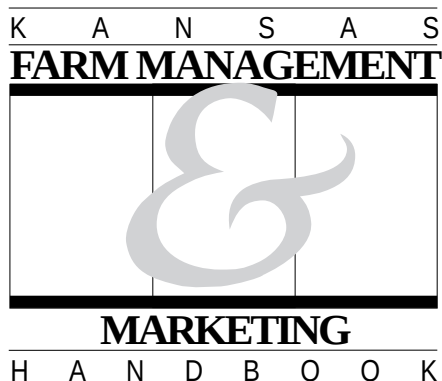




Irrigation Capital Requirements and Energy Costs

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Irrigation allows producers to grow high volume crops that otherwise would not be possible due to low rainfall. In addition, the production risk associated with those crops is reduced. However, producers must weigh the costs of irrigating with the benefits received. The costs associated with irrigation will vary depending on well depth, delivery system, energy costs, and management ability.

Table 1 outlines average capital requirements for those items other than the actual delivery system. The cost of these items will be similar for the different system types. Irrigated land values often include the well, pump and gearhead in the per acre cost. It is beneficial to break this value down into the individual components for budgeting purposes. Also, the well, pump and gearhead costs will generally be the same regardless of how many acres are irrigated. Thus, the well and pump and gearhead per

acre costs change as the amount of irrigated acres increase or decrease.

The value of irrigated land will vary depending on slope and soil type. Flood and drip systems require a relatively flat field whereas pivot systems can operate on rougher terrain. In the following irrigation tables and budgets, total land value was assumed to be the same for flood and center pivot land. However, when well, pump and gearhead costs are subtracted, flood land was priced at a slight premium to pivot land. The cost of the well was based on a 300-foot well, while the cost of the pump and gearhead was based on an 8-inch pump at a 245-foot setting. The motor cost was based on the power required given the depth of the well and the pump used. These costs will increase as the depth and capacity of the well is increased.

Table 1. Irrigation Capital Requirements for Land, Well, Pump-Gearhead, and Power Unit*

Item	Budgeted Total	Acres/Field		Your Farm	
		160 \$ Per Acre	126**	Total	Per Acre
Land	XXXXX	\$ 605.00	\$ 540.00	_____	_____
Well	\$16,500	103.00	131.00	_____	_____
Pump & Gearhead	20,000	125.00	159.00	_____	_____
Power Unit	4,500	28.00	36.00	_____	_____
Water Meter	1,000	6.25	7.94	_____	_____
Connectors	750	4.69	5.95	_____	_____
Total per Irrigated Acre		\$ 871.94	\$ 879.89	_____	_____

* Revised October 1994 and 1995.

**Land value = \$830 - value of well, pump and gearhead.

Irrigation Delivery Systems

The type of delivery system used will have a big impact on the size of the investment. Tables 2, 3, and 4 list average costs of center pivot, flood irrigation (gated pipe), and drip irrigation. While flood and center pivot irrigation systems are very common in Kansas, drip irrigation is relatively new. The costs of all three systems are based on a quarter of ground with the well located at the edge of the field.

There are many factors to consider when comparing the different systems in addition to total investment costs. Some of these are:

1. Available capital;
2. Labor available during growing season;
3. Well capacity;
4. Topography;
5. Soil type;
6. Pumping cost; and
7. Management ability

The investment cost of flood irrigation is significantly lower than center pivot or drip systems. However, labor

requirements can be as much as 1 hour/acre less for a sprinkler system compared to flood irrigation. Well capacity and application efficiencies also need to be considered. Research indicates application efficiency with flood irrigation is generally in the range of 50-75% depending on management abilities.

This application efficiency compares to a range of 75-95% for center pivot and approximately 99 % with drip. Therefore, a more efficient system, if managed properly, may increase yields and/or allow for more acres to be irrigated from the same well.

Topography can also dictate which system is used. Both flood and drip systems require relatively flat land, whereas pivots can be used on uneven terrain. The more efficient systems will also realize larger savings from less water pumped if pumping costs are high. While hard to measure, the producer's management ability is one of the more important factors in choosing which system is best.

Table 2. Capital Requirements: Center Pivot Irrigation System (126 acres)¹

Item	Items by Foot Feet	Price/ft	Other Items	Total	Your Farm Total
Standard 8' Tower Pivot					
System Base Price	1,320		\$32,500		_____
Drops on 60" Spacing			2,100		_____
Low Drift Nozzles			2,400		_____
32" x 11.2 Tires			3,000		_____
Sprinkler System Total				\$40,000	_____
8" Underground Pipe	1,320	\$ 2.40		3,168	_____
Electrical Wiring	1,320	\$ 2.10		2,772	_____
Connectors			\$ 350	350	_____
12 KVA Generator			\$ 2,200	2,200	_____
Total				\$ 48,490	_____
System Costs Per Irrigated Acre				\$ 384.84	_____

¹All charges on an installed basis. Revised October, 1994.

Table 3. Capital Requirements: Flood Irrigation System (160 acres)¹

Item	Items by Foot Feet	Price/ft	Single Items	Total	Your Farm Total
8" Pipe	0	\$ 0.00		0	_____
Gated Pipe	2,640	\$ 1.30		\$ 3,432	_____
Surge Valve			\$ 1,700	1,700	_____
Connectors			150	150	_____
Total				\$ 5,282	_____
System Costs Per Irrigated Acre				\$ 33.01	_____

¹All charges on an installed basis. Revised October, 1994.

Table 4. Capital Requirements: Drip Irrigation System (160 acres)¹

Item	Items by Foot		Other Items	Total	Your Farm Total
	Feet	Price/ft			
8" Mainline Pipe	1,980	\$1.30		\$ 2,574	
8" Submain Pipe	2,640	\$1.30		3,432	
6" Submain Pipe	1,360	\$0.70		952	
4" Submain Pipe	1,280	\$0.61		781	
4" Flushline Pipe	10,560	\$0.61		6,442	
Driptape	1,399,200	\$0.0318		44,495	
Driptape connectors (supply tubing & sleeve locks)			\$3,168	3,168	
2—8" PIP Crosses			147	147	
4—8" PVC wafer butterfly valves			1,336	1,336	
4—8-6"PVC reducers			70	70	
4—6-4" PVC reducers			38	38	
12—4" PVC elbows			117	117	
12—4" PVC removable endcaps			190	190	
PVC glue and solvent			250	250	
Filter—900 GPM, automated sand media			7,974	7,974	
18—Pressure Gauges (0-30 PSI)			390	390	
Trenching	15,180	\$0.675		10,247	
Producer Labor (995 hrs @ \$8/hr)			\$7,960	7,960	
Producer Provided Tractor (62 hrs)			433	433	
Total				\$ 90,995	
System Costs Per Irrigated Acre				\$ 568.72	

¹All charges based on producer installing system. Revised October 1994.

Table 5 compares the total investment required for a quarter of land and all irrigation equipment for center pivot, flood and drip systems. The land cost with a center pivot system is adjusted to include the cost of the

nonirrigated corners. While the total cost of the flood and center pivot are not tremendously different, the number of acres being irrigated needs to be considered.

Table 5. Capital Requirements by Irrigation System¹

Item	Acres = = >		126		160		160	
			Center Pivot		Flood		Drip System	
			/Ac.	/Qtr.	/Ac.	/Qtr.	/Ac.	/Qtr.
Land			\$ 540.00	\$ 68,040	\$ 605.00	\$ 96,800	\$ 605.00	\$ 96,800
Well			131.00	16,500	103.00	16,500	103.00	16,500
Pump & Gearhead			159.00	20,000	125.00	20,000	125.00	20,000
Power Unit			36.00	4,500	28.00	4,500	28.00	4,500
Water Meter			8.00	1,000	6.00	1,000	6.00	1,000
At Well Connectors			6.00	750	5.00	750	5.00	750
System			385.00	48,490	33.00	5,282	569.00	90,995
Total per Irrigated Acre			\$1,265.00		\$ 905.00		\$1,441.00	
Quarter Adjustment ²				\$ 15,640				
Total per Quarter				\$174,920		\$144,832		\$230,545
Total per Acre			\$1,093.00		\$ 905.00		\$1,441.00	

¹Revised October, 1994 and 1995.

²Adjustment is for value of nonirrigated corners.

Pumping Costs

Energy source, price, and Total Dynamic Head (TDH) are the important facts affecting pumping costs. Total

Dynamic Head is determined by the amount of lift, pressure, and any friction losses. Table 6 lists the pumping costs per acre inch at various levels of TDH and different prices of natural gas, diesel, electricity, and

propane.

Table 6. Energy Pumping Cost Per Acre Inch¹

	100	200	Total Dynamic Head (TDH) ²		500	600	700
			300	400			
Natural Gas (\$/mcf)							
\$2.00	0.49	0.99	1.48	1.98	2.47	2.97	3.46
\$3.00	0.74	1.48	2.22	2.97	3.71	4.45	5.19
\$4.00	0.99	1.98	2.97	3.96	4.94	5.93	6.92
\$5.00	1.24	2.48	3.72	4.96	6.20	7.44	8.68
Diesel (\$/gal)							
\$0.50	0.61	1.22	1.83	2.44	3.05	3.66	4.27
\$0.75	0.92	1.83	2.75	3.66	4.58	5.49	6.41
\$1.00	1.22	2.44	3.66	4.88	6.10	7.32	8.54
\$1.25	1.53	3.05	4.58	6.10	7.63	9.15	10.68
Electricity (\$/KWH)							
\$0.04	0.69	1.38	2.07	2.76	3.45	4.14	4.83
\$0.06	1.03	2.07	3.10	4.14	5.17	6.20	7.24
\$0.08	1.38	2.76	4.14	5.52	6.89	8.27	9.65
\$0.10	1.72	3.45	5.17	6.89	8.62	10.34	12.06
Propane (\$/gal)							
\$0.40	0.89	1.77	2.66	3.54	4.43	5.31	6.20
\$0.65	1.44	2.88	4.32	5.76	7.19	8.63	10.07
\$0.90	1.99	3.98	5.98	7.97	9.96	11.95	13.95
\$1.15	2.55	5.09	7.64	10.18	12.73	15.28	17.82

¹Basis for fuel calculations are Nebraska Fuel Test Standards @ 75% efficiency. Revised October 1994 and 1995.

²TDH = Feet lift + $2.31 \times \text{PSI}$ + Friction losses.



COOPERATIVE EXTENSION SERVICE, MANHATTAN, KANSAS

MF-836 Revised

October 1995

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File Code: Farm Management 3-2

10-95—1.5M