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### **Irrigation Costs**

Cooperative Extension, South Dakota State University

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Website: [extension.sdstate.edu](http://extension.sdstate.edu)

Phone: 605-688-4792

Email: [sdsu.extension@sdstate.edu](mailto:sdsu.extension@sdstate.edu)

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## Irrigation Costs<sup>1</sup>

This Fact Sheet will give farmers an idea of the comparative costs of gravity and sprinkler irrigation. It is also meant to acquaint farmers with typical considerations which go along with developing irrigation systems in present farm operations. Specifically, these considerations include system efficiency, operating costs, and credit and additional capital needs.

Introducing irrigation on established dryland farms is certain to raise numerous problems and adjustments. First, when the shift to irrigation is considered, the farmer should develop a tentative plan for the changes needed in his operation. The plan should show all changes in the operation and the probable effect on the net income. A farmer should obtain engineering and farm management advice to insure success in planning the operation.

The change in system of farming may mean some farmers will need to learn new skills and management techniques, which differ considerably from dryland methods. The shift from dryland to a partially irrigated-dryland unit involves such questions as how much land to develop; choice of irrigation system; cost of the development; and labor, equipment, and machinery requirements. Farmers should recognize the need for possible adjustments in the livestock and crop program and changes in feed supply, especially during the development period.

### TYPICAL INVESTMENTS IN A GRAVITY AND SPRINKLER SYSTEM FOR A 100 ACRE IRRIGATION UNIT

The method of irrigation has an important bearing on the investment. Examples of the investments in the two methods of irrigation obtained from typical farms in Beadle and Spink Counties are shown in Tables 1 and 2 below.

Table 1 shows investment in a gravity system capable of fully irrigating 100 acres of land. The total investment is \$10,125. The investment includes the cost of developing a 100-foot-deep well with a capacity capable of pumping 1,000 gallons per minute. The cost of the well is \$1,500. The gear head pump and propane motor cost \$3,900 and are depreciated over a period of 13 years. The investment also includes a leveler valued at \$950, a ditcher at \$470, and dams and siphon tubes inventoried at \$305. Land development costs will average \$30 per acre or a total of \$3,000 for 100 acres.

Interest on the average investment is figured at 6%, repairs are figured at 2.5% of the new cost.

Putting the costs on an annual basis, the total cost per year is figured at \$1,506.79. This includes both the

<sup>1</sup>Prepared by J. F. Robinson, Extension Farm Management Specialist  
<sup>2</sup>The data used in this fact sheet was obtained from a study of aquifer irrigation farms in the Beadle and Spink County areas by J. F. Robinson.

# Irrigation Costs

Cooperative Extension Service



fixed and variable costs, applying 18 inches of irrigation water during the season. On a per acre basis, the cost is \$15.07 or \$.84 per acre inch.

Table 1. Investment and Cost Per Acre for a Gravity Irrigation System for 100 Acres

<b>Investment</b>	
<b>Land Development</b>	
Leveling 100 acres @ \$30/A.....	\$ 3,000.00
Well 100' deep—1,000 gal. capacity @ \$15/ft.....	1,500.00
Gear head pump and motor (Propane).....	3,900.00
<b>Field Equipment</b>	
Leveler 9'3" capacity.....	950.00
Ditcher 6'.....	470.00
Dams and siphon tubes.....	305.00
Total investment.....	\$10,125.00
<b>Annual Costs</b>	
Interest on average investment @ 6%.....	\$ 303.75
Depreciation.....	375.00
Taxes 60% of average assessed value—3%.....	91.13
Repairs 2.5%.....	178.13
Tractor use @ \$.50/hr.—(114 hrs.— Ditcher and leveling).....	57.00
Fuel (tractor 216.6 gal. @ \$.24/gal.)..... (propane engine 900 hrs.—4 gal./hr. @ \$.12/gal.).....	51.98 432.00
Oil and grease.....	17.80
Total annual cost.....	\$ 1,506.79
Number of acres irrigated.....	100
Cost per acre irrigated.....	\$15.07
Cost per acre, each 4-inch irrigation.....	3.36
Cost per acre, each 1-inch irrigation.....	.84
Fixed cost per acre irrigated.....	8.27
Variable cost per acre irrigated.....	6.80

Under the sprinkler method (Table 2) the investment includes a \$3,900 sprinkler system consisting of 800 feet of 6-inch main line and 2600 feet of 4-inch laterals. The pump gear head and propane engine cost

\$3,750. The well is of the same capacity as for the gravity system and valued at \$1,500. Interest is figured at 6% of the average investment and taxes at 3% of the average assessed valuation at 60%.

On an annual basis, the investment in the sprinkler layout is \$2,175.71 or \$21.76 per acre inch.

Table 2. Investment and Cost Per Acre for a Sprinkler Irrigation System for 100 Acres

<b>Investment</b>	
<b>Development Costs</b>	
Well 100' deep—1,000 gal. cap. @ \$15/ft.	\$1,500.00
Gear head pump and motor (propane)	3,750.00
Sprinkler—800'—6" main line, 2,600' lateral 4"	4,000.00
Total investment	\$9,250.00
<b>Annual Costs</b>	
Interest on average investment @ 6%	\$ 277.50
Depreciation	763.46
Taxes 60% of average assessed value—3%	83.25
Repairs @ 3%	277.50
Tractor use @ \$.50/hr. (20 hrs.)	10.00
Fuel (tractor—20 gal. @ \$.24/gal.)	4.80
(propane engine 1,120 hrs.—5.5 gal./hr. @ \$.12/gal.)	739.20
Oil and grease—misc.	20.00
Total annual cost	\$2,175.71
Number of acres irrigated	100
Cost per acre irrigated	\$21.76
Cost per acre, each 4-inch irrigation	5.44
Cost per acre, each 1-inch irrigation	1.36
Fixed cost per acre irrigated	11.34
Variable cost per acre irrigated	10.42

Comparing the two systems, the sprinkler system cost \$6.69 per acre more than the gravity system, or \$52 per acre-inch more than the gravity method. These figures give an idea of the comparative investment cost. However, there are many other factors involved. Land usually can be more economically used for surface irrigation, rather than with the sprinkler method, whenever leveling will not materially reduce productivity. On the other hand, sprinkler systems provide greater flexibility in permitting farmers to use larger equipment more easily in field preparation.

#### OPERATING COSTS

Many factors affect the cost of operating irrigation facilities. These costs vary from a few cents to several dollars per acre-inch. The main factors affecting operating costs are amount of use, size of irrigation system, source of water, method of irrigation, kind of crops irrigated, and management.

Use of equipment is important in keeping operating costs low. Fixed costs such as depreciation and interest, if put on a per acre-foot basis, decrease as more acres are irrigated or more water is applied.

The type of irrigation system used affects both the operating costs and investment. The information in

South Dakota referred to previously in which gravity and sprinkler systems were compared generally show highest total costs for sprinkler systems and lowest cost for the gravity siphon method. Sprinkler systems may be used on soils with rough topography, soil underlain by gravel or rocky parent material, or sandy soils where depth of soil makes leveling impractical.

#### EFFICIENCY

Sprinklers generally require more labor and power because of the high pressure required in the sprinkler lines. Sprinkler systems are more efficient in distributing water. Water distribution efficiency is very important in spreading a limited supply of water over larger acreages. There is also less loss of plant nutrient by leaching than other methods if properly handled. Selecting the system that is adapted to your farm will give you the greatest return on your investment.

#### CREDIT NEEDS

Credit is usually needed to help provide for the increased capital investment. Serious consideration should be given to the rate of interest on borrowed capital, plans for repayment, the length of the loan and possibilities of renewal when the loan has reached maturity. The useful life of the irrigation facilities, machinery and equipment should be carefully considered in relation to the life of the loan. Failure to estimate accurately the rates of depreciation, repairs, maintenance costs, and plans for possible expansion may result in financial difficulties. If too slow a rate of depreciation is used, the operator may have to replace equipment before the loan on the original equipment is paid off. The length of the development period is an important factor in determining credit needs. Factors that lengthen the development period are the time it takes to learn how to irrigate, the amount of leveling required, the amount of equipment and additional livestock needed for utilizing the additional feed produced.

#### ADDITIONAL CAPITAL NEEDED

Investment costs per farm and per acre show wide variation because of individual farm differences in topography, source of water, method of irrigation, and size of irrigation system. The major portion of the acreage in Western United States is irrigated by flooding. Consequently, with gravity irrigation, leveling is one of the major investments. If a large amount of leveling is required, it may be more profitable to use a sprinkler system. In developing sources of water, it is usually much more expensive to develop an irrigation well rather than use water from an irrigation ditch such as are developed to distribute water on the Belle Fourche or the Angostura Projects in Western South Dakota.