1963

Costs and Benefits of Developing the Wagner, Tower, and Greenwood Irrigation Units

F. F. Kerr

Raymond Lund

F.S. 161

Cooperative Extension Service

SOUTH DAKOTA STATE COLLEGE

Costs and Benefits of Developing the Wagner, Tower, and Greenwood Irrigation Units

Developing the Wagner, Tower, and Greenwood Irrigation Units

This fact sheet is designed for two purposes. First it gives specific costs to individual irrigators in the proposed Wagner, Tower, and Greenwood Units. Secondly it gives the dollar value of benefits these persons may expect to receive from irrigation development.

Before discussing these specific irrigation benefits a brief review of the general concept of public development of water resource projects is presented.

Part I presents a brief review of these general concepts.

Part II deals with direct irrigation costs and benefits.

Indirect benefits to the community and associated costs are not evaluated.

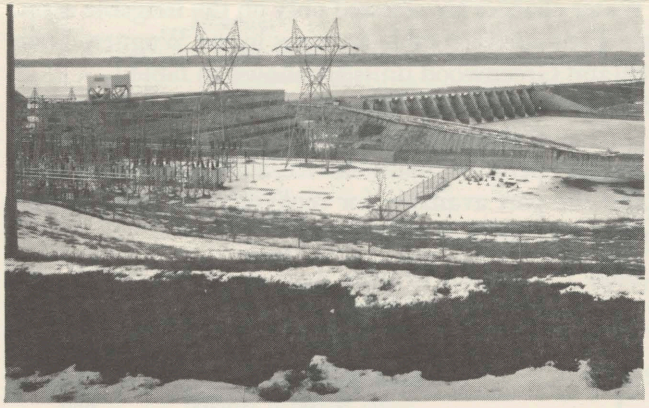
PART I — GENERAL CONSIDERATIONS

WHO PAYS THE COSTS

Publicly financed water resource developments usually include one or more of the following functions:

1. Irrigation
2. Power
3. Flood control
4. Navigation
5. Municipal and industrial water
6. Fish and wildlife conservation
7. Recreation

By *F. F. Kerr,* Extension water resources specialist, and *Raymond Lund,* district specialist, Water Resources Commission



The sale of power generated at the Missouri River reservoirs helps to pay for the cost of irrigation development in the Missouri Basin.

When a project includes more than one function an appropriate share of the costs is allocated to each function. Congress appropriates funds for construction of the projects and also establishes rules as to which costs shall be paid from Federal funds and which shall be repaid by the people who are benefitted. Congress does not require repayment of money spent for navigation, flood control, or fish and wildlife conservation. These are called "nonreimbursable" functions. At times, recreation costs are considered nonreimbursable.

Costs of power projects, and municipal and industrial water projects are reimbursable to the Federal Treasury with interest. Costs of irrigation projects are reimbursable but in this case no interest is charged.

This arrangement is relatively simple if a project includes only "nonreimbursable" functions or only one reimbursable function. However, it becomes quite complex for the Missouri River Basin Project which includes all of the listed functions.

To state the Missouri River Basin Project case as simply as possible, the big "money maker" (power) absorbs a part of the cost of developing irrigation projects that are less able to repay their obligation within a 50-year period. For the Missouri River Basin Project as a whole, power revenues will repay to the Federal Treasury approximately 85% of irrigation costs.

KINDS OF BENEFITS

Decisions to develop, or not to develop, water resource projects usually depend on whether the anticipated tangible benefits will exceed the costs. This is called the benefit-cost ratio.

Two kinds of benefits, direct and indirect, are usually used in the benefit-cost ratio. Of these two kinds,

the direct benefits are the more easily understood and the most important.

Direct benefits are those which are received by the immediate users and thus directly result from the project. An example of direct benefits of the Wagner, Tower, and Greenwood Units is the increased farm income to the irrigator. This increased farm income results from timely application of water to the soils assuring increased and stabilized crop yields and livestock production, more opportunity for diversified crop and expanded livestock production, the opportunity to produce new crops such as sugar beets and vegetables, and "off season" utilization of labor.

Indirect benefits are represented by increased income, above associated costs, which accrue to those who sell to, or buy from, the direct beneficiaries. Examples of indirect beneficiaries are:

1. Dealers who sell additional equipment to, or buy additional products from, the irrigators

2. Added employment resulting from increased and stabilized crop and livestock production on irrigated land

3. Economic community growth stimulated by the increased agricultural production. This might be new or expanded facilities for feed and seed processing plants, commercial livestock feeding or sales plants, sugar refineries, etc.

4. Improved governmental facilities (schools, roads, etc.) resulting from the same mill levy on a larger taxable valuation

These indirect benefits are tangible benefits. You can put your fingers on them and add them up. They are increased profits, wages, and tax income which can be estimated with reasonable accuracy.

Intangible benefits are more difficult to attach dollar values to. What is the dollar value of stabilized production and the effect this has on a community? What is the value of doctors, clinics, libraries, etc., who locate in a prosperous, stable community? It is well nigh impossible to place a dollar value on this type of benefit—but they are there and very real.These intangible benefits are not included in economic justification.

WHO MAKES THE DECISION

The farmer owning land within a proposed irrigation district will make the decision as to whether or not the irrigation unit is to be developed. He decides yes or no, and his decision is final. The farmer will make this decision based on his estimate of whether his dollar returns and future financial security will be improved with irrigation development. The indirect and intangible benefits will have some influence on his final decision, but primarily this decision will be based on the direct, tangible benefits. For this reason Part II of this leaflet is devoted to anticipated dollar returns and dollar costs to farmers in the proposed Wagner, Tower, and Greenwood irrigation units.

PART II — DIRECT COSTS AND BENEFITS

LAND

Land in the Wagner, Tower, and Greenwood Units has been surveyed and classified by the Bureau of Reclamation as irrigable and non-irrigable land. Irrigable land is defined as that land which is suitable for sustained irrigation farming and to which irrigation water can be supplied at a reasonable cost.

Returns from these irrigable lands should:

1. Meet all production expenses, including farm and project operation and maintenance costs.

2. Repay a reasonable return on farm investment.

3. Repay a reasonable amount of the investment in project facilities.

4. Provide a satisfactory level of living for the farm family.

The irrigable land is divided into three economic land classes depending on its ability to pay water charges.

Land Class I includes the best of these irrigable lands with the highest payment capacity.

Land Class II includes the intermediate irrigable lands.

Land Class III includes the less suitable irrigable lands, but which are still able to meet the minimum requirements set forth in the preceding paragraph.

Irrigable land is intermingled with non-irrigable land throughout the units. Estimates are that most farm operating units would be composed of about equal portions of irrigable and nonirrigable acreages. Water charges are assessed only on the irrigable acres.

Estimated irrigable acreages in the Wagner, Tower, and Greenwood units are shown in table 1.

Estimated water charges per irrigable acre and the portion of these charges that would be used to defray annual operation, maintenance, and replacement costs and the part available for repayment of construction costs are shown in table 2.

Table 1. Estimated Irrigable Acres in the Wagner, Tower, and Greenwood Units

Land class	Wagner unit	Tower unit	Greenwood unit
1	3,200	200	660
2	7,700	570	1,350
3	8,600	630	1,540
Total	19,500	1,400	3,550

Table 2. Estimated Water Charges by Land Class

	Land class			Weighted average
	1	2	3	
Wagner Unit:				
OM & R*	$ 6.40	$6.40	$6.40	$6.40
Repayment	5.60	3.40	1.00	2.70
Total	$12.00	$9.80	$7.40	$9.10
Tower Unit:				
OM & R	$ 5.80	$5.80	$5.80	$5.80
Repayment	5.00	3.10	.60	2.20
Total	$10.80	$8.90	$6.40	$8.00
Greenwood Unit:				
OM & R	$ 5.80	$5.80	$5.80	$5.80
Repayment	5.00	3.00	.70	2.40
Total	$10.80	$8.80	$6.50	$8.20

*Operation, Maintenance and Replacement

In Table 3 the irrigation farm is less than half as large in acres as the dryland farm and requires slightly less capital investment. Land was sold from the dryland farm to obtain capital to develop and equip the remainder of the farm for irrigation. Net farm income on the dryland farm was $7,600 compared to $8,900 for the partially irrigated farm. Net farm income with irrigation increased by $1,300 and required a slightly smaller farm investment.

The second set of farm budgets in Table 3 compares a 1,000 acre dryland farm with a 620 acre partially irrigated farm. In this case, the farm acreage was reduced 38% when irrigation was developed and farm investment increased by 13%. However, net farm income with irrigation development increased by 66%. Net farm income on the dryland farm was $15,800 compared with $26,300 on the partially irrigated farm. Net farm income increased by $10,500 with irrigation development, but it also required an additional investment of $19,500.

In Table 4 an average dryland farm of 400 acres for the Wagner Unit is compared with an anticipated average size irrigation farm of 259 acres. This irrigated farm of slightly more than half the acreage of the dryland farm requires $8,000 more investment. Land was sold from the dryland farm to obtain most of the cap-

Table 3. Comparison of Income—Dryland vs. Irrigated Farms, Tower and Greenwood Units

	Average size farm		Larger farm	
	Without irrigation	With irrigation	Without irrigation	With irrigation
Farm size, in acres:				
Dry cropland	296	39	560	104
Other dryland	234	91	440	236
Irrigated	0	110	0	280
Total	530	240	1,000	620
Farm investment:				
Livestock	$11,800	$10,200	$ 23,600	$ 28,900
Machinery and equipment	18,600	21,800	24,900	28,200
Buildings and improvement	20,400	18,800	26,600	27,500
Land	35,100	16,900	66,400	43,600
Land development	0	11,400	0	29,100
Other	2,300	3,200	4,100	7,800
Total	$88,200	$82,300	$145,600	$165,100
Income:				
Crop sales	$ 1,900	$ 4,200	$ 3,600	$ 11,200
Livestock sales	18,900	17,800	37,500	49,800
Total	$20,800	$22,000	$ 41,100	$ 61,000
Expenses:				
Water charges	0	$ 900	0	$ 2,200
Interest	$ 3,500	3,300	$ 5,800	6,600
All other	9,700	8,900	19,500	25,900
Total	$13,200	$13,100	$ 25,300	$ 34,700
Net farm income	$ 7,600	$ 8,900	$ 15,800	$ 26,300
Net farm income per acre operated	$14.34	$37.08	$15.80	$42.42
Hours of family labor	2,500	2,600	3,300	3,400
Hours of hired labor	0	300	700	2,700
Total hours of labor	2,500	2,900	4,000	6,100

Table 4. Comparison of Income—Dryland vs. Irrigated Farms, Wagner Unit

	Average size farm		Larger farm	
	Without irrigation	With irrigation	Without irrigation	With irrigation
Farm size, in acres:				
Dry cropland	310	102	865	285
Other dryland	90	51	255	142
Irrigated	0	106	0	297
Total	400	259	1,120	724
Farm investment:				
Livestock	$ 6,300	$ 9,200	$ 26,700	$ 35,200
Machinery and equipment	15,500	21,900	30,700	35,400
Buildings and improvements	20,300	19,900	27,700	27,600
Land	34,800	22,800	97,500	63,800
Land development	0	10,200	0	28,700
Other	1,500	2,400	5,200	8,000
Total	$78,400	$86,400	$187,800	$198,700
Income:				
Crop sales	$ 3,300	$ 5,600	$ 4,300	$ 20,100
Livestock sales	10,700	13,500	45,200	55,600
Total	$14,000	$19,100	$ 49,500	$ 75,700
Expenses:				
Water charges	0	$ 1,000	0	$ 2,700
Interest	$ 3,100	3,500	$ 7,500	7,900
All other	6,100	7,700	25,600	29,400
Total	$ 9,200	$12,200	$ 33,100	$ 40,000
Net farm income	$ 4,800	$ 6,900	$ 16,400	$ 35,700
Net farm income per acre operated	$12.00	$26.64	$14.64	$49.31
Hours of family labor	2,700	2,800	3,300	3,400
Hours of hired labor	0	100	1,500	4,000
Total hours of labor	2,700	2,900	4,800	7,400

ital to develop and equip the remainder of the farm for irrigation. Net farm income to the dryland farm was $4,800 compared to $6,900 on the partly irrigated farm. Total labor requirements were 2,700 hours on the dryland farm compared with 2,900 hours on the partly irrigated farm.

The second part of Table 4 compares a 1,120-acre dryland farm on the Wagner Unit with a 724 acre partly irrigated farm. In this case 396 acres of the dryland farm were sold to obtain most of the capital to develop and equip the irrigated farm. The dryland farm required $187,800 compared with $198,700 for the irrigated one or $10,900 more investment. Net farm income from the dryland farm was $16,400 compared with $35,700 for the partially irrigated farm, or $19,300 more net income. Total labor requirements were 4,800 hours on the dryland farm compared with 7,400 hours on the irrigated farm.

IRRIGATION BENEFITS TO FARMER

Two principal benefits apply to farmers converting to irrigation. These are:

1. Stabilization of production and income.
2. Increased net farm income.

Stabilization of production and income was investigated by a South Dakota Agricultural Experiment Station study and reported in Bulletin 444. This study showed that fluctuations in income and production would be reduced by 70% on a partially irrigated farm compared to a dry-land farm in east-central South Dakota.

Increased net farm income as shown in Table 3 and 4 is estimated by comparison of farm budgets for representative farms without irrigation and those with irrigation development. Representative farms of the livestock-feeder type were used for this comparison. Crops raised on these representative farms, both without and with irrigation, included corn, sorghum, oats, barley, and alfalfa. Sugar beets were also included on the irrigable farm.

In Table 3 an *average* size dryland farm is compared with an *anticipated average* size irrigated farm and alongside this comparison is another comparison of larger than average farms. These are for the Tower and Greenwood Units.

In Table 4 a smiliar comparison is made for Wagner Unit farms.

Published and distributed in furtherance of the Acts of Congress of May 8 and June 30, 1914, by the Cooperative Extension Service of the South Dakota State College of Agriculture and Mechanic Arts, Brookings, John T. Stone, Director, U. S. Department of Agriculture cooperating.
4M—5-63—37