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Cost Comparison of Alternative Irrigation Systems

Before committing land to irrigation, a farmer should analyze the economic feasibility of an irrigation system. An analysis can be made very early in the planning phase by using estimated costs, which can be refined later as more specific costs are obtained.

To assist the prospective irrigator, the authors have analyzed six system alternatives both for a quarter section of land and for less than a quarter. Summaries of the estimated initial investment, annual ownership costs, and the operating cost for the alternatives are shown in tables 1 and 2.

The investment costs are based on estimates received in West Central Minnesota during November 1980. The energy costs selected are the authors' predictions for 1981 (diesel = \$1.10 per gallon and electricity = 8 cents per kilowatt-hour).

When reviewing the cost comparisons, remember that these are estimates for the systems designed and operated within the assumptions listed at the bottom of each table. For a detailed approach to estimate a specific proposal, review the discussion in the University of Minnesota Agricultural Extension Service Report 150, "Water Sources and Irrigation Economics - DISC," and apply current prices from a local dealer.

Table 1. A Cost Comparison of Alternative Center Pivot Irrigation Systems for a Quarter Section of Land

	Diesel Water	Diesel Electric	Electric Electric	Electric Electric	Electric Electric	Electric Electric (corner)
	Large	Large	Large	Small	Large	Large
	65-55	65-55	65-55	80-55	35-25	70-55
	800	800	800	800	800	900
	130	130	130	130	130	150
Initial Investment Cost						
Well	\$10,800	\$10,800	\$10,800	\$10,800	\$10,800	\$10,800
Pump unit	5,470	5,470	5,470	5,770	4,970	5,770
Power unit	11,775	14,375	7,225	7,655	3,515	7,655
Pipe	4,700	4,700	4,700	4,700	4,700	4,700
Irrigating machine	30,500	38,400	38,400	33,400	39,400	53,200
Fertilizer injector	1,600	1,600	1,600	1,600	1,600	1,600
TOTAL	\$64,846	\$75,345	\$68,195	\$63,875	\$64,985	\$83,725
(Cost per acre)	(\$499)	(\$580)	(\$525)	(\$491)	(\$500)	(\$644)
Annual Ownership Cost						
Capital recovery	\$10,442	\$12,151	\$10,987	\$10,294	\$10,464	\$13,516
Insurance	540	645	574	531	542	729
TOTAL	\$10,982	\$12,796	\$11,561	\$10,825	\$11,006	\$14,245
(% of initial investment)	(16.9%)	(16.9%)	(16.9%)	(16.9%)	(16.9%)	(17%)
Annual Operating Costs (12 inches gross)						
Energy and lubrication	\$ 4,122	\$ 4,432	\$ 3,764	\$ 4,334	\$ 2,840	\$ 4,661
Maintenance	450	500	400	400	400	500
TOTAL	\$ 4,622	\$ 4,932	\$ 4,164	\$ 4,734	\$ 3,240	\$ 5,161
(Cost per acre-inch)	(\$2.96)	(\$3.16)	(\$2.67)	(\$3.03)	(\$2.08)	(\$2.87)
Labor for Irrigating (12 inches)	\$ 540	\$ 540	\$ 510	\$ 510	\$ 510	\$ 588
Annual Cost per Acre Irrigated (12 inches)						
Ownership cost	\$ 84.47	\$ 98.43	\$ 88.93	\$ 83.27	\$ 84.66	\$ 94.96
Operating cost	35.55	37.94	32.03	36.42	24.92	34.41
Labor	4.15	4.15	3.92	3.92	3.92	3.92
TOTAL	\$124.17	\$140.52	\$124.88	\$123.61	\$113.50	\$133.29

Assumptions: 14% long-term interest rate; Energy cost: diesel fuel at \$1.10 per gallon and electricity at 8 cents per kilowatt-hour; Well: 16 inch diameter, 80 feet deep, 30 feet stainless steel screen; 50 feet of pumping lift; Labor: \$6 per hour; Center pivot pipe size: large \geq 6 5/8 inch O.D. and small $<$ 6 inch O.D.; 1000 feet of buried PVC pipe — 8 inch O.D.

Table 2. A Cost Comparison of Alternative Irrigation Systems for Less Than a Quarter Section of Land

Irrigation machine type	Traveller	C.P. Windshield	C.P. Towable	C.P. Towable	C.P. Towable	C.P. Towable
Machine drive	Water	Electric	Electric	Electric	Water	Water
Power unit type	Electric	Electric	Electric	Diesel	Diesel	Diesel
Operating pressure (Psi)	92	63	58	58	58	60
System capacity (GPM)	500	400	450	450	450	650
Acres irrigated	80	65	70	70	70	105
Initial Investment Cost						
Well	\$10,000	\$10,000	\$10,000	\$10,000	\$10,000	\$10,000
Pump unit	5,165	4,370	4,370	4,370	4,370	4,840
Power unit	2,530	3,050	3,050	9,950	7,780	11,010
Pipe	5,800	4,500	4,500	4,500	4,500	8,400
Irrigating machine	12,500	33,400	20,100	20,100	16,500	16,500
Fertilizer injector	1,600	1,600	1,600	1,600	1,600	1,600
TOTAL	\$37,595	\$56,920	\$43,620	\$50,520	\$44,750	\$52,350
(Cost per acre)	(\$471)	(\$876)	(\$623)	(\$722)	(\$639)	(\$499)
Annual Ownership Cost						
Capital Recovery	\$ 6,908	\$ 9,180	\$ 7,015	\$ 8,163	\$ 7,223	\$ 8,399
Insurance	276	469	236	405	348	424
TOTAL	\$ 7,184	\$ 9,649	\$ 7,251	\$ 8,568	\$ 7,571	\$ 8,823
(% of initial investment)	(19.1%)	(17.0%)	(16.6%)	(17.0%)	(16.9%)	(16.9%)
Annual Operating Costs (12 inches gross)						
Energy and lubrication	\$ 2,847	\$ 1,835	\$ 1,864	\$ 2,087	\$ 1,962	\$ 3,338
Maintenance	200	200	200	300	250	250
TOTAL	\$ 3,047	\$ 2,035	\$ 2,064	\$ 2,387	\$ 2,212	\$ 3,588
(Cost per acre-inch)	(\$3.17)	(\$2.61)	(\$2.46)	(\$2.84)	(\$2.63)	(\$2.85)
Labor for Irrigating (12 inches)	\$ 1,152	\$ 300	\$ 330	\$ 354	\$ 354	\$ 530
Annual Cost per Acre Irrigated (12 inches)						
Ownership cost	\$ 89.80	\$148.45	\$103.58	\$122.40	\$108.16	\$ 84.03
Operating cost	38.09	31.30	29.49	34.10	31.60	34.17
Labor	14.40	4.62	4.71	5.05	5.05	5.05
TOTAL	\$142.29	\$184.37	\$137.78	\$161.55	\$144.81	\$123.25

Assumptions: 14% long-term interest rate; Energy cost: diesel fuel at \$1.10 per gallon and electricity at 8 cents per kilowatt-hour; Well: 12 inch diameter, 80 feet deep, 30 feet stainless steel screen; 50 feet of pumping lift; Labor: \$6 per hour; Buried 6 inch PVC pipe.

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