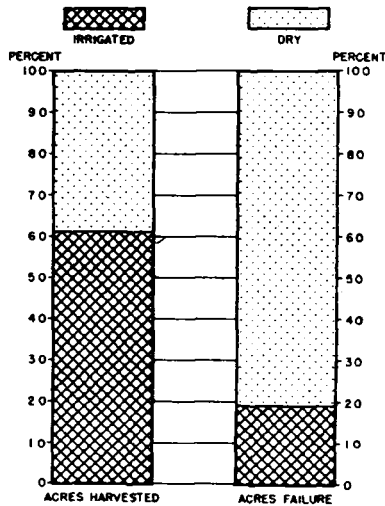


Figure 1. Comparison of crop failure on dry and irrigated land in Yellowstone County, 1929.

The wide variations in production and consequent agricultural instability in areas of uncertain and widely fluctuating rainfall, as well as the stability where adequate moisture is available, are shown in figure 2. The cattle population in Fallon County reached 21,512 head in 1926 and fell to 14,017 head in 1927. By 1934, the number had increased to 27,970, then dropped to 11,528

head by 1935, as a result of the 1934 drought. In Ravalli County, an irrigated area, the cattle population shows relatively little fluctuation from year to year over the same period, although the trend in numbers has been upward.

TABLE 2.—COMPARISON OF YIELDS PER ACRE ON DRY AND IRRIGATED LAND IN YELLOWSTONE COUNTY, 1929*

Crops	Average yields, dry land	Average yields, irrigated land	Average yields all land
Corn	9.54	22.28	12.76
Wheat	8.93	23.25	10.27
Barley	10.51	31.70	20.22
Rye	5.65	20.90	6.20
Hay (small grain) ^b47	1.10	.56
Alfalfa ^b	1.03	2.29	1.953
Potatoes	82.88	139.4	127.13
Oats	11.24	37.02	29.70

*Data from U. S. Census of Agriculture.

^bTons per acre; other figures in bushels per acre.

Wheat production shows material variations in most dry-farming counties of the state. Fallon County, which is typical of many eastern Montana areas, shows wide fluctuations in harvested acreage. The Ravalli County wheat acreage has decreased very materially since 1932, but does not show the ups and downs characteristic of Fallon County.

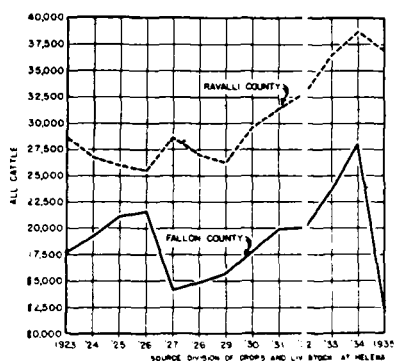


Figure 2. Relative stability of cattle numbers in Ravalli and Fallon counties, 1923-1935.

The yield per acre shows even greater fluctuations in dry-land areas; for example, in 1934 the average yield in Fallon County was one bushel per acre as against 26 bushels per acre for Ravalli County. The Huntley Project shows 19.3 bushels per acre in 1923,

but since that time it has been above 20 bushels. These data are summarized in table 3.

TABLE 3.—RELATIVE STABILITY OF WHEAT ACRES AND YIELDS IN IRRIGATED AND DRY AREAS^a

Year	Fallon		Ravalli		Fergus		Huntley ^b	
	Acreage	Yield	Acreage	Yield	Acreage	Yield	Acreage	Yield
1923	80,000	9.0	11,000	26.6	286,000	20.0	3075	19.3
1924	76,000	14.8	7,000	20.1	200,000	17.4	—	—
1925	76,000	10.0	10,000	19.4	228,000	10.5	3701	24.8
1926	92,000	6.8	11,000	18.0	236,000	14.7	3858	23.1
1927	94,000	15.8	5,000	26.4	244,000	20.4	3989	26.7
1928	96,000	13.1	8,000	24.0	260,000	17.9	5324	22.6
1929	95,000	9.2	8,000	18.4	256,000	10.6	2552	20.0
1930	82,500	8.4	8,000	14.5	191,000	8.0	1456	20.3
1931	24,000	6.6	6,500	10.7	152,000	6.9	763	21.2
1932	90,000	10.0	7,500	44.0	278,000	15.0	2548	31.1
1933	43,000	7.0	—	—	243,000	7.8	2192	24.4
1934	23,000	1.0	2,000	26.0	185,000	14.0	2426	23.6

^aData from U. S. Census of Agriculture.

^bAnnual reports of Huntley Irrigation District.

While income is affected by both production and price, it is also true that price fluctuations are influenced in many ways by production stability. Forced selling of livestock and, on the other hand, occasional large crops in the marginal grain areas have a depressing influence upon prices directly as well as indirectly through their influence on city purchasing power.

Crop Values on Irrigated and Dry Land.—Not only is it important to an individual to have a stable and adequate income, but it is important also to a community, county, and state. The community and county income determine to a large extent the social services which can be made available. If the community income is relatively low, the social services such as schools, roads, etc., are likely to be very poorly or uncertainly provided for.

The community and county income must be of a certain magnitude to afford a reasonable provision for the items which generally are considered desirable for an adequate living standard. Good schools are not possible if the population is widely scattered and the income uncertain. Neither can the community afford to provide good roads to scattered farms. It is important, therefore, to compare irrigated and dry-land areas from the standpoint of crop values and hence the possibilities for satisfactory community development.

A study of Yellowstone County for 1929 shows that over three-

fourths of the total value of crops was produced on irrigated lands. In the poorest years this proportion would be even greater. A comparison of the gross returns shows that in 1929 irrigated land returned thirteen times as much per acre as did dry land. The irrigated land in farms comprises 23.4 per cent of all the land in farms in Yellowstone County; yet in 1929 this area produced more than three times as much crop value as the dry-land farms, which made up 76.6 per cent of all the land in farms in the county.

If the land now under irrigation in this county were farmed as dry land, with the same average farm set-up and with the same returns per acre as obtained from dry-land farms in 1929, the total value of all crops for the county in 1929 would have been diminished by \$3,219,547 or by 75 per cent.

TABLE 4.—COMPARISON OF VALUES PRODUCED ON DRY AND IRRIGATED LAND IN YELLOWSTONE COUNTY, 1929^a

Items	All farms	Irrigated farms	Dry farms
Total crop value	\$4,376,629	\$3,489,424.00	\$ 887,205.00
Crop value per acre	—	14.61	1.13
Total crop value if land all dry farmed	1,157,081.77	269,876.77 ^b	887,205.00
Increase in crop value through irrigation	3,210,547.23	—	—
Total products sold, traded or used by operator's family	5,773,843.00	4,199,092.94	1,574,750.06
Total products if land all dry farmed	2,057,150.30	482,400.24 ^b	1,574,750.06
Increase in value of products sold through irrigation	3,716,692.70	—	—

^aData from U. S. Census of Agriculture and the Census of Irrigation of Agricultural Lands, 1930.

^bValues for the present irrigated areas, if farmed dry, on the basis of average county dry-land yield.

The total value of all products sold from irrigated land in Yellowstone County in 1929 was over two and one-half times as much as the total value of the products sold from dry land in 1929.³ Had this irrigated land been farmed as dry land and with the same proportion of products marketed, the value of products sold would have been diminished by \$3,716,692.70, or by 64.4 per cent.⁴

³"All products sold" includes everything sold or traded—livestock, crops, and other products.

⁴Nineteen twenty-nine, as gauged by total wheat production in the state, was only slightly below average. The average used in determining quotas and payments under the Agricultural Adjustment Administration Act was about 45 million bushels, whereas the 1929 production was about 41 million bushels.

The above comparisons are found in table 4 and indicate a substantial increase in farm output from the use of irrigation water.

On irrigated land a large percentage of this income is from crops requiring intensive cultivation. On dry land, however, such crops may produce little or nothing. While the hay produced on the irrigated farms of the state is four times that produced on dry land, much the greater values in cereal crops are produced on dry land. Crops which are doubtful producers on dry land may give very large returns on irrigated land.⁵ The per acre crop value on both irrigated and dry lands, as reported for certain areas, may be comparatively low due to the inclusion of uncultivated or waste lands in the figures used for determining the average.

It is not meant to imply, from the above statement, that dry-land farming is not important in Yellowstone County and in Montana. In the aggregate, returns from Montana's dry-land wheat alone have in some years far exceeded the total income from the irrigated lands. However, irrigated agriculture is the more stable and dependable; it also furnishes a feed base for Montana's livestock which are on the range during part of the year. Hence, the use of both dry and irrigated land is complementary and interdependent and both types are necessary in Montana's agricultural picture.

THE IMPORTANCE OF IRRIGATION IN COMMUNITY DEVELOPMENT IN MONTANA

Irrigated agriculture is generally carried on much more intensively than is dry-land agriculture. Moreover, the returns per acre on irrigated land are usually materially higher and more stable. This permits smaller farm units on irrigated land and, therefore, more people per square mile. As shown in table 5, the irrigated farms in Yellowstone County in 1929 averaged 216.7 acres⁶; the average size of dry farms was about 1200 acres.⁷

⁵The Huntley Project now supports 8965.5 animal units, while if dry it would support a maximum of 1444.4 animal units, based on 18 acres per animal unit, which is the average capacity for first-grade grazing land.

⁶The 1935 Census data show an increase of 177 farms in Yellowstone County since 1929. Since some dry-land farms have been abandoned and since the irrigated area has not been extended to any degree, it is evident that the population density has increased in the irrigated sections.

⁷In some counties where ranching predominates, the average acreage in what the census classifies as irrigated "units" may exceed the average acreage in dry-land farms. The census includes *all land* comprised within each operating unit in figuring size. The present discussion, however, is concerned with irrigated farming as such, not stock raising.

There is much greater average population density in irrigated than in dry-land areas as shown in tables 6 and 7. Ravalli and

TABLE 5.—SIZE OF DRY AND IRRIGATED FARMS IN YELLOWSTONE COUNTY, 1929^a.

County	All farms	Irrigated farms		Dry farms	
		Acres	Per cent of total	Acres	Per cent of total
Yellowstone					
Total acres in farms	1,018,795	238,812	23.4	779,983	76.6
Average size of all farms	583 ^b	216.7	—	1,207.4	—

^aData from U. S. Census of Agriculture, 1930.

^bIn 1934, the average size of all farms was 599.9 acres.

Lake counties have very little dry farming and Fergus and Fallon counties have little or no irrigated land. Table 6 shows a farm

TABLE 6.—COMPARISON OF POPULATION IN IRRIGATED AND NON-IRRIGATED COUNTIES^a

	Irrigated		Dry farms	
	Ravalli	Lake	Fergus	Carter and Fallon
Total population	10,315	9,541	16,531	8,704
Total population per sq. mile ^b	22.59	15.09	6.32	2.95
Rural population per sq. mile	22.59	15.09	4.27	2.95
Farm population per sq. mile	12.36	8.14	3.13	2.16

^aData from U. S. Census of Agriculture, 1930.

^bSquare mile of land in farms.

population density averaging about 12 per square mile for Ravalli and Lake counties as against an average of about 2 for Fallon and Fergus.⁵

TABLE 7.—DENSITY OF RURAL POPULATION ON DRY AND IRRIGATED FARMS IN YELLOWSTONE COUNTY, 1929^a

	Irrigated farms	Dry farms
Total farm population	5,705.00	3,344.00
Average farm population per sq. mile of land in farms	15.28	2.74
Average farm population per township	550.08	98.64
Average number farm children 5 to 14 years old	122.00	20.00
Average number of farm families per township	105.78	18.96

^aData from U. S. Census of Agriculture. This table was calculated on the basis of one family per farm, with 3 irrigated farms per section of land, and one-half dry farm per section, and 5.2 persons per family.

The average density per square mile in Yellowstone County is 15.3 for irrigated against 2.74 for dry land. The number of families per township is 106 for irrigated against 18.96 for the dry-farmed land.

⁵These figures are based upon the density on "land in farms" and, hence, exclude forests and waste land.

It is evident that a densely populated community can support a wider variety of social services, and support them on a better scale, than can a sparsely settled community. Distances to school are lessened and the opportunity for more thorough elementary training, as well as for advanced education, is necessarily enhanced. Table 7 shows for Yellowstone County in 1929, a total of 122 children of school age per township in irrigated areas against 20 per township for dry-land areas.

Other social advantages gained in a more densely populated area are the availability of churches of various denominations, better medical facilities and other professional services, and generally more opportunity for community improvement.

Population Density Related to School Costs.—A study of school costs in irrigated and dry-land districts in Yellowstone County shows that the total of costs in all irrigated districts for 1937 was \$196,197.42, and in dry-land districts \$59,515.93. The average cost per student was \$79.07 in irrigated and \$119.27 in dry-land districts. The total cost in irrigated districts for 1937 was \$36,681.49 more than in the dry-land districts, but 1982 additional students were served.

TABLE 8.—COMPARISON OF SCHOOL COSTS IN IRRIGATED AND DRY FARMING AREAS IN YELLOWSTONE COUNTY, 1937*

	Entire county	Irrigated districts	% of total	Dry land districts	% of total
Number of rural schools	97	30	31	67	69
Number of schools closed	40	2	5	38	95
Number of schools open	57	28	49	29	51
Number of pupils in rural schools ...	2980	2481	83	499	17
Total cost	\$255,713.35	\$196,197.42	77	\$59,515.93	23
Average cost per student	\$ 85.80	\$ 79.07	—	\$ 119.27	—

*Data from unpublished manuscript in the Montana State College Agricultural Experiment Station.

Distances to schools in the dry-land districts average greater than in the irrigated, hence the cost of transportation for the children of families far from schools in the former may be a factor in the higher costs of education shown in table 8.

Availability of Home Conveniences.—Density of population and stability of income are both factors in determining the type and amount of home conveniences available in rural areas. Telephones, electric lights, and similar conveniences are generally found only in rural areas having considerable population density and

stability of income.⁹ Table 9 shows the availability of home conveniences on farms in certain irrigated and dry-land counties in 1929. The comparison can best be made by noting the per cent of farms in each county which have the conveniences listed. These

TABLE 9.—AVAILABILITY OF HOME CONVENIENCES, IRRIGATED AND DRY-FARMING COUNTIES, 1929^a

Item	Yellowstone ^b		Gallatin		Fallon		Fergus	
	Farms	% of total	Farms	% of total	Farms	% of total	Farms	% of total
Telephone	519	29.7	606	49.5	130	8.7	439	21.1
Water piped to house	283	16.4	359	26.9	46	3.0	259	12.5
Water piped to bathroom	91	5.2	193	14.5	16	1.1	138	6.7
Electric lights	230	13.2	206	15.4	39	2.6	118	5.7
Electric motors	59	3.4	135	10.1	13	0.8	73	3.5

^aData from U. S. Census of Agriculture, 1930.

^bYellowstone and Gallatin counties have a large percentage of irrigated land; the other counties now have little or no irrigated land. The Huntley Irrigation Project in Yellowstone County is now (1937-38) developing a rural electrification project.

figures are important from the standpoint of the manufacture and sale of the equipment necessary, and they call attention to the interest of manufacturing industries in agricultural development.

Irrigation Development Related to Industry and Trade.—Modern economic society is based on the exchange of goods and services. A community which itself produces little can have little trade, except temporarily from borrowing money or obtaining relief funds etc., which may be used in lieu of produce.¹⁰ In an irrigated community where production is stable and large, it is possible to support many local trade and manufacturing institutions—grocery and dry goods stores, creameries, hotels, service stations, garages, professional services, and so on—and also such business establishments in other states as supply Montana irrigation projects with all the products necessary to carry on.

In irrigated areas, where the population generally is dense and the production stable, there is a steady flow of goods into and out

⁹Some irrigated sections in Montana at present (1937-1938) are installing electricity under the Rural Electrification Program.

¹⁰During the period 1921-1935 inclusive, for example, the total feed and seed loans for Fallon and Fergus counties amounted to considerably over \$300,000 each as against about \$30,000 for Ravalli County which is mostly irrigated. Average repayment in the dry-land areas in Montana to date have amounted to less than 35 per cent of the total debt.

of the community from the time construction and settlement begins. As the population increases and the agricultural areas are developed and improved, money is spent for the maintenance of the original investments and for new improvements. Under average producing conditions, approximately 12 per cent of the inventory value of machinery would be spent annually for repairs and replacements. Building expenses (for upkeep and repairs under average conditions) amount to about 3 per cent of the inventory value.

TABLE 10.—MAINTENANCE COSTS ON DRY AND IRRIGATED LAND IN YELLOWSTONE COUNTY, 1929 VALUES*

	Total	Irrigated land	Dry land
Value of buildings	\$3,433,909.00	\$2,607,160.00	\$826,749.00
Value of buildings per acre	—	10.92	1.06
Value of equipment used	2,027,519.00	1,293,502.00	734,017.00
Value of equipment per acre	—	5.42	.94
12 per cent of value of equipment	243,302.29	155,220.25	88,082.04
3 per cent of value of buildings	103,017.27	78,214.80	24,802.47
Cost of operation and maintenance			
of irrigation works	123,985.92	123,985.92	—
Total upkeep costs	470,305.48	357,420.97	112,884.51
Amount attributed to irrigation	—	322,793.23	—

*Basic data from U. S. Census of Agriculture, 1930.

The farmers on irrigated land in Yellowstone County control 23.4 per cent of all land in farms, and on the average will spend for maintenance and replacements of buildings and equipment approximately \$300,000 per year. In areas of uncertain income, on the other hand, repairs and replacements often cannot be made when needed or if made, often are not paid for promptly. Table 10 summarizes the average annual farm expenditures necessary to maintain buildings, equipment, machinery, and irrigation works in Yellowstone County based upon 1929 values for dry-farmed and irrigated land.

The construction costs of the Huntley Project up to and including 1935 amounted to a total of \$1,927,512.41 for the 26,000 acres now under irrigation on the project,¹¹ which comprises approximately one-fourth of the irrigated area in Yellowstone County. The expenses for operation and maintenance in 1929 aver-

¹¹Cost to the U. S. Bureau of Reclamation. The Huntley Irrigation District has spent some for improvements on the project in recent years which is not included in the figure above.

aged \$1.28 per acre for the county;¹² for the Huntley Project the operation and maintenance cost for 1935 was \$1.40 and averaged \$1.37 for the 8 years ending 1935. A large percentage of these expenditures is made in each local community. In addition to furnishing employment for a large number of persons on farms, these expenditures help support many business institutions.

The urban population is generally densest where the opportunities for marketing products and for selling goods and services are greatest. Highly developed agriculture in adjoining productive areas forms a market for many kinds of products and services. When people concentrate in these towns to exchange goods and services with those on the farm, there is created an opportunity for even more trade on account of the urban population. In an agricultural area this exchange of goods and services continues and the city population can be maintained as long as farm production and farm population is stable.

Trade.—The influence of irrigation development on local trade is shown in tables 11 and 12. On the average, there were about 68 people per retail establishment in Montana in 1929. At present, there is a total of 406 retail establishments in Yellowstone County, with considerable trade, however, coming from outside the county.

TABLE 11.—RETAIL ESTABLISHMENTS IN YELLOWSTONE COUNTY, WITH AND WITHOUT IRRIGATION 1929 BASIS*

Yellowstone County	If county was a dry area	Present irrigated farms	Present dryland farms
Number of farms	843.7	1,102	646
Farm population	4,370.0	5,705	3,344
Number of stores	64.5	84.3	49.4

*The average number of people per retail outlet in Montana is 67.7. This number was used in calculating the number of stores in this table.

Assuming that there was no irrigation in this trade area and assuming further a population density equal to that now found on the dry land, the number of retail establishments which now could be supported directly by the agricultural population would be only about 65.¹³ At present a total of 134 retail establishments is supported directly by the agricultural population of Yellowstone

¹²Data from U. S. Census of Irrigation, 1929.

¹³It has been assumed that purchases by the average dry-land farmer in Yellowstone County were equal to those of the average Montana farmer, including irrigation farmers. Also, it has been assumed that without irrigation, the average size of a dry-land unit would correspond to the size of a dry-land unit as shown in the 1929 Census; namely, about 1200 acres.

County alone, on the basis of the average number of people per store shown above.

On a similar basis, the farmers on the Huntley Irrigation Project now support directly about 27 retail outlets.¹⁴ If farmed dry, however, this same area would support directly less than 2 stores.¹⁵

TABLE 12.—RETAIL ESTABLISHMENTS SUPPORTED BY THE HUNTLEY PROJECT, WITH AND WITHOUT IRRIGATION DEVELOPMENT, BASIS 1929*.

Huntley project	If farmed as dry land	With present irrigated farms
Number of farms	27	360
Farm population	139	1,820
Number of stores	2	27

*Number of farms from Huntley Irrigation District crop census cards. Population figures from 1935 Reclamation Report.

The figures in table 12 do not include the hired labor which is important on irrigated land where intensive farming is practiced. The sugar beet contract labor alone on the Huntley Project has accounted for an average annual income of approximately \$125,000 during the period 1921-1935. On the basis of an annual average gross sale of \$24,000 per merchandizing establishment, this would account for 5 additional retail outlets. Adding in the other hired help necessary and the intertrade between business establishments, the figures would be even higher. The interrelationships of agriculture, trade, industry, and services are very evident from these data.

Industry.—Some industrial activities grow directly out of irrigation development. For example, Montana now has 5 beet sugar factories—all because sugar beet production is possible on much of the state's irrigated lands. To show the part irrigation farming plays in a community, a partial distribution of gross income from beets might be cited. The data are based upon figures for 3 of the large beet sugar factories in Montana. These figures show a gross cash income of about \$175 per acre of beets excluding the

¹⁴Indirectly, more establishments are made possible since these stores themselves account for enough people to attract more retail outlets. The U. S. Census shows an average of over 2 full-time workers per retail outlet.

¹⁵Some dry-land areas in Montana may be more densely populated than is assumed here, although even where the best farm land is found, about 640 acres generally is considered a minimum for a family unit.

value of tops. The factory pays the largest part of this to farmers and to railroads, and for labor, coal, linerock, other material, taxes, and so on. The farmer during the last 10 years has averaged about \$80 gross per acre for his beets. In turn, the farmer has paid about \$24 per acre for *contract* labor, plus a bonus based on the yield of beets. In addition he generally hires extra help to cultivate, irrigate, harvest, and deliver the beets. For hauling the beets harvested, the railroad receives about \$35 per acre, which buys coal, labor, etc. It costs the sugar company \$16 per acre of beets for labor to operate the factory.

Of this total, about \$175 per acre of harvested beets, the greatest part is spent and circulated in the local community. Thus, the different stores, theaters, lumber yards, doctors, dentists, etc., all benefit either directly or indirectly from each acre of sugar beets grown. This trade and exchange, in turn, is the basis for stable community and area development.

Creameries, bean warehouses, canning factories, and so on, are other industrial activities which in Montana grow directly out of irrigation developments. No figures are given for these enterprises since the same principle applies as shown above for sugar beets.

Numerous statistics might be cited to show the ramifications of irrigation development upon industry and trade, locally and in the country as a whole. For example, a study of the amount and variety of goods shipped on the railroads to the Huntley Project would indicate the wide variety of interest in irrigation development for the nation as a whole.

THE INFLUENCE OF IRRIGATED AGRICULTURE UPON COUNTY GOVERNMENT

County government is set up to administer the county business—such as the construction and maintenance of roads and schools, the recording of deeds, contracts, and other important documents, the enforcement of laws, and the protection of property. As in private industry, it is necessary to have a constant income to carry on this public business effectively. To maintain a constant income from taxation in an agricultural county, it is necessary, first of all, that the land be maintained at a stable level of value and with a

fairly constant production.³⁸ This, in turn, would be reflected in a relatively stable activity in the urban centers affected.

A comparison of the taxable values and taxes levied from irrigated and dry land in Yellowstone County from 1927 to 1936, inclusive, (summarized in table 13) shows that the taxes per acre assessed on irrigated lands have decreased 15.8 per cent, while taxes assessed on dry land have decreased 66.7 per cent. The tax levies in the county have remained practically the same but the land values have decreased, causing this difference in the taxes assessed.

TABLE 13.—TAXABLE LAND VALUES AND TAXES PER ACRE ON DRY AND IRRIGATED LAND IN YELLOWSTONE COUNTY FOR THE YEARS 1927 TO 1936*.

Year	Irrigated land		Dry tillable land		Percentage changes in taxes levied per acre, 1927 base	
	Average taxable value	tax per acre	Average taxable value	tax per acre	Irrigated	Dry
					100%	100%
1927	\$25.18	\$1.13	\$3.95	\$.18	100%	100%
1928	24.90	1.10	3.93	.17	97.4	94.5
1929	22.28	1.08	3.54	.17	95.5	94.5
1930	20.74	.96	3.48	.16	85.0	89.0
1931	22.25	1.17	2.58	.14	103.5	78.0
1932	18.91	.91	1.91	.10	80.5	55.5
1933	18.96	1.02	1.91	.10	90.2	55.5
1934	18.69	.99	1.91	.10	87.5	55.5
1935	19.00	.96	1.23	.06	85.0	33.3
1936	18.91	.95	1.24	.06	84.2	33.3
Average	20.98	1.03	2.57	.12	—	—

*From reports of the State Board of Equalization.

A study of land values and taxes per acre for Yellowstone County from 1927 through 1936 shows that irrigated land values have decreased 25 per cent, while dry-land values have decreased 69 per cent, or over twice as much. On irrigated land in 1936, the per acre tax was 84.2 per cent of the figure for 1927, while on dry land the per acre tax had fallen to 33.3 per cent of the 1927 figure. In 1927, the tax per acre of dry land was 15.9 per cent of the tax per irrigated acre; in 1936 this figure had fallen to 6.3 per cent, with land values reduced in the same proportion.

The Seventh Biennial Report of the State Board of Equalization shows that the taxable value of irrigated land in Montana in 1936 was \$49,783,973, or an average of \$34.50 per acre. The average

³⁸Falling farm prices, as in 1932, will lower the farmers' cash income and may affect the taxes collected, but generally will not affect the amount of products per acre.

value of non-irrigated tillable farm land was \$8.86 per acre. From other figures in the report it is found that the irrigated lands of Montana had a taxable value in 1936 of nearly 36 times as much as all the patented mining claims in the state, over fourteen times the taxable value of all mining improvements, 108 times the taxable value of mineral reservations and twice the taxable value of all the cattle in the state.

Tax Status.—A study has been made of the tax status and land ownership for all Montana counties for 1933. Figure 3 shows the data for Yellowstone County, with the major irrigated areas designated. It will be noted that generally tax delinquency was much less in the irrigated areas than in the rest of the county; the one exception is an irrigation district which has found it necessary

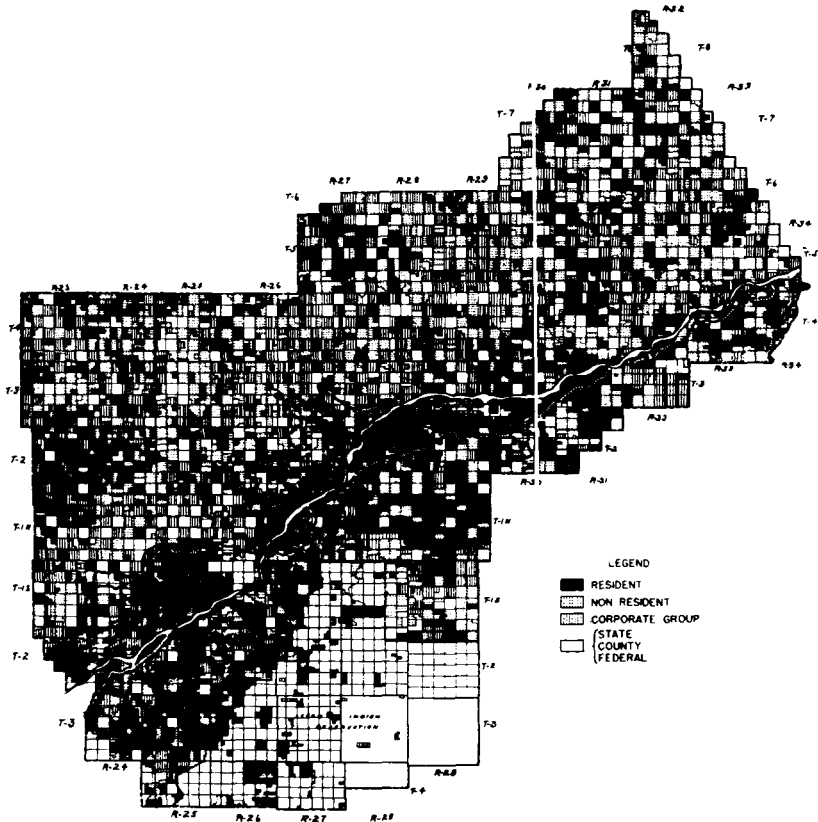


Figure 3. Tax delinquency as of July 1, 1936, in Yellowstone County.

to make relatively high levies for water and is classified delinquent largely because of failure to pay water charges.

Land Ownership.—Figure 4 shows the land ownership status in Yellowstone County for 1933, with the main irrigated sections outlined. With the same exception as noted for tax delinquency, the irrigated areas generally show a very high percentage of resident ownership, relative to the balance of the country.¹⁷

If it is assumed that a large proportion of resident ownership,

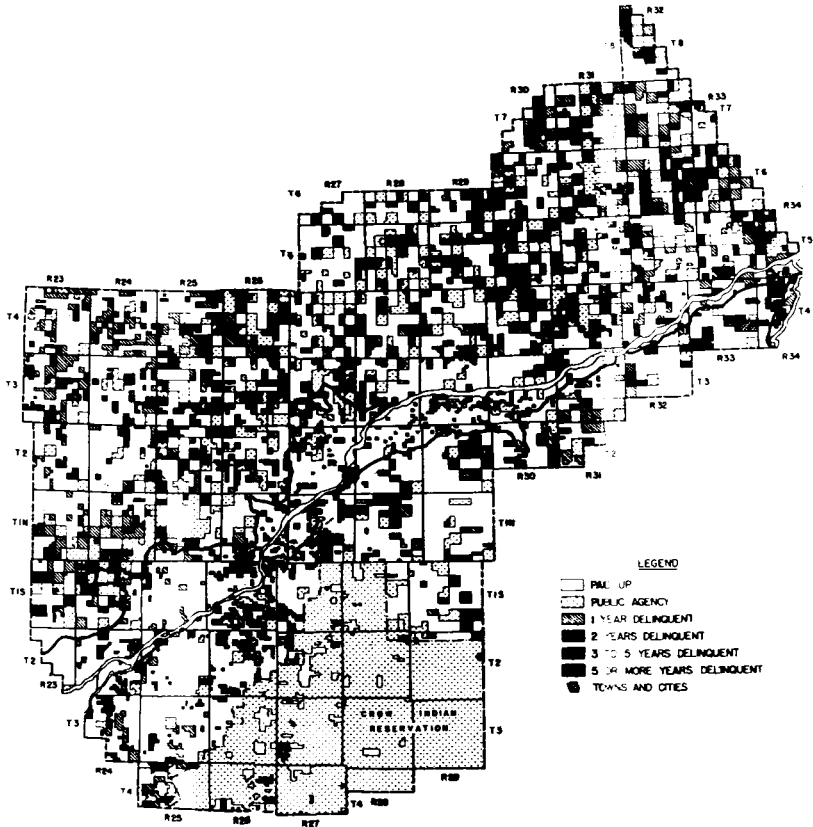


Figure 4. Land ownership in Yellowstone County, 1933.

a dense rural population, and stable tax-paying ability are desirable for community development, then the good irrigated sections show very favorably in the Montana picture.

¹⁷Land owned by residents of Montana.

CONCLUSION

The preceding analysis has summarized briefly the economic and social importance of irrigation in Montana. No attempt was made to analyze in detail the influence of irrigation upon the state's total production pattern. Clearly, the importance of water to the state's agriculture is impossible to measure statistically. Most of Montana's stock ranches rely on some irrigation in providing winter feed for stock; much of the state's vast range necessarily would be worth little or nothing without some irrigation development, whether a private ditch or an organized large-scale project.

The importance of irrigation in community development, however, requires emphasis. Without stability in production and hence in income, the farmer can do little or no planning. Stability in production, moreover, is necessary for stable county and state government. It is generally assumed that a substantial amount of resident ownership in a community is desirable; this again usually is based upon consistent farm income. If a community is to obtain and pay for certain social services, such as good roads and schools, and for the many items of living now generally deemed necessities, a relatively stable income is required. A dense farm population can provide for itself many social services usually beyond the financial reach of people living far apart and, perhaps, with an uncertain income. Stable farm production and income in turn influence stability in trade and manufacturing.

Many of Montana's dry-land communities have a relatively stable production and, in consequence, a fairly large agricultural population. In many other dry-land areas, however, rainfall and agricultural production are uncertain. It is clear, therefore, that those irrigated areas having productive soil and sufficient water can provide many social services and much "livability" not possible in many dry-land areas.

It is also evident that a highly integrated society can function best if all phases of economic activity are exchanging and producing every year. A corollary would be that all branches of economic activity are interested in agricultural stability and income; so if this can be promoted in dry-land areas through irrigation, then such development becomes important. This is true not only for the farmers who are to use this particular land, but for the rest of the community, state and nation including trade, industry, and

professional activities. Since agriculture is one of the basic industries, it is necessary that its production and income be as stable as possible so that the economic groups depending upon it may also be able to carry on the necessary exchange of goods and services and maintain production and employment in their field.

As irrigation development makes intensive agriculture possible and appears to provide stability in production in areas of low rainfall where otherwise it would not be possible, such development, it would seem, should be a matter of widespread interest. This would imply that irrigation development, wherever economically feasible, may be broadly looked upon as in part a social investment. The benefits do not all accrue to the farmer on the land but also to those whose occupation and living is tied up to agricultural production.

As an illustration of this, a study shows that the value of machinery and equipment on the irrigated farms on Federal Reclamation projects in Montana is approximately \$4,300,000. The original value of automobiles and trucks on these same farms has been estimated at \$3,000,000. Adding to this such items as motor fuel, lumber, furniture, plumbing and electrical fixtures, radios and musical instruments, cotton seed cake, canned goods, and other food products, drugs, and countless other commodities bought by the people on the projects, gives an indication of the importance of the purchasing power created through irrigation development. Since the products come from nearly every state in the union, and a large proportion from east of the Mississippi river, the national interest in Reclamation should be evident.

It should be pointed out finally that the analysis presented is not intended as a recommendation for any and all irrigation developments.¹⁸ Many factors enter in to determine the feasibility of each investment. It is not enough to know that the soil is adapted for one particular crop, since a variety of crops is necessary on irrigated agriculture to permit a rotation and to maintain high yields. Neither is it enough to know that it is possible from an engineering standpoint to get water to and over the land. Irrigation developments are very expensive and some con-

ference here is to intensive agriculture, not to seasonal flood irrigation, which is similar only for hay production.

sideration must be given to costs and returns. What has been shown in this analysis is that returns and benefits from irrigation developments are widely diffused. The implication is: Is it not also logical to diffuse the costs among all those who benefit?

Agriculture on the Flathead Irrigation Project

by

P. L. SLAGSVOLD

and

J. D. MATHEWS

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INTRODUCTION

The Flathead Project occupies the major portion of the lower Flathead Valley lying south of Flathead Lake. The Flathead River flows from the lake in a southerly direction to help form the Clarks Fork of the Columbia River.

The project proper, comprising a little more than 138,000 ultimately irrigable acres, of which about 68,000 acres are now actually being irrigated, is made up of three major divisions. The Mission Valley division lies between the Flathead River on the west and the snow-capped Mission Range on the east and extends from St. Ignatius on the south to Polson on the north. Irrigation water for this division is obtained from numerous small streams flowing from the Mission Range through the project. Several reservoirs have been constructed for water storage.¹

The Jocko division forms the southernmost part of the project. It is in two parts, one near Dixon in Lake County and one extending south into Missoula County. Irrigation water for the various parts of this division is obtained from the Jocko River and its tributaries and from Revais Creek.

The Camas division is located in Sanders County and is some distance west of the other parts of the project. Irrigation water for this area is obtained from the Little Bitterroot River.—(See cover cut).

The main line of the Northern Pacific Railway traverses the Jocko division of the project, Arlee, Ravalli, and Dixon being the three shipping points. A branch line extends northward from Dixon through the Mission Valley division to the north edge of the project at Polson. The Camas division averages about 20 miles from the nearest railroad shipping points, at Plains and Perma. Polson, the county seat of Lake County, has a population of nearly 1500. From Polson to Spokane the distance by railroad is about 255 miles, and to Seattle and Portland, about 650 miles.

¹A pumping plant now is under construction on the Flathead River. When completed this is expected to furnish 60,000 acre feet additional water.

A surfaced highway extends northward from Missoula, through Ravalli, St. Ignatius, Ronan, Pablo, and Polson to Kalispell, connecting two coast to coast highways, one to the north and one to the south of the project.

Kalispell, located north of Flathead Lake, is a city of 6000 inhabitants. From the southern part of the project it is about 30 miles to Missoula, which has a population of 15,000. This is the largest local trading center, followed by Kalispell, Polson, and the numerous smaller towns mentioned above. Lone Pine, Camas, and Hot Springs are towns on the Camas division of the project.

Livestock is shipped both east and west, depending upon type and also upon the condition of the market. Surplus dairy and poultry products generally are sent to western markets, either direct or by local processors and concentration plants. Sugar beets are processed near Missoula.

High schools are located at Polson, Ronan, St. Ignatius, Arlee, Dixon, Charlo, and Lone Pine; grade schools are located at these and other points throughout the irrigated area. Busses make school facilities available for all parts of the project. The Montana State University is located at Missoula.

The Flathead area is one of the oldest farming sections in the State. Catholic missionaries as early as 1854 established a mission for the Flathead Indians at what is now St. Ignatius and began cultivating some of the land nearby. The project is part of the Flathead Indian Reservation.

Construction of the irrigation works was begun in 1909 and the area was opened for white settlement in 1910, the Indians having previously chosen their individual allotments. Since then, the Indians have sold much of their land to white settlers.

The land was parceled out by lottery methods, and the settlers came from all walks of life. Many knew little about irrigation farming and few had adequate capital. Moreover, to start with, sufficient water was not available for proper irrigation. As a result, many farmers were unsuccessful and progress was slow. However, in 1917, 1928, and again in 1935, appropriations were made for additional storage construction which will practically insure an adequate water supply. The project is administered by the Bureau of Indian Affairs.

Some dry farming and range areas border the irrigated areas

to the west and north although much of the surrounding country is mountains and forest.

PURPOSE OF STUDY

This is one of a series of publications dealing with the agricultural development and present status of representative Montana irrigation projects. With the many adjustments in agriculture which are now taking place in response to changed economic and physical conditions, there is a need for data upon which to base an orderly and progressive program. This is a preliminary report of the fundamental factors affecting the development and present status of agriculture on the Flathead Project and facts are given which may aid in molding a sound agricultural policy for the area.

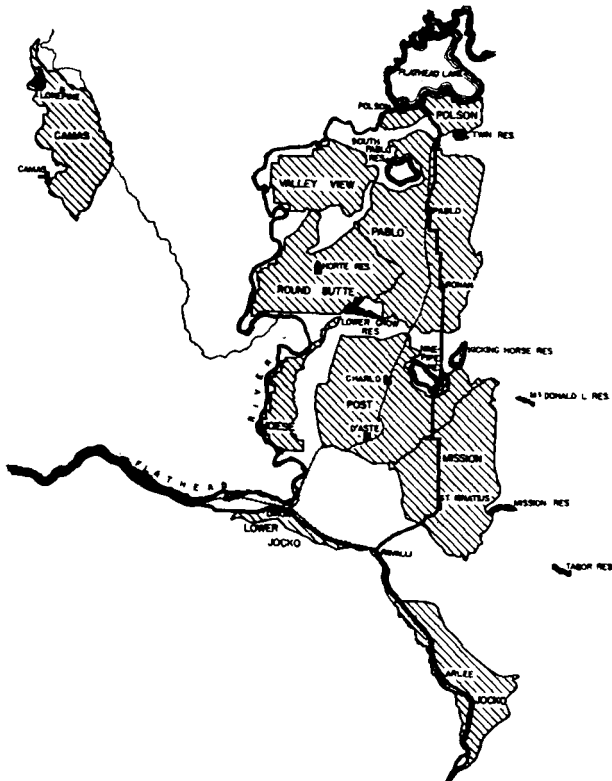


Figure 2.—Location of the divisions and districts of the Flathead Project.

SOURCES OF DATA

Most of the analysis is based upon data obtained from the project. Individual farm records were analyzed for each division and for each district within a division. Summaries by districts show the variations found in land use, tenure, and so on.² Climatological data was obtained from reports of the United States Weather Bureau at Helena.

SOILS AND TOPOGRAPHY³

The soils of the Flathead area vary quite widely even within districts. In general, the part of the project lying near the Mission Range has a dark loam soil which is for the most part very fertile. West and northwest of this section the soil becomes lighter in color and has a thinner layer of top soil and a heavier and more impermeable clay subsoil. Other parts of the project have a silt loam to clay surface soil with a clay subsoil.

North of Ronan the soils are quite sandy. The soils in the Moiese district north of Dixon are more or less underlain with gravel and hence require more water.

The topography of most parts of the project is rolling. In many places the land is cut up with small ridges, knolls, pot holes, and gullies. Lands with steep slopes generally have been eliminated from the irrigable acreage. The balance is relatively easy to irrigate. Where land is rolling there is a tendency to use more water than on level land. Light soils also usually get more water, perhaps not always justifiably.

CLIMATE

The climate in the Flathead area is typical of Montana's lower mountain valleys. The growing season is relatively long, averaging 132 days at Polson and 123 days at St. Ignatius.⁴ The number of heat units during the growing season averages about 2446.⁵ The winters are quite mild. Severe winds are pre-

²The project is made up of the following districts: Polson, Jocko, Mission, Nine Pipe, Valley View, Round Butte, Pablo, Moiese, Ronan, and Camas. The Ronan district now is part of the Pablo district. The Round Butte district is also known as the Horte district. (See figure 2).

³De Young, William, and Roberts, R. C., Soil Survey of the Lower Flathead Valley Area Montana, U. S. Dept. of Agriculture Bulletin 22.

⁴The climate at Polson is tempered considerably by Flathead Lake.

⁵Calculated by taking the average monthly temperature, subtracting 43° from this, and multiplying the balance by the number of days in the month. The average number of heat units at Bozeman is 1938, at Huntley 3173, and at Fairfield 2121.

vented by the surrounding mountains.

The average annual precipitation at St. Ignatius is 15.25 inches, more than half of which falls during the growing season, April 1 to September 30. Precipitation generally is heaviest near the mountains.

NUMBER AND AREA OF FARMS

The project is divided up into about 1850 units. (See figure 2). Of these, 1474 are on the Mission Valley division, about 210 in the Camas division, and 168 in the Jocko division. These units are combined into about 1000 operating farm units. Of the 1850 units, some over 1600 are owned by whites, about 170 are operated by lessees of Indian land, and about 70 are operated by Indians.

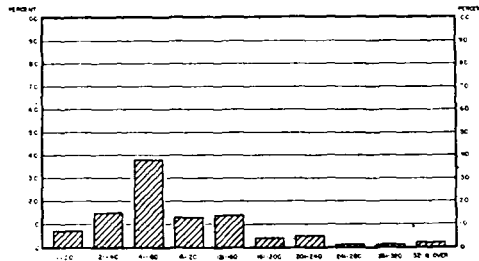


Figure 3.—Percentage of farms in various size groups with size of farms in acres. Most of the farms on the Flathead Project are 160 acres or less. The average size on the project is about 105 acres. 1932-1935 average.

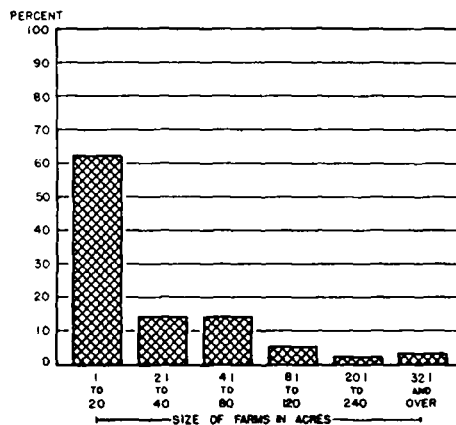


Figure 4.—Percentage of farms in various size groups in the Polson district. Sixty per cent are under 20 acres. 1932-1935 average.

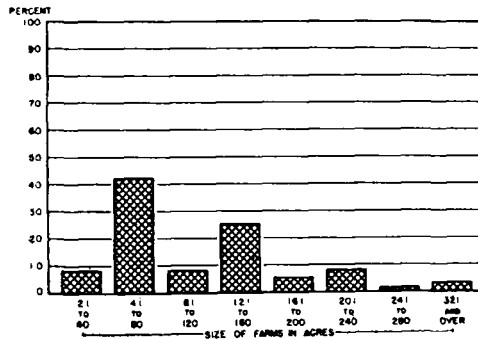


Figure 5.—Percentage of farms in various size groups in the Valley View district. They average larger than in the other districts. Eighty per cent of the farms are under 160 acres. 1932-1935 average.

Most of the units operated by Indians are on the Mission Valley division.

About 48 per cent of the farms on the entire project are 80 acres or less. There is some variation between districts, however. For example, over 60 per cent of the farms in the Polson district are 20 acres or less. Farms in the Valley View district and on the Jocko division average the largest. Figures 3 to 5 show the distribution of size of farm for the project as a whole and for the Polson and Valley View districts.*

LAND TENURE

More than one-half of the farms on the Flathead Project are owned by the operators; approximately 15 per cent are owned in part by the operators, and about 30 per cent are operated by tenants—as seen by figure 6. The tenure situation remained fairly constant during the period 1932 to 1935, inclusive.

Over 90 per cent of the 1 to 20 acre farms were operated by owners compared with 10 per cent for farms over 320 acres. The proportion operated by owners decreases with an increase in size of unit, as shown in figure 7. The proportion of owner-renters also increases with an increase in size of farms.

The Polson district has the largest proportion of farms operated by owners, with an average of 92 per cent for the years studied. The corresponding figures are 74 per cent for the Jocko division; Mission, 62 per cent; Ronan, 60 per cent; Pablo, Camas, Moiese, and Valley View, each about 50 per cent; Nine Pipe and

*The Polson district has about 70 operating units and the Valley View about 60.

Round Butte (Horte), each about 40 per cent. About 40 per cent of the farms in the Round Butte (Horte), Nine Pipe, and Valley View districts are operated by tenants.

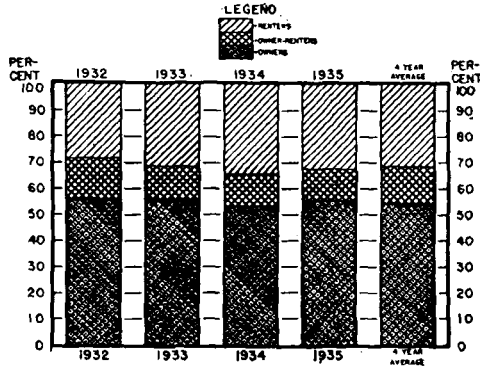


Figure 6.—The per cent of the farms operated by owners, owner-renters, and by renters. About 55 per cent of the farms on the Flathead Project are operated by owners.

The relatively high percentage of owner-operators in some districts indicates the development of a comparatively stable agricultural situation. Where soil conditions are least favorable and where the distance from a shipping point is greatest, farms tend to be larger than in more favorable areas. The increase in size usually comes about by renting additional units, as indicated in figure 7.

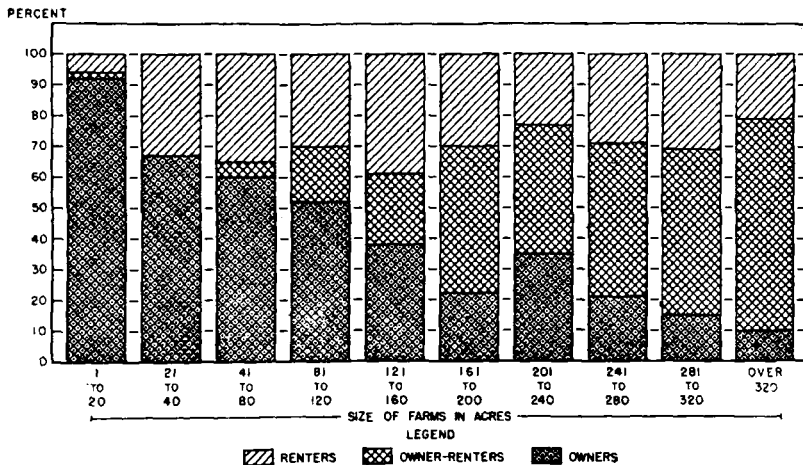


Figure 7.—Tenure by size of farm. The per cent of farm owners decreases as the size of the farms increases. 1932-1935 average.

Ownership.—Most of the land in the Flathead Project which is owned by private agencies is held by residents of Montana according to figure 8. From the point of view of farm and community stability, a high degree of resident ownership is regarded as a desirable situation. In addition to being desirable within itself, a high proportion of resident ownership usually indicates a fairly healthy social and economic situation.

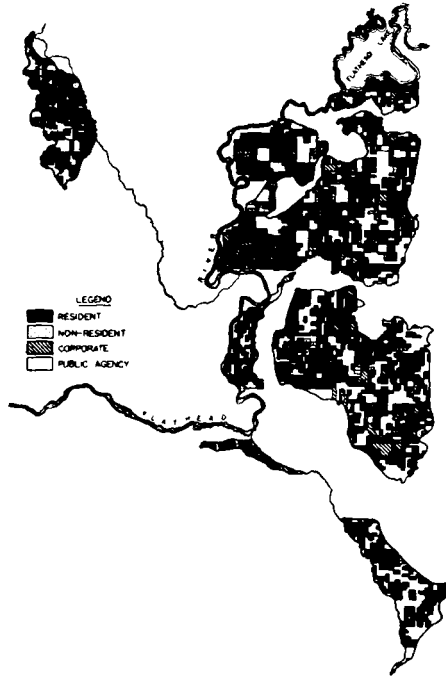


Figure 8.—Farm ownership pattern on the Flathead Project, March 1, 1934.

LAND USE

There is a notable uniformity in the land use on different size farms, as seen by figure 9. Irrigated pasture, farmstead, and dry waste land used for grazing on an average comprise about 60 per cent of the total area in farms. On farms of over 40 acres an average of 10 per cent of the land in farms is in irrigated pasture, while on the smaller farms the proportion is greater. The Mission Valley division has about 21 per cent, the Jocko division about 12 per cent, and the Camas division about 19 per cent of the irrigated area in irrigated pasture. Alfalfa,

TABLE 1.—AVERAGE NUMBER OF ACRES IRRIGABLE, IRRIGATED AND CROPPED. FLATHEAD PROJECT*
1932-1935

Size of farm	Average acres in farm	Average irrigable acres	Average irrigated acres	Average cropped acres
1-20	9.9	7.5	6.7	4.0
21-40	39.4	29.3	24.1	17.3
41-80	79.2	42.6	41.4	32.4
81-120	116.5	75.6	61.8	44.7
121-160	158.5	104.4	80.0	64.9
161-200	196.3	126.7	101.0	80.4
201-240	237.8	155.3	123.0	97.5
241-280	274.0	146.3	113.7	91.9
281-320	317.0	196.7	151.6	116.3
321-over	471.0	230.0	174.0	140.0

*Source: Flathead Indian Service Crop Census Cards.

together with other hay, accounts for more than 30 per cent of the land in farms, which is about 75 per cent of the cropped land. Thus, more than 85 per cent of all land in farms on the project

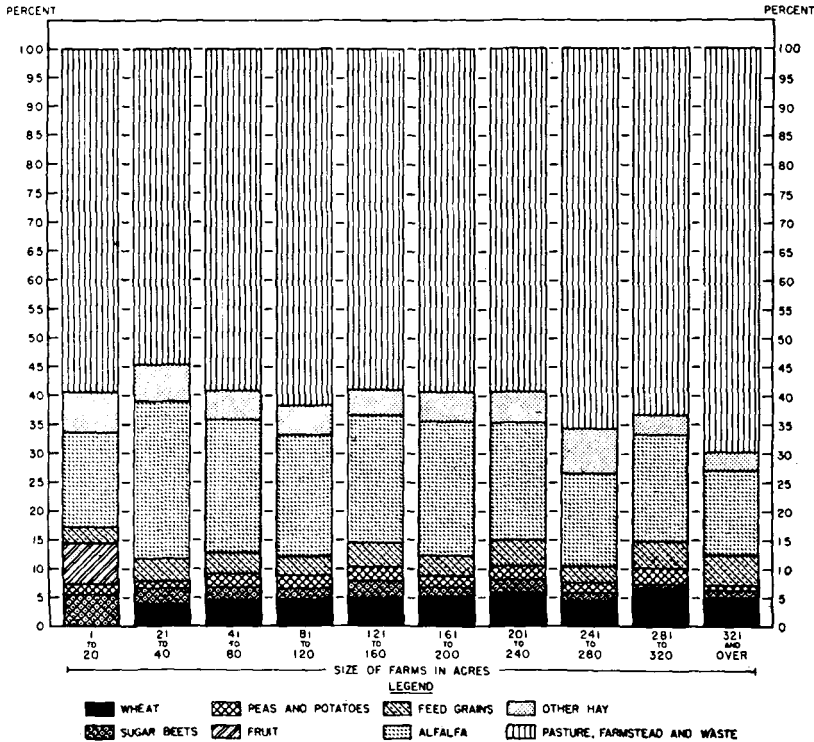


Figure 9.—Relationship of size of farms to the amount and variety of crops grown on the Flathead Project. 1931-1935 average.

is in hay and pasture. The remainder of the land is used for wheat, feed grains, sugar beets, and peas which rank in acreage in the order named.

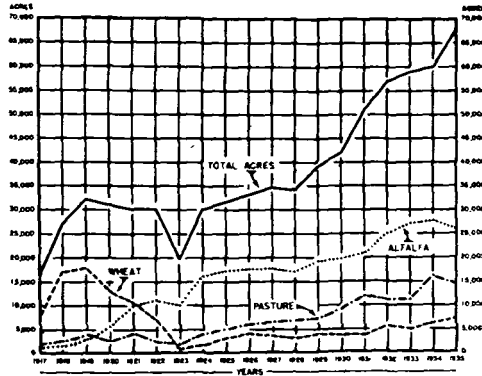


Figure 10.—Trend in irrigated acreage of various crops and total irrigated area.

Figure 10 shows the trend in acreages of leading irrigated crops since 1917. A considerable proportion of the increase in irrigated area since 1924 now is used for sugar beets and peas. The land use in acres for crop land, 1931 through 1936, is shown in table 2.

TABLE 2.—LAND USE ON FLATHEAD PROJECT, ACRES OF VARIOUS CROPS 1931-1936

	1931	1932	1933	1934	1935	1936
Alfalfa	21,558	23,357	25,344	25,508	24,677	24,422
Apples	84	69	80	79	106	24
Barley	2,069	2,143	1,387	1,256	1,544	1,760
Beans	87	—	5	33	2	25
Sugar beets	2,323	2,000	2,522.5	2,479	2,318	2,285
Clover	2,081	1,888	2,341	2,509	1,638	2,039
Corn	2,014	359	390.30	234	253	259
Fruits, small	17	44	43.70	61	59	7
Garden	341	461	511.60	507	508	577
Hay	2,880	2,982	3,201.40	2,029	2,889	2,053
Oats	1,334	2,768	1,871	1,889	3,053	2,943
Onions	—	—	11.5	2	4	2
Pasture	11,226	10,397	10,755.40	15,542	13,704	12,394
Peas	510	33	520.00	1,942	4,397	3,616
Potatoes	487	277	292.15	222	158	207
Rye	148	51	76	97	135	15
Timothy seed	—	43	44	44	18	42
Wheat	2,937	4,440	4,067	4,398	5,957	7,564
Total acres cropped	50,096	51,312.00	53,463.55	58,831	61,420	60,234

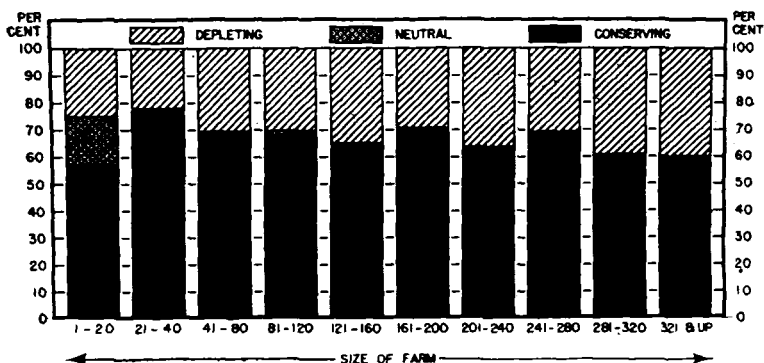


Figure 11.—The relationship of soil conserving, neutral, and depleting acres to the total cropped acres. The proportion of cropped acres in soil conserving crops is about 65 per cent for the entire project, 1932-1935 average.

As indicated in figure 11, about two-thirds of the cropped acreage is in soil conserving crops, primarily alfalfa; the remaining one-third is in soil depleting crops, including wheat, feed grains, sugar beets, and peas. The farms of less than 20 acres have about 15 per cent of the cropped acreage in orchards.⁷

The Camas, Round Butte (Horte), and Valley View districts average about 80 per cent of the acreage in soil conserving crops. The Ronan district shows the smallest (40 per cent) of the cropped acreage in soil conserving use.

There is considerable variation in the cropping program in the different districts. Very few farms in the Round Butte (Horte), Jocko, and Valley View districts grew sugar beets during the period studied, 1932-1936. The Camas division, being far from a railway, did not grow any. In the Polson district one-third of the farms produced small fruit and about one-fifth produced apples. Peas were grown in all but one district and in the Jocko, Mission, and Ronan areas by about one-fourth of the farmers.

A high proportion of soil conserving crops indicates a well balanced type of farming which, on irrigated land, should tend toward good yields and agricultural stability.⁸ In most ir-

⁷Land in orchards here is designated as "neutral", in line with the classification which has been used by the Agricultural Adjustment Administration of the U. S. Dept. of Agriculture.

⁸This is assuming that the alfalfa is plowed up every 4 to 6 years and the land used for other crops.

irrigated areas in Montana, at least one-half of the cropped land in soil conserving crops has been found necessary to maintain yields, unless this is off-set by applications of barnyard manure.⁹

Crop Yields.—Variations in weather and in insect pests bring annual fluctuations in yields on irrigated land in the Flat-head area. However, these fluctuations are not as great as on dry land nor as on irrigated land where the natural precipitation for starting spring crops is less plentiful and uniform.

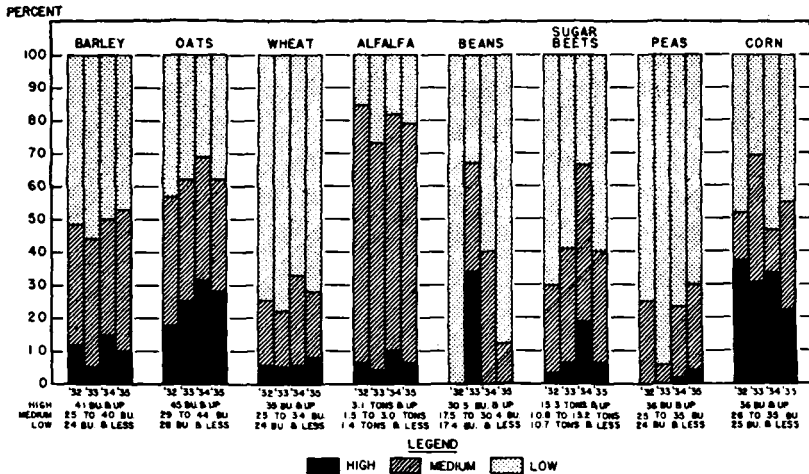


Figure 12.—The percentage distribution of farms receiving high, medium, and low yields. The per cent of farms receiving high yields is low in all crops but corn and oats.

Figure 12 shows the per cent of operators obtaining yields arbitrarily designated as high, medium, and low, for each year 1932 to 1935, inclusive. An average of about 10 per cent of the operators obtains more than 40 bushels of barley per acre, more than 25 per cent get 45 bushels or more of oats, but only about 6 per cent of the operators get more than 35 bushels of wheat per acre. More than 70 per cent of the operators obtain less than 24 bushels of wheat per acre. The large proportion of operators getting low yields of wheat is accounted for by the fact that wheat often is grown on a considerable acreage of irrigable land which has not had sufficient water. The shortage of water has been especially evident in recent years, which ac-

⁹Based on rotation experiments at the Huntley Experiment Station near Billings.

TABLE 3.—ANNUAL PER ACRE YIELDS OF MAJOR CROPS ON FLATHEAD PROJECT FOR THE YEARS 1917-1935

	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933	1934	1935	Ave.
Wheat	7.	11.2	12.3	14.	10.8	10.1	17.4	18.2	17.7	17.6	21.2	19.9	19.2	20.4	15.3	20.6	15.9	19.5	18.9	16.16
Oats	16.25	19.4	26.5	31.	27.	29.8	27.8	39.4	21.6	31.3	37.2	38.8	32.5	34.3	30.3	28.5	32.	37.5	28.8	29.99
Barley	5.6	15.7	8.6	15.	14.8	17.7	20.4	20.6	27.7	24.3	28.3	31.	24.5	24.5	21.1	21.9	20.4	26.	24.6	20.66
Alfalfa	1.38	2.30	2.02	2.00	1.95	2.18	2.03	2.30	3.22	2.32	2.23	2.22	2.1	1.89	1.81	2.03	1.81	2.06	1.82	2.08
Clover	1.33	2.30	1.60	1.31	1.33	1.59	1.78	1.81	1.50	1.58	1.47	1.64	1.15	1.18	1.39	1.67	1.98	1.52	1.31	1.54
Other																				
hay	1.04	.95	1.00	1.00	1.20	1.24	1.36	1.52	1.19	1.30	1.50	1.42	1.	1.4	1.17	1.26	1.87	1.31	1.28	1.26

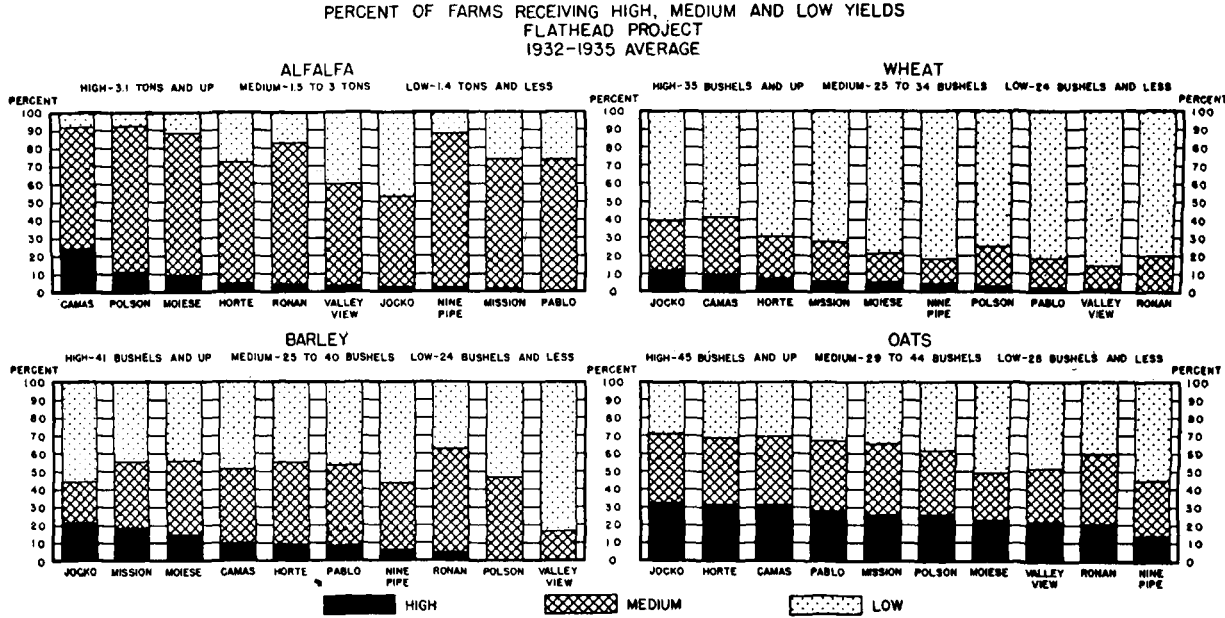


Figure 13.—The percentage distribution of farms receiving high, medium, and low yields by districts. The Jocko district leads in high grain yields while Camas district has the largest per cent of high alfalfa yields. Horte district is also called Round Butte district. 1932-1935 average.

counts for much of the dry farming on irrigable lands.

Bean yields fluctuated widely during the period studied; all farmers obtained low yields in 1932, while in 1933 high (30.5 bushels or more) or medium yields (17.5 to 30.4 bushels) were recorded by all but about 30 per cent of the farmers. Bean yields have decreased somewhat since 1933.

Most of the operators produce between 1.5 and 3.0 tons of alfalfa per acre. Alfalfa yields have been quite regular from year to year since 1929, but show considerable variation over a period of years, ranging from 3.2 tons to 1.3 tons per acre.

Most operators have averaged less than 10.7 tons of sugar beets per acre in recent years. This, in part, is accounted for by the water shortage. An average of about 7 per cent each year receives more than 15.3 tons per acre. More than 75 per cent of the operators receive low pea yields. On an average, corn yields are quite high, more than half of the operators obtaining medium or better yields (26 bushels or more). Table 3 shows the average yields on the project.

Figure 13 shows that the Jocko division has the largest per cent of farmers getting high yields of wheat, barley and oats. Camas rates first in yields of alfalfa. In most of the districts a high per cent of the farmers get medium yields.

Table 3 and figures 14 and 15 show the average yield of major crops for the entire project from 1917 to 1935. It is evident that the trend for grain crops was upward until 1927 and relatively constant since then. The yield of hay crops has remained on about the same level except for the good yields in 1925.

While there has been some water shortage on the project,

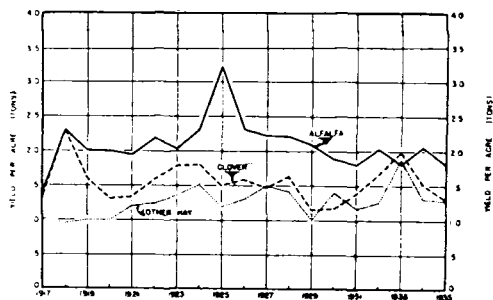


Figure 14.—The average annual per acre yield of alfalfa, clover, and other hay. The per acre yield of other hay shows a small increase, 1917-1935.

the fact that some operators who do not have the best land yet get high yields of each crop, indicates that many are not following the best farming practices. If these farmers would establish and maintain better rotations, carry on the field work and irrigation operations in a more timely and efficient manner, and also grow the best varieties, the average yields on the project would be raised materially.

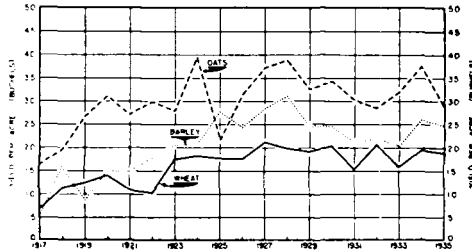


Figure 15—Average annual per acre yield of oats, barley, and wheat. All crops show an increase to 1924 and a fairly uniform yield up to 1935.

Livestock.—Dairying is the most important livestock enterprise on the Flathead Project, as indicated by the fact that nearly one-half the total animal units are dairy cattle. The relative importance of dairy cattle decreases on the larger farms, as seen in figure 16.

Beef cattle are second in importance, making up nearly one-fourth of the total animal units on all farms. The beef enterprise makes up about one-half of the total animal units on the farms over 321 acres.

Horses comprise, on an average, 15 per cent of the total animal units on all farms. There does not seem to be any consistent relationship between the size of farm and the per cent of total livestock units made up by horses. This is in part due to the relatively larger number owned by the Indian farmers on the project. Moreover, as farms increase in size, tractors are to some extent substituted for horses.

Hogs make up nearly 5 per cent of the total animal units on all farms, their relative importance increasing as the size of farm increases.

Sheep apparently are relatively unimportant on the project,

comprising only about 4 per cent of the total livestock units on all farms.

Poultry is relatively more important on the smaller farms, making up nearly 10 per cent of the animal units on the farms of less than 20 acres and less than one per cent on the farms over 321 acres.

Some variation in livestock density and distribution between districts is evident. The proportion of all farms having dairy cows ranges from 90 per cent in the Round Butte (Horte) district to less than 70 per cent in the Valley View district. Beef cattle are found on nearly 40 per cent of the farms in the Valley View district, but are on less than 10 per cent in the Polson district. In the Polson district nearly one-third of the farms had a flock of sheep while in the Pablo, Ronan and Nine Pipe districts less than 5 per cent of the farms had sheep. Nearly all the farms in the Round Butte (Horte) district but only one-third of those

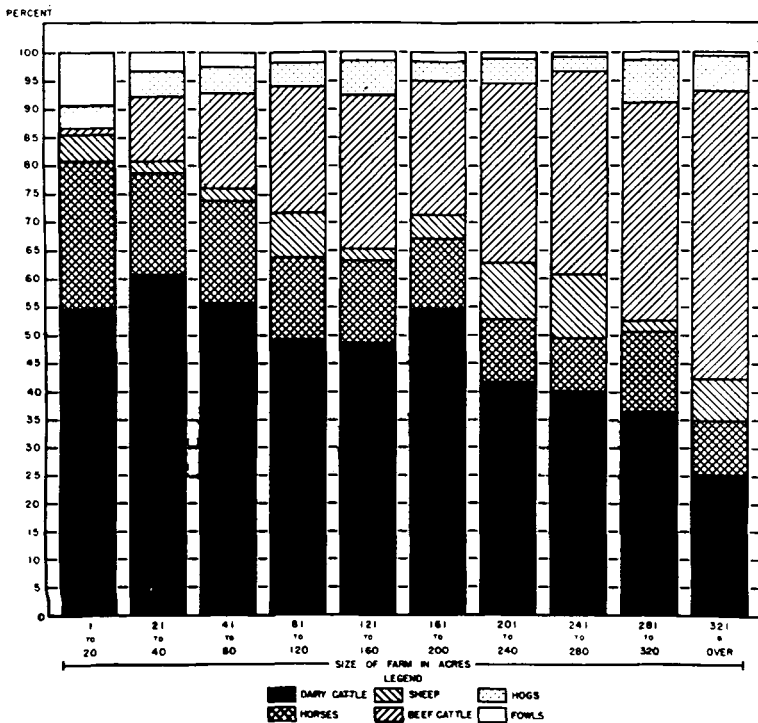


Figure 16.—Distribution of livestock, Flathead Project. 1932-1935 average.

in the Polson area have hogs. Except in the Polson district, an area of many small units, nearly all farms had horses.

The greatest number of dairy cattle per farm is in the Round Butte (Horte) and Moiese districts and the fewest number is in the Polson and Ronan districts. The Camas district has the greatest number of beef cattle per farm; and the Valley View and the Round Butte areas, the most sheep per farm. These districts have easier access to range land than the others.

WATER COSTS

The total cost of constructing the irrigation works on the Flathead Project up to April 1, 1936, amounted to \$7,382,296, which is about \$65 per acre for the present irrigable area. The

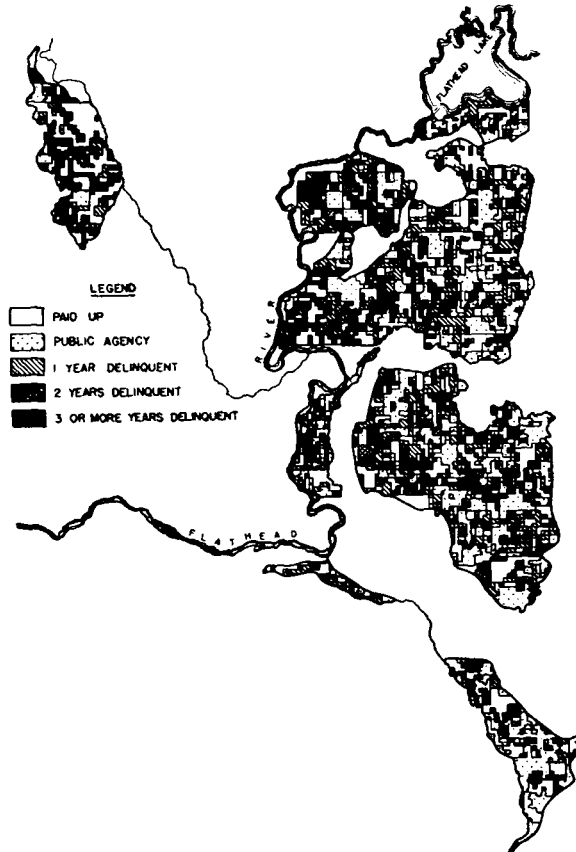


Figure 17.—Tax delinquency of the Flathead Project as of March 1, 1934.

costs incurred up to the time of signing the contract were to be paid off in 40 years from the time of completion, but payments were deferred until 1938. The charges beginning in 1938 are to be distributed over a 32-year period. Since construction charges bear no interest, the annual payment based on the first contract will be about \$1.28 per acre. Subsequent construction costs will be paid after 1970 on the same terms.

Operation and maintenance together with administrative costs are about 95 cents per irrigated acre.

TAXES

Taxes on land and improvements are about 85 cents per acre. With 5 cents per acre tax on farming equipment and 20 cents

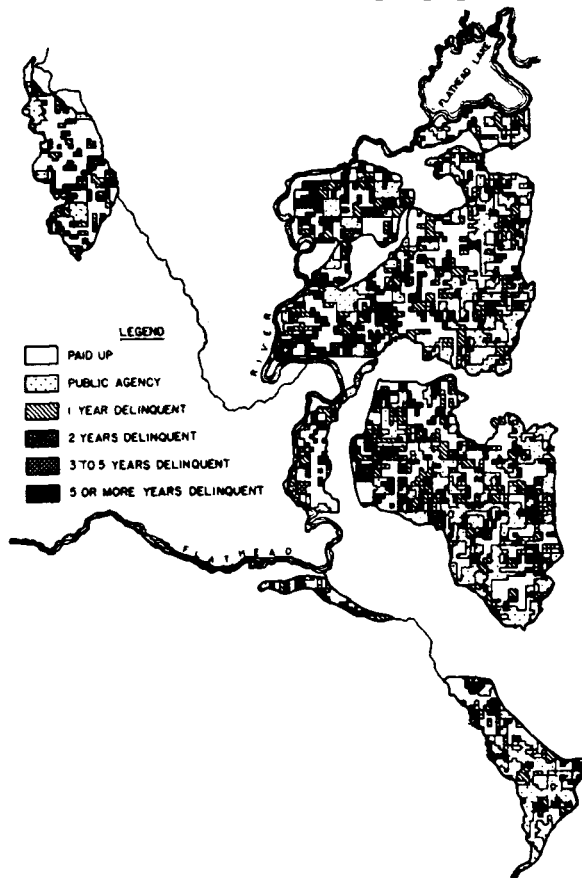


Figure 18.—Tax delinquency of the Flathead Project as of July 1, 1936.

per acre on livestock," the total tax per acre is about \$1.10.

Unless another moratorium is declared on construction charges after 1938, the annual cash outlay per acre to meet taxes and water charges will be about \$3.40. Of this, however, \$1.28 is a capital payment on the cost of the irrigation work.

More than one-half of the privately owned lands on the Flathead Project were one or more years delinquent in the payment of taxes in 1936, much of this having been delinquent for a period exceeding five years, according to figure 18. The status of tax payments has, however, improved considerably since 1934, according to figures 17 and 18. Higher prices and better farming practices have increased farm incomes sufficiently to provide tax money.

FARM INVESTMENTS

The average investment in land, equipment, and livestock is about \$36 per acre in farms, \$55 per irrigable acre, and \$90 per cropped acre, not including construction charges. The investment in equipment is about \$3 per acre in farms, \$5 per irrigable acre, and \$8 per cropped acre. The investment in livestock in 1932 to 1935 was \$7.50 per acre in farms, \$12 per irrigable acre, and \$20 per cropped acre. The combined investment in land and improvements, equipment, and livestock was \$46 per acre in farms, \$72 per irrigable acre, and \$118 per farmed acre, as shown in table 4.

TABLE 4.—INVESTMENT IN FARMS, FARMING EQUIPMENT, AND LIVESTOCK, FLATHEAD IRRIGATION PROJECT

Average 1932-1935, Inclusive			
	Per acre in farms	Per irri- gable acre	Per cropped acre
Land and improvements	\$36.00	\$55.00	\$90.00
Equipment	3.00	5.00	8.00
Livestock	7.50	12.00	20.00
Total	\$46.50	\$72.00	\$118.00

GROSS INCOME

Gross income data are presented to show the relative importance of the different farm enterprises. Figure 19 shows that, on the average, about one-half of the gross farm income on all farms is from dairy cattle. The relative importance of dairy cattle tends to decrease on the larger farms. For all farms, beef cattle production

¹⁰On the basis of average livestock density 1932 to 1935.

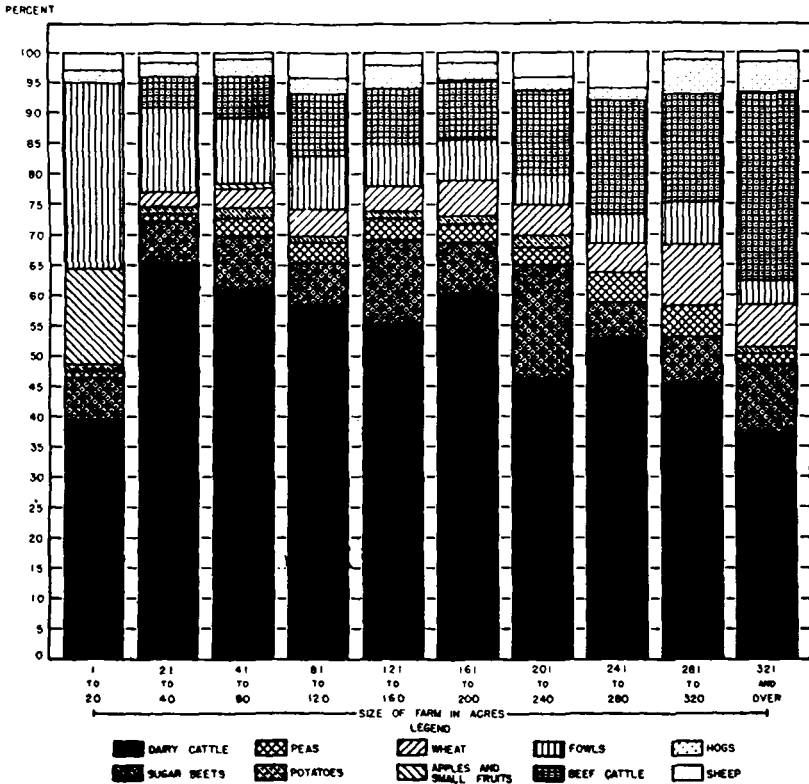


Figure 19.—Gross income composition by size of farm. Dairy cattle account for nearly 50 per cent of gross income on the Flathead Project, 1932-1935 average.

was the second most important enterprise, being relatively more significant on the larger farms. Sugar beets were the third largest source of gross income on all farms, followed by poultry, wheat, hogs, sheep, peas, and fruit in the order named. Fruit is an important enterprise on the farms below 20 acres where it is exceeded as a source of gross income only by dairying and poultry raising.