

South Dakota State University
**Open PRAIRIE: Open Public Research Access Institutional
Repository and Information Exchange**

Bulletins

South Dakota State University Agricultural
Experiment Station

6-1-1951

Development of Irrigated Farms on the Mirage Flats Project

K. Kristjanson

Follow this and additional works at: http://openprairie.sdstate.edu/agexperimentsta_bulletins

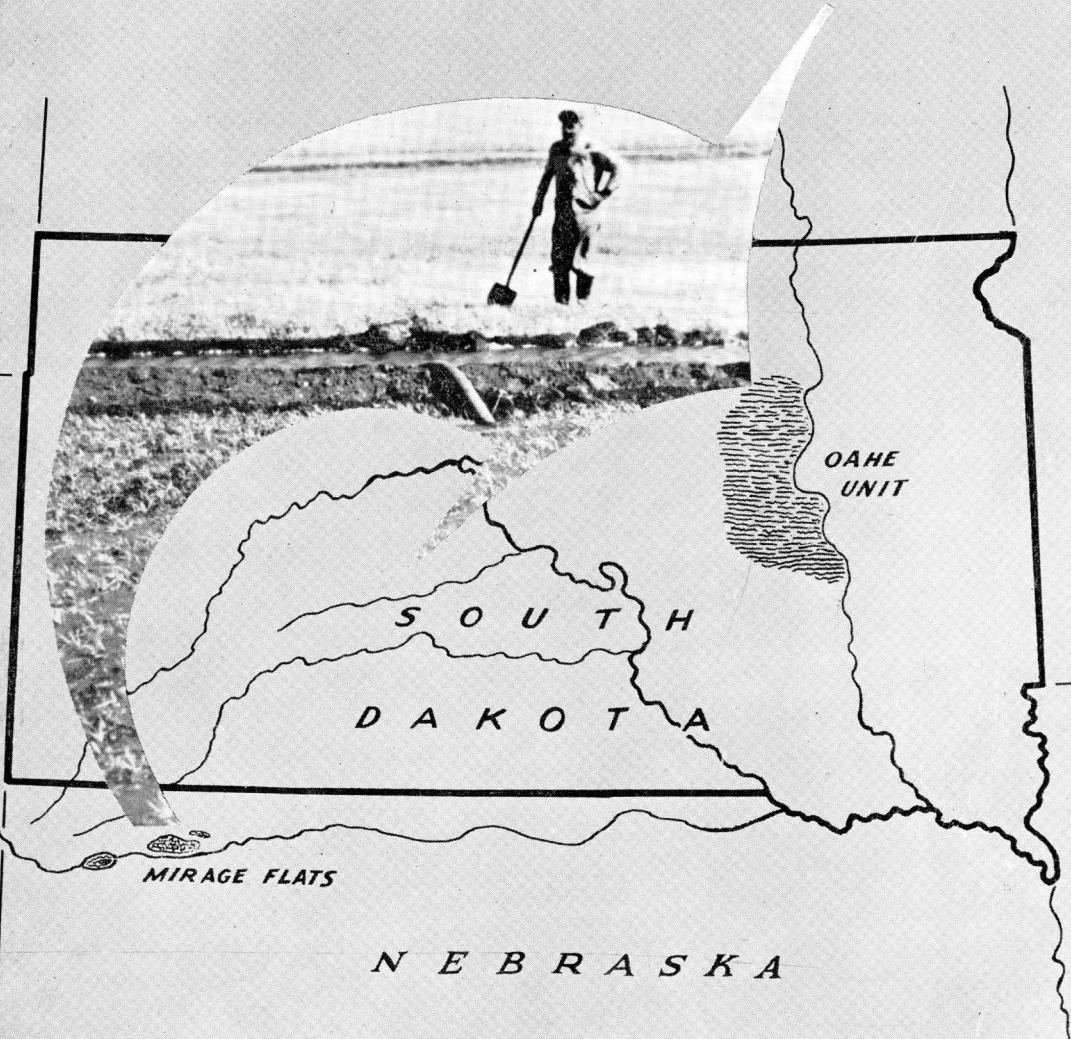
Recommended Citation

Kristjanson, K., "Development of Irrigated Farms on the Mirage Flats Project" (1951). *Bulletins*. Paper 410.
http://openprairie.sdstate.edu/agexperimentsta_bulletins/410

This Bulletin is brought to you for free and open access by the South Dakota State University Agricultural Experiment Station at Open PRAIRIE: Open Public Research Access Institutional Repository and Information Exchange. It has been accepted for inclusion in Bulletins by an authorized administrator of Open PRAIRIE: Open Public Research Access Institutional Repository and Information Exchange. For more information, please contact michael.biondo@sdstate.edu.

Development Of Irrigated Farms

ON THE MIRAGE FLATS PROJECT



AGRICULTURAL ECONOMICS DEPARTMENT
Agricultural Experiment Station
SOUTH DAKOTA STATE COLLEGE ♦ BROOKINGS
AND BUREAU OF AGRICULTURAL ECONOMICS,
U. S. D. A. COOPERATING

Table of Contents

Summary and Conclusions	3
The Case- Wheeler Program	8
The Mirage Flats Project	9
Land Purchase and Cost of Development	12
Original Estimates of Ability to Pay Land and Water Charges	12
Income of Settlers	14
Problems in Converting from Dryland to Irrigation	18
Opinions of Settlers	22
Appendix	25

Development of Irrigated Farms on the Mirage Flats Project

Summary and Conclusions

In view of the irrigation proposed in South Dakota, people have asked for information which will help them formulate sound policies and procedures for such development. The purpose of this bulletin is to analyze the planning and settlement of Mirage Flats Project in northwestern Nebraska, which has an average annual rainfall of about 20 inches. This project was selected for study because it represented an experiment in predevelopment of land by the Government. That is, the Bureau of Reclamation constructed the dam and the distribution system necessary to bring the water to the high point of each farm, and the Soil Conservation Service leveled land, constructed farm irrigation ditches and structures for each farm.

The Mirage Flats Project was planned during a period of depressed economic conditions and drought in the late 1930's, and was one of several projects approved under the Case-Wheeler program. The original objective of this program was to develop medium-sized irrigation projects to provide settlement opportunities for destitute dry-land farmers as well as to allow for expansion in size of existing dry-land farms. Construction was started in 1941, delayed by the war, and completed in 1949. Much of the work was done when costs of labor and materials were high. The cost of the project originally was estimated at \$2,560,000. The actual cost was approximately \$4,300,000. It was estimated that the farmers could pay \$815,-

000 of the construction costs, interest free, over a period of 40 years.¹ This was an annual payment of \$1.70 per acre. In addition, it was expected that the farmers could pay annual operation and maintenance costs estimated to average \$1.50 per acre.

On the basis of an average annual cost for water of \$3.20 per acre, the value of land, as appraised by the Government, averaged \$70 per acre without buildings. The contract for the purchase of land called for a down payment of 5 percent and the remainder in 40 annual installments with interest at 3 percent. The price was not directly related to the cost of land development work, although the original purchase price was about \$25 per acre and cost of land preparation work was between \$35 and \$40 per acre. The land preparation work was done under private contract as well as by the Government. The cost in both cases was between \$35 and \$40. These figures do not include the cost of supervision or survey work; they represent the cost of land development where a minimum of land leveling was required.

After the land purchase contracts were signed, the Bureau of Reclamation, making different assumptions as to crop yields and prices, estimated the farmer's ability to pay for water to range from \$3.58 to \$5.33 per acre, de-

¹The contract signed in 1950 by representatives of the Bureau of Reclamation and the Mirage Flats Irrigation District provides for the repayment of \$815,000 over a period of 38 years.

pending on method of calculation used. In making these estimates, the price of land was assumed to average \$70 per acre, and \$1500 was allowed for family living.

From the study made, it is apparent that the incomes of many farmers on this project were low despite the favorable prices received. Likewise, the average amount spent for family living was less than that anticipated available for this purpose by the development agencies. Farmers who had buildings at time of settlement had a little larger income than those without buildings. This, however, is not entirely explained by buildings; this group also had more livestock and machinery at time of settlement.

Part of the low income undoubtedly was due to the short period of settlement, but there were other reasons also. Farmers attributed some of the low income to the small size of farm, inadequate credit for buildings and livestock, and low crop yields. Farmers suggested that in future projects the farms should have a larger irrigated acreage or a combination of range and irrigated land.

Farmers liked several features about this type of project. The long-term contract for purchase of land with small down payment and low rate of interest was the only opportunity for many of these operators to get started in farming. The operators also considered it desirable to have the land leveled before settlement and to have farms laid out on the basis of topographic features of the land. A large number of farmers believed that technical assistance was desirable.

A number of other problems must be met in changing from dry-land to

irrigation farming. Whether the land preparation work is done by the Government or by some private group, an appropriate organization is needed. A conservancy district, as discussed on page 21, may be better adapted to do the job than an association such as the one used in the Mirage Flats Project. More adequate planning for schools, roads, and markets under irrigation development is also needed.

Comparison With Projects In North Dakota and Montana

Similar studies have been made of the Buford-Trenton and Lewis and Clark Projects in North Dakota and the Buffalo Rapids and Kinsey Projects in Montana. The land on all four projects was predeveloped in varying degrees; in all cases the Government-owned land was cleared and leveled and farm irrigation structures at least partially completed. On many of the farms, buildings were constructed or already available from existing dry cropland farms.

Capital Accumulation

The Mirage Flats farms have been settled for an average of about 2 years compared with an average settlement period of 4.4 years on the North Dakota Projects, 5.8 years in Buffalo Rapids, and 7.6 years in Kinsey (Table 1). The average annual gain in net worth for somewhat comparable farms ranged from \$900 to \$1300 in the three states. The class of farms in North Dakota with 160 acres or more of dry cropland per farm had an annual gain of about \$2800 which is more than twice that of any other group.

Table 1. Length of Settlement, Annual Net Worth Gain Since Settlement, and Irrigated Land per Farm for Selected Development Classes, Three Study Areas, Missouri River Basin, 1950

	Length of settlement	Irrigable land per farm	Average net worth gain per year	Average unusual expenses per year	Average off-farm receipts per year	Average net worth gain from farming
	Years	Acres	Dollars	Dollars	Dollars	Dollars
Montana*						
Buffalo Rapids Area:	5.8	135	1166	—	—	—
Sold no buildings	4.1	121	901	76	376	601
Sold with buildings	7.4	140	1257	74	12	1319
Kinsey Area	7.6	99	1167	—	—	—
Nebraska						
Mirage Flats:						
Sold no buildings	2.0	96	1043	—	1004	39
Sold with buildings	2.5	104	1320	—	379	941
North Dakota*						
Less than 160 acres						
dry cropland	4.8	121	1103	65	177	991
160 acres or more						
of dry cropland	3.5	75	2843	358	747	2454

*Data from the following studies: Stewart, Clyde E. and Myrick, D. C., "Control and Use of Resources in Development of Irrigated Farms." Buffalo Rapids and Kinsey Projects, Montana; Voelker, Stanley W., "Settler's Progress on Two North Dakota Irrigation Projects," A Study of Farm Development and Resource Accumulation on the Buford-Trenton and Lewis and Clark Project, Bull. 369, 1951.

On the North Dakota projects a combination of dry-land and irrigated units was more prevalent than in other areas. For this reason, the farms were classified as follows: (1) Farms with less than 160 acres of dry cropland and (2) Farms with 160 acres or more of dry cropland.

In order to get a figure representing the gain in net worth resulting from farming operations, it is necessary to deduct all off-farm receipts and add all unusual expenses. On the Mirage Flats Project, G. I. benefits were an important source of income. Those who started farming with buildings had an average annual income from non-farm sources of \$379. Therefore,

the annual gain in net worth from farming was \$941. In the case of those who started farming without buildings, the average annual income from non-farm sources was \$1004, and the average annual gain in net worth from farming was only \$39. On the Buffalo Rapids Project the comparable figures were \$1330 and \$427.

Acknowledgment

The author wishes to thank the farmers on the Mirage Flats Project who gave so generously of their time in providing information for this report.

J. Russell Batie, Project Supervisor; and Ernest Foster, Samuel A. Gailey, and Joseph Shaughnessy, Instructors, Vocational Agriculture for Veterans, provided much assistance with the collection of data and contributed helpful suggestions in the preparation of this report.

This study was made under a memorandum of agreement between the Bureau of Agricultural Economics, United States Department of Agriculture and the Department of Agricultural Economics, South Dakota State College Agricultural Experiment Station. This is one of several studies, being made cooperatively by the Bureau of Agricultural Economics and the Agricultural Experiment Stations in the Missouri Basin, dealing with the economics of resource development.

Development of Irrigated Farms on the Mirage Flats Project

By KRIS KRISTJANSON²

Plans for development of the Missouri Basin provide for irrigation of large areas in South Dakota. If soils and drainage are found satisfactory and costs are not prohibitive, methods for irrigation development will have to be worked out. The people are interested in what can be learned from existing projects that will help them formulate sound development policies. Problems about which they are concerned include methods of farm development, probable income, credit, cost of water, and how to convert from dry-land to irrigation farming. The objective of this report is to show, insofar as possible, how these problems have been met on the Mirage Flats Project in northwestern Nebraska.

The Mirage Flats Project was developed under the Case-Wheeler Program, a new procedure for developing irrigation. The land was developed before settlement. In the study here reported, the experiences of the operators on that project have been summarized, with the thought that the resulting information would be useful to the people of South Dakota.

The Mirage Flats Project has soils which are excellent for irrigation, as

both internal and surface drainage are good, the topography is favorable, and the water supply is adequate. The experience of the operators can, therefore, help to point out what can be expected under these favorable physical conditions.

Upon completion, the project had 110 farms. Of this number, 7 were settled by original owners, 42 were bought by farmers who rented land on the project for one or more years, and 61 were bought by settlers from surrounding areas. Irrigation water was available in 1946, but the farm sales did not begin until 1947. There were buildings on 33 of these farms at time of sale. Twenty-nine were on old dry-land farmsteads, while four were constructed during the development period. Eighteen were settled in 1950 and were not included in the study.

Records of progress were obtained from 85 of the 92 operators who bought farms in 1947, 1948, and 1949. Only 65 records were considered sufficiently accurate to use in the analysis of earning capacity. Several checks were used to determine the accuracy of information obtained. When income data were questionable, the schedule was not used. For this reason, tabulation of income data was limited to 65 cases. Opinion data were used from all 85 records obtained.

²Agricultural Economist, cooperatively employed by the South Dakota Agricultural Experiment Station and the Bureau of Agricultural Economics. Appreciation is also expressed to John Muehlheier and others who have contributed to this report.

The Case-Wheeler Program

Description

The Case-Wheeler irrigation program was designed to provide greater opportunity for people who wanted to farm in the West.³ The primary purpose was to develop medium-sized irrigation projects in the arid and semi-arid regions of the 17 western states. Planning and administration of the program was to be carried out jointly by the Department of the Interior and the Department of Agriculture.

This program grew out of recommendations made to the President by the Northern Great Plains Committee of the National Resources Planning Board in October 1938.⁴ The original plan was to build irrigation projects with relief labor, thus reducing the cost which would have to be repaid by the water users, permitting the construction of projects not otherwise considered feasible, and providing employment where it was most needed in the western areas. It also proposed to develop "new lands" for the benefit of farm families who most needed assistance—destitute farmers who had been driven off their lands by drought or wind erosion, or those who had been trying to make a living on dry-land farms too small to support a family.

The Case-Wheeler program was first authorized by Congress in the fiscal year 1940.⁵ A subsequent appropriation of \$5,000,000 was provided for "water conservation and utilization projects." This fund was to be used only for "reimbursable" expenses to be repaid by irrigators over a period not to exceed 40 years. To limit the

size of projects constructed under this program, the reimbursable cost of a dam, reservoir, and irrigation works was limited to \$1,000,000.

Under the Case-Wheeler Act, the Bureau of Reclamation was responsible for design and construction of dams, canals, laterals, and drainage installations. The Work Projects Administration and the Civilian Conservation Corps were to contribute as much labor as possible for construction. The Department of Agriculture was responsible for land development and settlement. This work was to include selection of families for settlement and provide for rehabilitation loans.

The Farm Security Administration was assigned responsibility for investigating, developing, and settling the projects. This function was later transferred to the Soil Conservation Service. This agency had been providing technical help in investigating project areas and in making appraisals and soil surveys.

Selection of Settlers

Settlers for these projects were to be selected from families unable to earn an adequate living on dry-land farms. In this way, an additional objective—the enlargement of other dry-land farms—could be achieved.

³The original "Water Conservation and Utilization" (Act of May 10, 1939, 53 Stat. 685) program was continued and extended in 1940 by the Case-Wheeler Act, sponsored by Representative Francis Case of South Dakota and Senator Burton K. Wheeler of Montana.

⁴Summary and Progress Report of the Wheeler-Case Program. Issued by the Office of Land Use Coordination, May 15, 1941.

⁵At the present time, no new projects are being started under the Case-Wheeler Act.

In more recent years, some changes have been made in family selection to meet the requirements of a war and postwar period. The need for work projects and for resettlement of destitute families was no longer so great. Instead, there was the need to provide opportunities for veterans who have been given preference. In the early stages of development, however, a few farmers were selected from dry-land areas. Commitments had also been made to farmers, or their sons, who had sold land to the Government.

Selection of families was to be made by a committee. In the case of the Mirage Flats Project, this committee was composed of one county commissioner, the project supervisor, the county agent, a representative from Farmers Home Administration, and three others selected by the four mentioned.

The same procedure is being used for the Angostura Project in South Dakota. In this case, the committee consists of nine members, with two county commissioners and two county agents representing both Fall River and Custer Counties.

The Mirage Flats Project

Location

Box Butte Dam, which stores water for this project, is located on the Niobrara River in Dawes County, Nebraska, about 10 miles north of Hemingford in western Nebraska. The irrigable lands of the project are located in Sheridan County about 20 to 30 miles below the dam and about 10 miles south of Hay Springs. These lands include 11,985 acres of irrigable land lying in a compact body on the north bank of the Niobrara River. Towns, other than Hay Springs, in the general vicinity of the project include Alliance, county seat of Box Butte County, about 35 miles southwest of the project; Chadron, county seat of Dawes County, 35 miles northwest; and Rushville, county seat of Sheridan County, 15 miles northeast.

Physical Characteristics

Project soils are fine textured; they range from loamy fine sand to heavy silt loam.⁶ Most of the area consists of the Tripp and Rosebud soil series

which are approximately equal in acreage. The Tripp series is regarded as one of the best soil series for irrigation in western Nebraska. The Rosebud series is also good for irrigation. Most of the soils on the project retain moisture well and can be cultivated shortly after heavy rains without serious impairment of their physical condition. About 83 percent of the project area is Class I land.

The topography of most of the project area is flat to very gently undulating. The greater part of the project has sufficient slope to carry off surplus water. Although in a few local areas there are small knolls which cannot be economically leveled, most of the land already developed has required only light to moderate leveling, and none of the project lands required heavy grading. Most of the irrigable land on the project area lies in a compact body with a gentle slope to the southeast.

⁶This section on soils taken from Mirage Flats Economic Justification Report S-NB-61 prepared by U. S. Department of Agriculture—Soil Conservation Service unpublished report.

Project soils have good internal and surface drainage. Natural drains to the east are in existence throughout most of the area. Drains have been constructed to carry return flow from the irrigated land. The nature of the soils and the drains that have been constructed should preclude any drainage problems.

The soils and water of the project are such that it is not expected that problems due to the accumulation of salts or alkali will develop. The soils are neutral to slightly alkaline with no harmful amounts of soluble salts present.

History of Area

The first settlers arrived in this area in 1881. The Federal Government encouraged settlement in the area through tree claim, preemption, and homestead laws. The acreage was limited to 160 acres under any one act, although many settlers acquired land under all three acts.

The first colony to settle in Sheridan County came from Indiana. The early settlers were of many nationalities, but a large percentage were American born. The principal foreign nationalities represented were German, Irish, French, English, and Swedish.

The early homesteaders experienced a few years of good crops and immigration was greatly stimulated. By 1885 nearly every quarter section had its homesteader. This period of rapid settlement and good crops was followed by a severe drought, culminating in the extremely dry years of 1893 and 1894. This forced a large number of settlers to leave the area.

Among those who remained, the need for irrigation was keenly felt during the dry years of 1893 and 1894. In 1895 the farmers organized a mutual company and constructed a system to irrigate a somewhat larger area than is included in the present project.⁷

The principal features of the project were a diversion dam, two flumes each about 1,200 feet long with a maximum height of 45 feet, about 20 miles of canal, and a lateral system. The work was performed by farmers and was proportioned according to the acreage each expected to irrigate. Lumber for flumes was secured from a sawmill located south of Chadron, Nebraska. Water was delivered for a few years to a point due south of Hay Springs, but through lack of cooperation the entire system was not completed and farmers at the lower end of the project never received water.

No storage was provided and flow in the river was generally far below requirements for irrigation during June, July, and August.

The flumes were destroyed by a prairie fire in 1895 and the project was abandoned. The supply of rain during the years immediately following the fire was reasonably adequate and the loss was not keenly felt. Active interest in irrigation did not again develop until the drought period of the 1930's. Table 2 indicates the annual rainfall at Hay Springs from 1886 to 1939.

With passage of the Kinkaid Act of 1904, which increased the size of homesteads to 640 acres, immigration was again stimulated and within a

⁷Sloan, W. G., "Report on Mirage Flats Project," Bureau of Reclamation, U. S. Department of the Interior, Project Investigation Report No. 33, 1939.

Table 2. Annual Precipitation, Hay Springs, Nebraska, 1886—1939

Year	Precipitation inches	Year	Precipitation inches	Year	Precipitation inches	Year	Precipitation inches
1886	18.22	1900	18.07	1914	14.85	1927	27.64
1887	22.90	1901	24.86	1915	29.32	1928	18.04
1888	21.96	1902	22.03	1916	21.73	1929	25.74
1889	19.16	1903	25.11	1917	17.48	1930	23.26
1890	15.95	1904	18.37	1918	24.11	1931	14.76
1891	23.26	1905	25.91	1919	16.35	1932	18.53
1892	27.84	1906	23.26	1920	25.53	1933	19.78
1893	11.71	1907	14.76	1921	18.78	1934	12.81
1894	12.99	1908	22.30	1922	28.32	1935	23.23
1895	15.69	1909	25.94	1923	25.35	1936	10.87
1896	19.91	1910	13.39	1924	19.86	1937	19.34
1897	21.89	1911	17.52	1925	23.09	1938	16.75
1898	15.99	1912	19.32	1926	21.73	1939	15.40
1899	15.84	1913	16.58				

Source: Bureau of Reclamation, "Economic Analysis and Repayment Study of the Mirage Flats Project, Nebraska," March, 1949, p. 51.

short time much of the public land was reoccupied by homesteaders. By 1920, however, most of the Mirage Flats area was almost entirely in one ownership — the Peters - Williams Ranch. About 1920, Peters and Williams began to bring settlers into the area and to divide their ranch holdings into small farm units. This promotion brought in a Danish colony from central Nebraska which comprised the major part of the population prior to development of the irrigation project .

Authorization

An engineering appraisal of an irrigation program for the area was made in 1932 by a private firm. The findings are published in House Document No. 90, 73d Congress, with conclusions that the best utilization of the water resources would be for development of power, but that this would not be economically feasible under existing conditions, and any irrigation projects that had been contemplated were too costly.

A report and cost estimate were prepared in March 1937 for the Mirage Flats Public Power and Irrigation District. This report presented an estimate of project costs and a plan to finance the project through sale of water and electric power.

In 1937 an attempt was made to secure a P.W.A. loan and grant to construct the system, but the application was filed too late to be acted upon. The Bureau of Reclamation was then requested to investigate the proposed project. A reconnaissance report was prepared in 1938 which recommended that a detailed investigation be made. This detailed investigation was carried out in 1939.

The project was authorized under the Water Conservation and Utilization Program (Act of May 10, 1939, 53 Stat. 685) and approved by the President, April 26, 1940. It was estimated that the project would cost \$2,560,000, of which \$985,000 would be reimbursable funds allotted to the Bureau of Reclamation, and the remaining \$1,575,000 would be provided by the

Work Projects Administration through furnishing labor for construction work and some non-labor funds. Of the \$985,000 it was intended that \$815,000 would be made available to the Bureau for construction and \$170,000 to the Farm Security Administration for development of land. The estimated total cost was higher than the amount the prospective settlers could be expected to repay. Reimbursable costs were limited to \$985,000.

Land Area

The Farm Security Administration purchased 14,780 acres of land of which approximately 12,000 acres

were intended for irrigation. About 80 percent of this irrigable land is in a compact body on a bench north of the river, covering an area of about 10 miles in length and a maximum width of 3 miles. The remaining portion is adjacent to this main block but separated from it in some parts by a ridge of high land.

The entire irrigable area is well adapted for irrigation, consisting mainly of very gently sloping land. For the most part farms were laid out with regard to topography rather than subdivision of sections, although some section line roads are retained as farm boundaries. The elevation of irrigable land varies from 3,840 to 3,730 feet.

Land Purchase and Cost of Development

The Farm Security Administration appraised and optioned the land lying within the proposed project area. By 1941, options had been accepted on 14,780 acres at an average cost of \$25.06 per acre including improvements.

In the development of land acquired three methods were used. In

the early stages the work was done by W.P.A. labor. After World War II, some work was done under contract. Later, the remaining work was done by the Soil Conservation Service. Cost of land preparation by these three methods ranged from \$35 to \$40 per acre of irrigable land, not including cost of supervision and surveys.

Original Estimates of Ability to Pay

Land and Water Charges

Public funds were spent for the development of this project. Although a part of the justification of the project was work relief, farmers were expected to repay part of the cost. This was to be based on their ability to pay. They were not expected to obligate themselves beyond their ability to pay, regardless of the cost of constructing the project. This idea is basic to development of Federal reclamation.

Therefore, an analysis of methods used in making these calculations should be of interest to people in areas proposed for irrigation.

In the early stages of planning, the Bureau of Reclamation calculated that farmers could repay \$815,000 of the cost of construction originally estimated at \$2,560,000. This was an annual payment of \$1.70 per acre for a period of 40 years. In addition to this

charge, the Bureau of Reclamation estimated that operation and maintenance costs would average \$1.50 per acre, making a total annual cost of \$3.20 per acre for water.

Using the estimated cost of \$3.20 per acre for water, and certain assumptions as to production and prices, the Soil Conservation Service appraised the land at about \$70 per acre on the basis of its long-time earning capacity. Using this as the cost of land and making certain assumptions as to production and prices, the Bureau of Reclamation calculated that farmers could pay \$5.33 for water, a figure adjusted to \$4.26 to allow for unforeseen contingencies and to provide an incentive to undertake the development.

Different methods were used in making these estimates of farmers' ability to pay for land and water. The value of land, estimated by the Soil Conservation Service, was based on the capitalization of anticipated net returns to a landlord. The appraisal report for a typical farm is included in Appendix Table 1. The value of

water, estimated by the Bureau of Reclamation, was based on an analysis of income and expenses for a typical farm (Appendix Table 2). As an additional check, the Bureau of Reclamation also calculated the value of water by capitalizing the net returns to a landlord. By this method it was estimated that farmers could pay \$3.58 for water. These calculations are shown in Appendix Table 3. In all of these calculations, from \$1,500 to \$1,800 was allowed for family living.

It can thus be seen that there is no definite rule on how to determine the value of land or water, although the various methods used do serve as indicators. The limitations of the methods need to be kept constantly in mind. It should be noted that the value of land is related to the value of water. If a low cost for water is assumed, then a higher value for land results. Similarly, if the cost for water is increased, the value of land is lowered. Also important in the use of these methods are the crops, yields, and prices or cost of farm operations anticipated (Tables 3 and 4).

Table 3. Distribution of Crops, Yield per Acre, and Prices Assumed by Soil Conservation Service in Estimating Farmers' Ability to Pay for Land, Mirage Flats Project.

Crop	Distribution of crops		Yield per acre	Prices
	Acres	Percent		Dollars
Alfalfa	31.5	35	3 ton	7.00 per ton
Corn	18.0	20	43 bu.	.70 per bu.
Barley	9.0	10	48 bu.	.50 per bu.
Beans	9.0	10	24 bu.	1.95 per bu.
Potatoes	9.0	10	190 bu.	.50 per bu.
Irrigated pasture	9.0	10	*	
Yard, waste	4.5	5		
Total	90.0	100		

*Value of irrigated pasture was estimated at \$5.00 per head with carrying capacity assumed to be 2 animal units per acre.

Table 4. Distribution of Crops, Yield per Acre, and Prices Assumed by Bureau of Reclamation in Estimating Farmers' Ability to Pay for Water, Mirage Flats Project

Crop	Distribution of crops		Yield per acre	Prices
	Acres	Percent		Dollars
Alfalfa hay	17.0	16	2.5 ton	9.50 per ton
Corn	26.0	25	30.0 bu.	.81 per bu.
Barley	21.0	20	35.0 bu.	.64 per bu.
Beans	8.0	8	25.0 bu.	2.40 per bu.
Potatoes	11.0	10	200.0 bu.	.87 per bu.
Irrigated pasture	3.0	3	12.0 A.U.M.*	1.75 per A.U.M.*
Alfalfa seed	4.0	4	110.0 lbs.	.23 per lb.
Oats	8.0	8	40.0 bu.	.46 per bu.
Garden	0.5	1		
Farmstead, etc	5.5	5		
Total	104.0	100		

*A.U.M.—Animal Unit Months

Income of Settlers

An objective of this study was to make some analysis of the progress of settlers on the project. For purposes of analysis, the operators in the sample were divided into two groups: (1) those who bought land with buildings, and (2) those who bought land without buildings. The sample included 11 operators in the first group and 54 in the second. The first group had reasonably adequate farm buildings while the latter group had to construct some type of housing. In many cases temporary arrangements such as trailers, army barracks, etc., were used in the hope that Farmers Home Administration loans or other types of credit would become available.

The group which purchased farms with buildings had an average of \$9,489 in working capital at time of settlement. This figure represents the value of livestock, machinery, financial assets and the amount of money borrowed the first year. The average price of farms in this group was \$12,101 and the average down payment was \$764.

The average annual net income⁸ from farming of these 11 operators was \$2,146 before any deduction for interest on investment (Appendix Table 4). Of this income, an average of \$1,205 was spent for family living.⁹ If this group had spent an average of \$1,500 for family living, as set out in the budgets prepared by the development agencies on the basis of 1939-44 prices, the operators would have been able to pay construction charges but would have had no allowance for return on investment. The cost of living for 1947-49 had increased greatly over the average for 1939-44.

Analysis was also made of changes in assets and liabilities. The 11 operators in this group showed an average annual increase in the value of livestock and machinery of \$2,018.¹⁰ They

⁸The use of the term "net income" in this report differs from its more traditional meaning. The manner in which it has been derived is shown in Appendix Tables 4 and 5.

⁹The estimate of cash expenditures for family living in 1949 was assumed to represent the two or three years since settlement. In many cases the operators had actual accounts showing the amount expended for family living. Where accounts were not available, reliance was placed on the operator's estimate of cash expenditures.

paid an average of \$1,076 on their real estate loan but increased other debts an average of \$1,349 and reduced their cash \$425.¹¹ This group received an average of \$379 in non-farm income.¹²

The 54 farmers who bought farms without buildings had \$5,972 in working capital at time of settlement. The average price of farms in this group was \$7,377 and the average down payment was \$410.

The average annual net income from farming for this group was \$1,071 before any deduction for interest on investment (Appendix Table 5). Of this amount, an average of \$1,032 was spent for family living. If this group had spent an average of \$1,500 for family living, the operators would have shown an average annual net loss of \$429 without any allowance for payment on construction charges, or return on the owner's investment.

Some of the changes in assets and liabilities of this group were also different from those of the group previously discussed. The 54 operators who started without buildings showed an average increase in value

of livestock and machinery of \$2,100, not so different from the other group. On the other hand, they paid an average of \$2,058 on their real estate loan but increased other debts \$1,700. They reduced their cash on hand \$1,415. They received an average of \$1,004 in non-farm income, considerably larger than the group with buildings.

Again, it must be emphasized that this represents the results for the first three years of settlement, a period too short for irrigators to attain a high level of production and income (Table 5). Also, it should be noted that there was some loss in production from hail, rust, and insect damage (Table 6).

¹⁰These values at settlement and on April 1, 1950, were estimated by the operators but were checked with local market prices insofar as possible. In no case did the farmer's estimate differ sufficiently from market prices to materially affect the calculation of change in assets. The value of machinery was similarly obtained. Farmers generally believed that the increase in machinery prices from 1947-50 approximately offset depreciation.

¹¹Payments for land made since settlement were obtained from the files of the Soil Conservation Service. These records show the appraised value of each unit, the initial down payment and annual payments made since settlement. The expenditures for buildings and other improvements are based on the operator's accounts or estimates of total cash outlays for such improvements.

¹²Off-the-farm receipts were generally confined to G.I. benefits. Information on this item was accurate because dates of enrollment in training courses could be closely checked with the G.I. instructors.

Table 5. Long-time Crop Yields Anticipated by Soil Conservation Service and Bureau of Reclamation Compared with Average Yields on Mirage Flats Project, 1947-50

Crop	Unit	Estimates by:		Actual Yields: Average for 1947-50*
		Soil Conservation Service	Bureau of Reclamation	
Alfalfa	Ton	3	2.5	2.90
Barley	Bu.	48	35.0	17.30
Corn	Bu.	43	30.0	29.20
Beans	Bu.	24	25.0	19.50†
Potatoes	Bu.	190	200.0	260.96‡
Beets	Ton	—	—	16.00§
Oats	Bu.	—	40.0	23.50

*Based on Bureau of Reclamation annual census.

†The 1949 yields were assumed to be 5 bu. per acre. This figure is based on farmer opinion but not reported in the census.

‡1949 yields are not included in this average. The yields in the other three years were: 1947—119.3 Bu.; 1948—220.0 Bu.; 1950—443.6 Bu.

§1950 yield.

Table 6. Crop Yields, Mirage Flats Project, 1947—1950

Crop	Units	Average yield per acre			
		1947	1948	1949	1950
Barley	Bu.	18.9	13.3	25.9	11.0
Corn	Bu.	16.5	24.3	36.3	39.7
Oats	Bu.	22.7	16.4	36.1	18.9
Wheat	Bu.	—	12.1	16.0	18.7
Alfalfa	Tons	3.0	2.9	2.6	3.0
Beans, commercial	Bu.	13.9	19.8	*	24.8
Potatoes	Bu.	119.3	220.0	†	443.6
Sugar beets	Tons	—	—	—	16.0

Source: Bureau of Reclamation Census for Mirage Flats Project.

*Yield of beans not available, but crop seriously damaged by rust.

†Yield not available. Reason not known.

Furthermore, markets had not been adequately established.

On the other hand, the ratio of prices received to prices paid by farmers was more favorable than that assumed by the development agencies. The average prices received for the period 1947-50 were much above the long-time average assumed in calculating farmers' ability to pay land and water charges.

One lesson to be learned from the operators on the Mirage Flats Project is that farmers who wish to convert from dry-land to irrigation must have sufficient money or credit to support themselves and keep the farm going during the first few years they are trying to get established on the project. On the Mirage Flats Project, outside or non-farm income, particularly G. I. benefits, greatly helped many to keep going.

The difference in income between the two groups discussed above cannot be explained entirely by buildings. The group which bought farms with buildings also had more livestock and machinery at time of settlement (Table 7). The farmers in this group were older and better established in the community and consequently found it easier to obtain credit when needed. These farmers had been on the farms for an average of about two and a half years while those without buildings, had spent an average of about 2 years on the project.

Cropping practices of the two groups differed very little, although the group which bought farms with buildings had a few more acres of cropland (Table 8). These factors as well as others have had considerable effect on income.

Table 7. Value of Livestock and Machinery at Settlement and on April 1, 1950, on Two Groups of Farms on Mirage Flats Project

Item	11	54
	With buildings	Without buildings
Average value of livestock at settlement	\$2,246.00	\$ 589.00
Average value of livestock, 4/1/50	4,219.00	2,103.00
Average value of machinery at settlement	2,348.00	2,138.00
Average value of machinery, 4/1/50	5,238.00	3,614.00

Table 8. Average Acres in Various Crops on Two Groups of Farms, Mirage Flats Project, 1949

Crops	11 Farms with buildings		52 Farms without buildings*	
	Acres per farm	Percent	Acres per farm	Percent
Barley	22.7	22	19.0	20
Oats	3.7	4	6.1	6
Corn	12.4	12	13.7	14
Beets	2.3	2	3.2	3
Potatoes	3.7	4	3.6	4
Alfalfa	16.2	15	11.7	12
Beans	29.9	29	30.8	32
Safflower	0.9	1	2.0	2
Pasture	6.6	6	3.7	4
Fallow	5.3	5	2.6	3
Total	103.8	100	96.4	100

*Only 52 records were used because 2 of the 54 records showed a discrepancy in reporting crop acreage, although the remainder of the information appeared accurate.

The few individuals who were able to engage in feeding operations showed considerably higher net incomes than those who did not have livestock. Plans for extensive livestock operations on a permanent basis were somewhat limited because of inadequate pasture acreages. Many operators expressed a desire to have dry-land range in addition to the irrigated land. This would probably be the most effective means of utilizing relatively small irrigation units in this area. This is not without problems, however.¹³ In the Mirage Flats area most of the rangeland surrounding the irrigation project is held in a few hands and is not available to irrigators. The existing ownership pattern therefore seems to preclude integration between the dry-land and irrigated areas.

In planning future projects in South Dakota or other western states where integration between irrigation farming and dry-land range farming is one of the important factors in the justification of the project, careful consideration should be given to the ownership pattern. If the irrigated units are

all held by one group of operators and the surrounding range held by another group, then integration may be virtually impossible to attain. Some method should be worked out in advance to make possible an adequate combination of dry-land and irrigation farming.

It is believed that on projects such as the proposed pump irrigation along the Cheyenne River in western South Dakota, methods should be developed to provide irrigation units which are a part of an established ranching operation. Small isolated irrigation farms would not be economically feasible because of a lack of market facilities in this sparsely populated area. In this area there is not sufficient acreage of irrigable land in one block to make it feasible to establish an irrigation proj-

¹³Greenshields, Elco L. and Voelker, Stanley W., "Integration of Irrigated and Dry-land Farming in North Platte Valley 1946," USDA, BAE, in cooperation with U.S.D.I., Bureau of Reclamation, Washington, D. C. 1947.

Stewart, Clyde E. and Myrick, D. C., "Control and Use of Resources in the Development of Irrigated Farms." Buffalo Rapids and Kinsey Projects, Montana.

Voelker, Stanley W., "Settler's Progress on Two North Dakota Irrigation Projects," A Study of Farm Development and Resource Accumulation on the Buford-Trenton and Lewis and Clark Project, Bull. 369. 1951.

ect which is not a part of the existing ranching operations. The farmers on the Mirage Flats believed that their project of 12,000 acres was too small to encourage the growth of adequate marketing facilities.

Present indications are that in the proposed "Oahe" area in the James River area of South Dakota, where the irrigable land may be somewhat scat-

tered throughout a large area, plans should be made to incorporate these tracts with existing dry-land farms wherever possible. If reliance is to be placed on cash crops, there should be enough irrigable acreage in a relatively compact area to provide enough volume of production to encourage the growth of necessary marketing facilities.

Problems in Converting From Dry-land to Irrigation

In the process of converting from dry-land to irrigation, many new problems arise. Some of these involve the handling of land during the period of transition and providing for increased services, such as new roads and schools necessitated by irrigation development. Consequently, it is desirable to review and evaluate the experiences on the Mirage Flats during the period of transition.

In the original plans for land development work on the Mirage Flats, the Farm Security Administration was to (1) purchase dry-land, (2) rent dry-land during development period, (3) level land and construct farm irrigation system, (4) construct farm improvements, and (5) rent the improved units for five years following the delivery of water. During the time the Government held this land, the Farm Security Administration had planned to use the rental returns to (1) pay the counties and school districts a return in lieu of taxes, (2) create a revolving fund that would be used to pay for the construction of improvements on each of the farm units, and (3) pay for roads and other project improvements necessitated by the new development.

During the 1930's the Resettlement Administration in the Department of Agriculture was authorized to construct farm buildings. When the Case-Wheeler program was initiated, the Farm Security Administration was responsible for the resettlement program. On some of the earlier projects, the Farm Security Administration made loans to cooperatives for the construction of farm buildings on Case-Wheeler projects. When F.S.A. funds were no longer available for this purpose, a request was made for allocation of appropriated Case-Wheeler funds for the construction of farm buildings and farm access roads. The Comptroller General determined, however, that legislation authorizing the Department of Agriculture to develop, settle, and sell irrigated lands on Case-Wheeler Projects did not include authority to construct farm buildings and improve local roads.¹⁴

With assistance of the Farm Security Administration, the local people formed a cooperative organization for

¹⁴This information is based on a letter received from Lloyd R. Reed, Assistant to the Regional Chief of Operations, Soil Conservation Service, U.S.D.A., dated February 2, 1951.

the purpose of leasing the land from the Government and assisting with project development. This became the Mirage Flats Cooperative Association. This association was organized under the non-profit corporation laws of the State of Nebraska. The purpose of the Association, in general, was to establish, administer and participate in a program of rehabilitation of low-income farmers, improvement of farms, soil conservation and soil utilization on a non-profit cooperative basis by the acquisition and operation of such facilities as would contribute thereto.¹⁵

Water was delivered first to a few farms in 1946 while the Association was renting the land. These farms were sold in 1947. During the next three years the farms were sold when they were ready for irrigation.

From 1943 to 1946 the Association rented the lands held by the Government and paid a rental which was equivalent to payments made by the Government to the county and school districts in lieu of taxes. The Association in turn rented the land to individual operators on a share basis, usually one-fourth of the crop. Rents charged the Association were increased after 1946.

As a result of the difference between the rent paid to the Government and the rent received by the Cooperative Association, a surplus accumulated which, along with money borrowed from Farm Security Administration, was used to (1) remodel and repair existing improvements at a cost of approximately \$64,000, (2) build four sets of improvements on new units at a cost of approximately \$6,700 each,

(3) seed brome grass on the ditch banks, (4) buy certified alfalfa seed in order that all farmers on the project would grow the same kind of alfalfa, and (5) make other incidental improvements.

During the 3 years, 1943, 1944, and 1945, the Association was managed by a government employee. In addition to the services of a manager for this 3-year period, the Government paid the necessary bookkeeping costs. From 1946 until the early part of 1950, the Association was managed and directed by local people.

During the period from 1943 to 1945 the Association saved, above expenditures, approximately \$43,000. In 1946, the Association was able to set aside \$29,842 in savings. During the following years, returns to the Association gradually declined as settlement progressed.

The first sale of farms was made in the spring of 1947. Thirty farms were sold to previously approved applicants who had rented land on the project. Twenty-eight farms were sold in 1948; eighteen of these were selected in the drawing held in the fall of 1947. Thirty-five farms were sold in the spring of 1949; thirty of these were selected in the drawing held in the fall of 1948. The remaining eighteen farms, seventeen of which were advertised, were sold in the spring of 1950 with the new operators taking possession on March 1, 1950.

The Cooperative Association paid for construction of four sets of buildings and also improved the old build-

¹⁵Bureau of Reclamation, "Economic Analysis and Re-payment Study of the Mirage Flats Project, Nebraska," March, 1949, page 45.

ings. The Association borrowed money for this purpose. Before the farms were all sold, the Association conveyed its interest in the farm buildings in payment of its note to the Government. When the Association was dissolved in the early part of 1950, it had approximately \$72,000 in cash as well as title to one irrigated farm located near the center of the project.

Considerable controversy arose over the way in which this money should be used. The problem appeared to be whether the money should be used entirely for project improvement or whether some should be distributed on a patronage basis among those who had rented the land during the development period. The new settlers on the project apparently favored spending all the money for project improvement while some of the former settlers favored the latter proposal.

The new settlers felt an acute need for school facilities to take care of increased numbers of children in the area. These new settlers were also under the impression that the Cooperative Association had been organized primarily for the purpose of project improvement.

The older settlers, some of whom were the original land owners and had rented land during the development period, felt that they were entitled to patronage dividends. The by-laws of the organization permitted payment of these accumulated dividends. The original dry-land farmers also argued that Government officials who bought the land originally did so with the understanding that the land would be rented to them during the period of development at a figure

equivalent to their rate of taxes or slightly above. For this reason they felt that they were entitled to a substantial share of the earnings of this enterprise.

In order to avoid similar confusion and misunderstanding on future projects, it is suggested that (1) there be agreement in advance as to how the returns from land rental should be used; (2) all arrangements for the transfer of land be made in writing in order that misunderstanding should not arise from verbal promises; (3) if a cooperative is organized, voting rights should be attached to each irrigation farm, and settlers should join so they will have a voice concerning project development; and (4) administrative machinery be set up to deal with the problem of schools and new roads necessitated by project development. Many of these matters were discussed on the Mirage Flats Project.

New roads are required when the topographic layout of farms is used, although on Mirage Flats no improved roads had to be abandoned. New school facilities are also required to meet the needs of an increased number of families. Payments in lieu of taxes for dry-land conditions are inadequate to meet this need. For example, prior to irrigation, 84 children were attending school; in 1953 approximately 300 children of school age are expected to attend. Many local people suggested that all money collected from rental of land be used for local improvements.

There is need for further study to determine the best method for handling land during the period of transition from dry-land to irrigation. If

the land is to be held in Federal ownership during this period, it appears desirable (1) to pay the original landowner the appraised value as was done on the Mirage Flats which should be sufficient to liquidate all rights of the owner, but (2) to use the difference between payment in lieu of taxes and the rental rate to pay for increased community facilities. It may well be that a conservancy district would be better able to finance local improvements than a non-profit cooperative organization.

When it may not be feasible for the Federal Government to purchase dryland in large blocks, such as in the proposed "Oahe" unit in South Dakota, some other alternative will have to be worked out. One alternative would be to have the farmer responsible for all land preparation work. This procedure results in slow development. It also makes it difficult to change farm boundaries for topographic layout of the irrigation system.

A possible alternative would be to organize a conservancy district, or similar type of organization, which would carry out land development work. A conservancy district would have powers to tax all property within the area. A district, representing all property owners within the area, could borrow money on a long-term basis in order to carry out development work. The cost of land development could then be levied against the farm units and repaid over a period of 40 to 50 years, or whatever length of time was considered feasible by members of the conservancy district.

The ways in which conservancy

districts would gain control of land for development purposes would vary with the physical features of the area to be irrigated. If the irrigable land is scattered throughout a large area, land purchase by the district would be limited. If, on the other hand, there are large blocks of irrigable land in one compact body, there would be need for subdivision into units of 160 acres or less.¹⁶ This subdivision into units with a desirable topographic layout could probably only be accomplished through a complete transfer of ownership.

Another idea for land development which might work out, would be to classify the land so that it would reflect need for land preparation work as well as productivity. On the basis of this classification, a conservancy district or some other quasi-public organization formed by local people could issue land certificates to the original owners in lieu of cash payment. These certificates would represent the number of acres to be bought by the district. These land certificates could carry a priority rating which would permit the original owner to select the 160 acres he wants to retain under irrigation farming.

If this alternative was used, the conservancy district, representing all property owners within the area, could obtain funds for land preparation work by assessment or borrowing. When an area is ready for irrigation the land could be sold at a price which represents the original cost of land plus development costs, or at whatever price the market would

¹⁶Present Federal Reclamation Law requires that water shall not be delivered to more than 160 acres of irrigable land held in one ownership. See 44 Stat. 649, 650, 43 USC 4230.

bring for land ready for irrigation. In the latter case, any gain or loss due to fluctuation in land prices would be absorbed by the district representing the people in the area directly affected by irrigation development. As irrigable land in the area is developed, the original landowner would be permitted to resell the land certificates in excess of the 160 acres he proposes to irrigate. The original landowner would carry part of the cost by holding these certificates.

This method can be illustrated by a simple example. Suppose a farmer owned 640 acres of irrigable land in an area approved for irrigation by the majority of landowners, 320 acres in Class I and the remaining 320 in Class II. The district would issue 320 land certificates for the Class I land, at a price agreed to by the district and the landowner, and 320 for the Class II land, and the landowner would trans-

fer title to the district. If these land certificates were resold to prospective settlers at the market price plus the cost of land-development work, the money received from the sale of this land could then be used for further land development. As development progressed, the original landowners would be allowed to turn in land certificates to the district. It should be emphasized that this represents a hypothetical example of how the problem of land development might be handled. Several questions can be raised concerning this procedure.¹⁷ Answers to these questions would be formulated by local people in the area to be affected.

¹⁷Some questions which arise in considering the above mentioned plan are:

Would landowners receive land certificates and cash in exchange for transferring title to the district?

Would land certificates with priority ratings be issued on only 160 acres which each landowner wishes to retain for irrigation?

When would the land be sold to prospective settlers?
Can state laws be adapted for this kind of arrangement?

Opinions of Settlers

How Can Credit Arrangements Be Improved?

The operators on the Mirage Flats Project were asked to indicate their opinion as to how credit arrangements could be improved. The more important opinions on this question were as follows:

Forty suggested that long-term Farmers Home Administration or similar building loans were needed. They further argued that if the policy of the Farmers Home Administration was to make loans to irrigation farmers, loans at time of settlement rather than several years after the settler begins farming would be much more effective.

Twelve operators suggested that there was need for long-term production credit. They held that credit on a 6-month basis was not adequate for irrigation farming. Their complaint was that bankers too often considered the loans in terms of dry-land farming conditions rather than in terms of the peculiar needs of irrigation farmers. Others said that bankers in the surrounding community provided adequate credit.

Twelve operators expressed a need for livestock credit. They felt that if livestock loans could be made on a longer term basis, buying and feeding operations could be carried out more effectively.

One operator thought the problem was one of avoiding the over-extension of credit. He suggested that credit should be kept in line with earning capacity of the farm. On the basis of his calculations he felt that annual fixed payments should not exceed \$1,000 per year for most farms on the Mirage Flats Project.

Advantages of Being on This Project

The operators were also asked to indicate what they considered to be the chief advantages of being on the project. Seventy operators indicated their opinions on this question.

Forty-six said that the plan of land purchase used was the chief advantage. (This plan called for a 5 percent down payment with the balance payable in 40 annual installments. The rate of interest is 3 percent on the unpaid balance.)

Twelve believed that good land and good drainage were the chief advantages.

Eleven believed that the good supply of water was the main advantage.

Others mentioned the following advantages: certainty of crops, independence, and good cooperation among neighbors.

Disadvantages of Being on This Project

Farmers were also asked to indicate what they believed were the chief disadvantages.

Thirty-eight said that market facilities were inadequate. Nine of these felt that the project was too small and too isolated to build up a market for cash crops. In many cases, cash crops had to be hauled to Alliance or Bayard. The long distance to a supply

center also increased expense and inconvenience of operations. The nearest trade center is Hay Springs which is 15 miles from the center of the project. A term in the mortgage did not permit the land to be used for non-agricultural purposes. This stipulation was believed to have discouraged the establishment of a trading center at a convenient location on the project.

Nineteen operators felt that inadequacy of farm irrigation structures was the main problem. This included difficulties with laterals, turnouts, headgates, drops, etc.

Seventeen believed the problem of farm ditches was the chief disadvantage. The main farm ditches had been made too deep and too wide to be cleaned with ordinary farm equipment. This made it necessary in most cases to fill in the original ditches and construct new ones which could be cleaned more conveniently.

Eight indicated that the local road problem was one of the undesirable features. Five mentioned inadequacy of school facilities. Others mentioned the following disadvantages: the large amount of capital required; poor land leveling; weed problems; railroad problems; not enough farm buildings provided at settlement; poor farm labor available; and too much wheat grown on land prior to irrigation.

Suggestions for Improving Project Development

The operators were asked how the development of the project could be improved. Answers to this question were as follows:

Twenty-one would hold the Federal agency responsible for completing

land leveling for a 2-year period after the operator takes over. Equipment for final land leveling could be left in the community as government property or sold to a cooperative group. In either case, some arrangement could be made to allow individual operators to rent this equipment in order to do the final leveling work.

Six believed that there should be more owner supervision of leveling work.

Seventeen suggested that farm ditches be made smaller or the operator be allowed to put them in himself.

Ten thought that the drawing of numbers for farms should be completed in the fall so the purchaser would have until spring to prepare for moving to the farm.

Ten believed that improvement could be made in the procedures used by the Cooperative Association in handling land during the period of transition.

Eight suggested that the Federal Government should put buildings on each unit.

Six thought that one agency should be responsible for the over-all construction and land preparation work.

Six thought that a convenient area should be set aside for a trade center.

Four suggested that a program for consolidation of schools should be worked out as the project is developed; four thought the water delivery system could be improved.

Others made the following suggestions for improving project development:

All ditch banks should be seeded to brome; Federal supervision should be

discontinued when the unit is turned over to the settler; Ditch bank rights-of-way should be more adequately determined to make cleaning possible; There should be compulsory weed control during the development period; Range land should be made available along with irrigated land; The ditch banks should be leveled for the ditch riders' road rather than take other land for road purposes. This had the advantage of conserving land as well as providing a better road for the ditch rider.

Further suggestions were that: The selection committee should consist of people who have irrigation experience; No capital should be required to qualify for a unit; The land should be rented directly from the government; Proper rotations should be followed during the development period; The number of bureaucrats should be reduced; There should be a board of four or five to supervise development; The operator should be brought in before all the work is completed.

How Should Farm Preparation Work Be Done?

The operators were asked to indicate how they thought the work of preparing the farm should be done. There was general agreement among the operators that the land leveling work should be done by a Federal agency while the design and construction of dwellings and drilling of the well should be done by the owner.

There was a difference of opinion as to who should be responsible for the design and layout of the field irrigation system. The difference appeared to center around the extent and kind of technical assistance to be

provided for this work. Most operators felt that a trained technician should be available to assist with this work. Approximately 42 of the operators felt that this assistance should be limited to an advisory service at the request of the farmer.

It is felt that the results of this study may have application to other irrigation projects under consideration and that groups may find it advantageous to study these observations with that idea in mind.

Appendix

Appendix Table 1. Sample Appraisal Report

UNITED STATES DEPARTMENT OF AGRICULTURE

SOIL CONSERVATION SERVICE

Mirage Flats Project Unit No.
 State: Nebraska
 County: Sheridan

APPRAISAL REPORT

Applicant's name: John Doe Address: Hay Springs, Nebraska
 Vendor's name: U. S. A. Address:
 Description and location of farm:

VALUATION OF LAND

Crop land	Soil type	Class	Topography	Present land use	Adaptable for	Acres	Acre value	Total
Silt Loam		1	L	Irrigated	crops	74.50	\$78.00	\$5,811.00
Very fine Sandy loam		2	S	Irrigated	crops	11.70	70.00	819.00
Very fine Sandy loam		3	S	Irrigated	crops	23.71	50.00	1,186.00
Very fine Sandy loam		6	G	Dry crops		6.43	22.00	142.00
Native hay								
Native grazing								
Forest pasture								
Waste	.18	Roads	2.71			2.89		
Totals (Normal agricultural value of land)						119.23		\$7,958.00

VALUATION OF IMPROVEMENTS

Kind of building	Age	Dimensions	Material	Roof	Foundation	General condition	Present value	Value to farm
Well, depth general description								
Fencing	general description					Rods @ \$	per rod	None
Total value of improvements								
Normal agricultural value of farm including improvements								
Grazing rights	Animal units					net worth per head	Total \$	
This amount capitalized at% gives value for grazing rights								
Mineral rights acres @ \$ per acre								
Total normal value of farm								\$7,958.00

Appendix Table 1. (Continued)

EARNING CAPACITY OF FARM

Earning Capacity of Farm Based on Crop and Pasture Production

From proposed farm plan

Appraiser's estimates

Crop	Acres proposed	Yield per acre	Total production	Normal unit price	Total value	Landlord's share	Value of landlord's share
Alfalfa	32.8	3 T	98.4 T	\$7.00	\$ 688.80	1/2	\$344.40
Barley	21.4	48 B	1,027.0 B	.50	513.50	1/3	171.16
Corn	21.4	43 B	920.0 B	.70	644.00	1/3	214.66
Beans	10.7	24 B	256.0 B	1.95	499.20	1/4	124.80
Potatoes	10.7	190 B	2,033.0 B	.50	1,016.50	1/4	254.12
Wheat dry	3.0	18 B	54.0 B	.70	37.80	1/3	12.60
Fallow	3.0						
Roads, waste & yard	6.23						
Pasture irrigated	10.00						
Total acres	119.23						
				For 20 head for			
				...Mo. at \$5.00 per head	100.00		100.00
				Total gross			
				value of products	\$3,499.80		\$1,221.74

Estimated Landlord's Income and Expense

Income (1)	Expense (2)
Total gross value of products, landlord's share (from crop production table)	Feed, seed
\$1,221.74	Fertilizer
Landlord's share soil conservation benefit payments	Depreciation and repair bldgs., and improvements
Other (specify) Rent Bldgs. 100.00	Taxes
	Insurance
	O. & M. (Irrigation) \$1.50
	Irrigation construction repayment (annual) \$1.70
	Other (specify)
Total income	Total expense
\$1,321.74	\$648.73
Landlord's net share rental income (col. 1 less col. 2)	
\$ 673.01	
Normal agricultural value of farm (Page 15) plus cost of needed improvements	
Est. \$5,500	13,460.00
Percent landlord's net share rental income is of normal agricultural value of farm plus cost of needed improvements	5%

REMARKS: This unit is larger than the average, having 107 acres irrigable farm land. Has no improvements. Estimated cost of improvements under normal conditions, \$5,500.00. Consider a fair value of this unit, without improvements, \$7,958.00.

Date appraised 2/4 1947 (Signed) _____

Appraiser

Date this report prepared 2/4/47

Appendix Table 2. Farm Budget Summary of Income and Expenses—Mirage Flats Assembled by the Bureau of Reclamation

Crops	Unit	Land Use		Yield		Production		Disposition (Value)			
		Irrigated acres	Dry-land acres	Irrigated land	Dryland	Amount	1939-44 Price	Value	Farm	Home	Sales
Corn	Bu.	26	10	30	13	910	.81	737.00	638.00		99.00
Oats	Bu.	8		40		320	.46	147.00	141.00		6.00
Barley	Bu.	21		35		735	.64	470.00	429.00		41.00
Beans	Bu.	8		25		200	2.40	480.00	17.00		463.00
Potatoes	Bu.	11		200		2200	.87	1436.00*	163.00	10.00	1263.00
Alfalfa Hay	Ton	17		2.5		43	9.50	409.00	285.00		124.00
Alfalfa Seed	Lb.	4		110		440	.23	101.00	12.00		89.00
Pasture	AUM	3	15	12	.833	48	1.75	84.00	84.00		
Garden		0.5						75.00		75.00	
Farmstead, roads ditches, etc.		5.5	1								
Subtotal Crops		104	26					3939.00	1769.00	85.00	2085.00
Livestock and Livestock Products:											
		Number		Yield							
Milk cows, B. F.	Lb.	6	150			900	.36	324.00		79.00	245.00
Milk cows, sold	Cwt.	1‡	10			10	8.00	10.00			10.00
Feeder cattle, beef	Cwt.	12	7.25			87	11.35	987.00			987.00
Hogs, pork	Cwt.	24	2.33			56	9.60	538.00		96.00	442.00
Hens, eggs	Doz.	250	12			3000	.25	750.00		30.00	720.00
Hens, sold	Lb.	120	5			500	.15	90.00			90.00
Broilers, sold	Lb.	300	3			900	.15	135.00		18.00	117.00
Subtotal Livestock								2834.00		223.00	2611.00
Total Farm								6773.0	1769.00	308.00	4696.00

*75% of crop saleable.

†Includes repair and maintenance of farm irrigation structures.

‡One every 8 years.

Current Farm Expenses

General:	
Interest cost	\$ 620.36
Taxes:	
Real estate	110.21
Personal	35.87
Insurance	36.75
Auto (Farm share)	141.50
Improvements, Depreciation and Repair	257.50†
Utilities (Farm share)	50.00
Subtotal	\$1,252.19
Livestock:	
Feed	\$ 276.66
Veterinary	18.40
Breeding service	26.00
Death loss	28.10
Purchases	342.65
Subtotal	\$ 691.81
Crops:	
Seed	44.75
Harvesting	143.87
Machinery, Depreciation and Repair	303.69
Tractor power cost	220.98
Subtotal	\$ 713.29
Hired labor	340.00
Total	\$2,997.29

Investment

Land	\$ 7,686.00
Improvements	5,150.00
Machinery and equipment	1,139.00
Livestock, actual value	1,103.00
Feed inventory	431.00
Total	\$15,509.00

Farm Work

Item	Days
Crops	214
Livestock	176
Farm upkeep	69
Total	459
Work by operator	267
Work by family	107
Work hired	85
Total	459

Financial Summary

Receipts	\$4,696.00
Farm privileges	355.00
Total	5,051.00
Farm expenses	2,997.00
Farm income	2,054.00
Farm family living allowance	1,500.00
Available for water charges	554.00
Payment capacity per irrigable acre	5.33

Appendix Table 3. Summary of the Income to Land Method of Analysis of the Payment Capacity of Land on the Mirage Flats Project Used by Bureau of Reclamation

Investment per acre:	
Land	\$ 70.00
Improvements	39.62
Total	\$109.62
Gross crop value (rent) *	\$11.75
Fixed Charges:	
Interest on investment @ 4%	\$4.38
Taxes, 41% of value @ 20.94 mills	0.94
Insurance @ 7.50 M	0.28
Depreciation @ 3%	1.19
Repairs @ 2%	0.79
Management expenses @ 5% of rent	0.59
Total charges	8.17
Payment capacity per irrigable acre	\$ 3.58

*This represents the value of the landlord's share of crop.

Appendix Table 4. Average Annual Net Income on Farm Units With Buildings at Settlement on Mirage Flats Irrigation Project, 1947-50

On the average, livestock and machinery increased by the following amounts. These increases represent part of the Net Income for the year:

	Dollars
Average increase in livestock	981
Average increase in machinery	1037
The average annual payments on real estate were \$1076.	
This is also a part of the year's Net Income	1076
The average cash family living amounted to \$1138 and medical expenses were \$67. These should be added back into Net Income because they were paid out of Net Income during the year	1205
Total of items showing increase	4299
The cash on hand (or in the bank) of the average farmer decreased by \$425. This represents a decrease of his net income	425
The average debt increase was \$1349 during the year. This must be taken off Net Income because it is offset by an increase in assets shown above	1349
The average receipts for off-farm work were \$191. The average annual G. I. benefits were \$188. These must be taken off income because they are included with the increase items shown above	379
Total of items showing decrease	2153
Average annual net income	2146

Appendix Table 5. Average Net Income on Farm Units Without Buildings at Settlement on Mirage Flats Irrigation Project, 1947-50

On the average, livestock and machinery increased by the following amounts. These increases represent part of the Net Income for the year:

	Dollars
Average increase in livestock	1080
Average increase in machinery	1020
The average annual payments on real estate was \$2058. This is also a part of the year's Net Income	2058
The average cash family living amounted to \$977 and medical expenses were \$55. These should be added back into Net Income because they were paid out of Net Income during the year	1032
Total of items showing increase	5190
The cash on hand (or in the bank) of the average farmer decreased by \$1415. This represents a decrease of his net income	1415
The average debt increase was \$1700 during the year. This must be taken off income because it is offset by an increase in assets shown above	1700
The average receipts for off-farm work were \$63. The annual G. I. Benefits were \$941. These must be taken off income because they are included with the increase items shown above	1004
Total of items showing decrease	4119
Average annual net income	1071