

# 2005 IRRIGATION EQUIPMENT COST SURVEY IN KANSAS

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## IRRIGATION EQUIPMENT COST SURVEY IN KANSAS

The Land Use Value Project in the Department of Agricultural Economics at Kansas State University (KSU) conducted an Irrigation Equipment Cost Survey in 2005 by contacting businesses involved in selling and servicing irrigation systems. The survey was conducted primarily over the phone. In some cases, forms were faxed to dealers for completion. Eighteen irrigation well and equipment dealers, and sixteen irrigation engine dealers across Kansas were contacted. Eight dealers chose not to respond. Due to the fact that the majority of irrigation done in Kansas is in the western part of the state, the majority of dealers were located there. Survey questions pertained to different components of irrigation systems (e.g., well, pump/gearhead, underground pipe, pivot) with regards to expected useful life and cost. The survey responses in 2005 reflect data for the 2004 calendar year, and so will be reported as 2004 data. All data were reviewed by irrigation specialists. From the survey results, data were summarized in this paper to increase the information available on irrigation equipment costs. Similar surveys were conducted in 2001 and 1997; each of these surveys collected data for the calendar year prior to the year in which they were conducted. The data from both of these surveys are reported and comparisons made between the 2005 and 2001 surveys.

### **Sources of Irrigation Equipment Costs**

#### Well

Useful life for a well was 28 years in the 2005 survey compared to 16 years in the 2001 survey (Table 1). The well has a depreciable life of 7 years for income tax purposes. Eight well depths were used in gathering costs for new wells in 2005. They were 50', 100', 200', 300', 400', 500', 600', and 700' (Table 2). Well costs appear to have increased for all well depths.

#### Pump/Gearhead

In the 2005 survey, useful life for a pump/gearhead was 28 years compared to 18 years in the 2001 survey (Table 1). The pump/gearhead has a depreciable life of 7 years for income tax purposes. Eight well depths were again used in gathering costs for new equipment in 2005 (Table 3). According to survey results, pump and gearhead costs for all well depths increased.

#### Flood System Underground Pipe

Useful life for underground pipe was 30 years in the 2005 survey compared to 29 years in the 2001 survey (Table 1). For income tax purposes, underground pipe has a depreciable life of 7 years. For 1,320 feet of underground pipe in a food irrigation system the 2005 survey showed a cost of \$3,696. This was a decrease of 7% from the 2001 survey cost of \$3,993 (Table 4).

#### Furrow Flood System/Gated Pipe

For a furrow flood system, useful life was 23 years in the 2005 survey which was the same as the 2001 survey (Table 1). The furrow flood system has a depreciable life of 7 years for income tax purposes. For 2,640 feet of the conventional furrow flood system, the 2005 survey cost of \$11,640 reflected an increase of 32% over the 2001 survey cost of \$8,811 (Table 4). The Surge Furrow Flood System cost in the 2005 survey for 2,640 feet was \$15,419, which was an increase of 25% from the 2001 survey cost of \$12,249 (Table 4).

#### Tailwater Reuse System

Useful life for a tailwater reuse system was 30 years in the 2005 survey which was the same as the 2001 survey (Table 1). For income tax purposes, tailwater reuse systems have a depreciable life of 15 years. The 2005 survey showed the tailwater reuse system to cost \$16,000 which was an increase of 6.7% from the 2001 survey cost of \$15,000 (Table 4).

#### Land Leveling

According to 2005 survey results, the useful life for land leveling was an infinite period of time which was the same as the 2001 survey (Table 1). For income tax purposes land leveling has a depreciable life of 15 years. The 2005 survey showed land leveling to cost \$88 an acre. This cost was the same in the 2001 survey (Table 4).

#### Center Pivot System

For a center pivot system, useful life was 21 years in the 2005 survey compared to 22 years in the 2001 survey (Table 1). For income tax purposes, a center pivot is depreciable over 7 years. For a system used to irrigate a quarter section (approximately 130 acres irrigated), the 2005 survey cost was \$43,350. This reflected a 22% increase from the 2001 survey cost of \$35,567 (Table 4).

#### Center Pivot System Underground Pipe and Wiring

Useful life for underground pipe was 30 years in the 2005 survey compared to 29 years in the 2001 survey (Table 1). For income tax purposes, underground pipe has a depreciable life of 7 years. For 1,320 feet of underground pipe and wiring (UG P & W) associated with a center pivot system the 2005 survey cost was \$8,910. This cost reflected an increase of 2% from the 2001 survey cost of \$8,745 (Table 4).

#### Engines

Power unit information was collected separately for both flood and center pivot irrigation systems because of differences in system power requirements. Center pivot systems generally require an engine with more horsepower than a flood system due to greater system pressure requirements. Table 5 shows the specific horsepower and total dynamic head (TDH) associated with each well depth for each engine type.

#### Natural Gas Engines

In the 2005 survey, useful life for a natural gas engine was 9 years which was the same as the 2001 survey (Table 1). This engine has a depreciable life of 7 years. The eight well depths were again used in gathering costs for all engines in 2005 (Tables 6 and 7). The survey indicated that from 2001 to 2005 natural gas engine costs increased for both flood and center pivot systems with the exception of the 400' well depth center pivot systems where costs decreased.

#### Diesel Engines

Useful life for a diesel engine was 8 years in the 2005 survey which was the same as the 2001 survey (Table 1). The diesel engine has a depreciable life of 7 years. The survey responses indicated that from 2001 to 2005, new diesel engine costs increased for both flood and center pivot systems associated with all well depths, with the exception of the 50' well depth where costs decreased (Tables 6 and 7).

### Electric Engine

For an electric engine, useful life was 15 years in the 2005 survey which was the same as the 2001 survey (Table 1). Electric engines have a depreciable life of 7 years. From 2001 to 2005 the cost of electric engines increased in both flood and center pivot systems across all well depths.

**Table 1. Irrigation Equipment Depreciable and Useful Life Results**

<b>Equipment</b>	<b>Depreciable Life in Years</b>	<b>2005 Survey Average Useful Life in Years</b>	<b>2001 Survey Average Useful Life in Years</b>	<b>1997 Survey Average Useful Life in Years</b>
Well	7	28	16	20
Pump/Gearhead	7	28	18	15
Underground Pipe (Flood and Center Pivot)	7	30	29	30
Furrow Flood System	7	23	23	20
Center Pivot	7	21	22	25
Tailwater Reuse System	15	30	30	30
Land Leveling	15	infinite	infinite	infinite
Nat. Gas/Propane Engine	7	9	9	10
Diesel Engine	7	8	8	10
Electric Engine	7	15	15	15

**Table 2. Well Costs by Depth**

<b>Well Depth</b>	<b>2005 Survey Average</b>	<b>2001 Survey Average</b>	<b>1997 Survey Average</b>	<b>2005-2001</b>	
				<b>\$ Change</b>	<b>% Change</b>
50'	\$6,820	\$4,520	\$5,570	\$2,300	50.88%
100'	\$12,620	\$7,165	\$7,705	\$5,455	76.13%
200'	\$21,220	\$12,195	\$13,160	\$9,025	74.01%
300'	\$27,330	\$17,185	\$17,180	\$10,145	59.03%
400'	\$34,440	\$22,180	\$22,770	\$12,260	55.28%
500'	\$42,550	\$27,170	\$27,700	\$15,380	56.61%
600'	\$44,440	\$32,195	\$32,680	\$12,245	38.03%
700'	\$57,400	\$37,190	\$37,610	\$20,210	54.34%

**Table 3. Pump and Gearhead Costs by Well Depth**

<b>Well Depth</b>	<b>2005</b>	<b>2001</b>	<b>1997</b>	<b>2005-2001</b>	
	<b>Survey Average</b>	<b>Survey Average</b>	<b>Survey Average</b>	<b>\$ Change</b>	<b>% Change</b>
50'	\$12,545	\$11,940	\$9,275	\$605	5.07%
100'	\$16,080	\$13,695	\$11,835	\$2,385	17.42%
200'	\$23,620	\$18,505	\$17,280	\$5,115	27.64%
300'	\$29,770	\$23,310	\$22,535	\$6,460	27.71%
400'	\$38,085	\$28,115	\$28,730	\$9,970	35.46%
500'	\$46,165	\$32,925	\$34,160	\$13,240	40.21%
600'	\$47,705	\$38,085	\$40,170	\$9,620	25.26%
700'	\$54,115	\$42,960	\$45,950	\$11,155	25.97%

**Table 4. Irrigation Equipment Costs**

<b>Equipment</b>	<b>2005 Survey</b>	<b>2001</b>	<b>1997</b>	<b>2005-2001</b>	
	<b>Average</b>	<b>Survey Average</b>	<b>Survey Average</b>	<b>\$ Change</b>	<b>%Change</b>
<b>Flood System Underground Pipe (1,320 ft)</b>	\$3,696	\$3,993	\$3,234	-\$297	-7.44%
<b>Furrow Flood System (2,640 ft)</b>	\$11,640	\$8,811	\$6,845	\$2,829	32.11%
<b>Surge Furrow Flood System (2,640 ft)</b>	\$15,419	\$12,249	\$10,315	\$3,170	25.88%
<b>Tailwater Reuse System</b>	\$16,000	\$15,000	\$10,015	\$1,000	6.67%
<b>Land Leveling (\$/acre)</b>	\$88	\$88	\$76	\$0	0.00%
<b>Center Pivot System</b>	\$43,350	\$35,567	\$37,870	\$7,783	21.88%
<b>Center Pivot System Underground Pipe &amp; Wiring (1,320 ft)</b>	\$8,910	\$8,745	\$5,544	\$165	1.89%

**Table 5. Horsepower Requirements by Well Depth and Energy Type**

	Well Depth	Flood System		Center Pivot System	
		Total Dynamic Head (TDH)	Required Horsepower	Total Dynamic Head (TDH)	Required Horsepower
<b>Natural Gas</b>					
	50'	50	20.7	50	20.7
	100'	100	41.4	100	41.4
	200'	150	62.2	200	82.9
	300'	250	103.6	300	124.3
	400'	350	145.0	400	165.8
	500'	450	186.5	500	207.2
	600'	550	227.9	600	248.6
	700'	650	269.4	700	290.1
<b>Diesel</b>					
	50'	50	20.7	50	20.7
	100'	100	41.4	100	41.4
	200'	150	62.2	200	82.9
	300'	250	103.6	300	124.3
	400'	350	145.0	400	165.8
	500'	450	186.5	500	207.2
	600'	550	227.9	600	248.6
	700'	650	269.4	700	290.1
<b>Electric</b>					
	50'	50	15.0	50	15.0
	100'	100	29.9	100	29.9
	200'	150	44.9	200	59.9
	300'	250	74.8	300	89.8
	400'	350	104.8	400	119.7
	500'	450	134.7	500	149.6
	600'	550	164.6	600	179.6
	700'	650	194.5	700	209.5

At some well depths center pivot has 50 more TDH due to greater system pressure requirements

These requirements are based on a flow rate of 800 gallons per minute

Pump Efficiency = 75%

Engine Derating = 65%

Electric Engine Efficiency = 90%

Flood Irrigated Acres = 155

Center Pivot Irrigated Acres = 130

**Table 6. Flood Irrigation Engine Costs**

Well Depth	2005 Survey	2001 Survey	1997 Survey	2005-2001		
	Average	Average	Average	\$ Change	% Change	
<b>Natural Gas</b>						
50'	\$3,570	\$3,300	\$3,025	\$270	8.18%	
100'	\$3,300	\$2,705	\$3,170	\$595	22.00%	
200'	\$4,315	\$4,055	\$3,340	\$260	6.41%	
300'	\$5,660	\$5,225	\$4,375	\$435	8.33%	
400'	\$9,855	\$9,750	\$8,215	\$105	1.08%	
500'	\$26,690	\$17,905	\$16,665	\$8,785	49.06%	
600'	\$28,738	No Info	\$21,300	\$28,738	No Info	
700'	\$30,785	\$22,000	\$26,700	\$8,785	39.93%	
<b>Diesel</b>						
50'	\$3,755	\$4,020	\$4,560	-\$265	-6.59%	
100'	\$4,825	\$4,430	\$5,615	\$395	8.92%	
200'	\$6,740	\$5,680	\$5,640	\$1,060	18.66%	
300'	\$8,815	\$8,150	\$8,145	\$665	8.16%	
400'	\$10,590	\$9,570	\$11,150	\$1,020	10.66%	
500'	\$13,230	\$12,650	\$13,520	\$580	4.58%	
600'	\$17,435	\$16,505	\$18,885	\$930	5.63%	
700'	\$19,715	No Info	\$19,610	\$19,715	No Info	
<b>Electric</b>						
50'	\$1,080	\$835	\$1,420	\$245	29.34%	
100'	\$1,620	\$1,430	\$2,020	\$190	13.29%	
200'	\$2,260	\$1,995	\$2,580	\$265	13.28%	
300'	\$5,230	\$4,105	\$3,935	\$1,125	27.41%	
400'	\$6,120	\$5,220	\$5,995	\$900	17.24%	
500'	\$8,600	\$4,380	\$7,040	\$4,220	96.35%	
600'	\$9,600	\$5,350	\$9,815	\$4,250	79.44%	
700'	\$10,600	\$8,560	\$9,815	\$2,040	23.83%	



**Table 7. Center Pivot Irrigation Engine Costs**

Well Depth	2005 Survey	2001 Survey	1997 Survey	2005-2001	
	Average	Average	Average	\$ Change	% Change
<b>Natural Gas</b>					
50'	\$3,570	\$3,300	\$3,025	\$270	8.18%
100'	\$3,300	\$2,705	\$3,170	\$595	22.00%
200'	\$4,685	\$4,420	\$3,835	\$265	6.00%
300'	\$5,820	\$5,600	\$5,860	\$220	3.93%
400'	\$12,925	\$13,735	\$11,625	-\$810	-5.90%
500'	\$14,726	No Info	\$20,585	\$14,726	No Info
600'	\$26,195	No Info	\$26,700	\$26,195	No Info
700'	\$37,665	\$27,400	\$26,700	\$10,265	37.46%
<b>Diesel</b>					
50'	\$3,755	\$4,020	\$4,560	-\$265	-6.59%
100'	\$4,825	\$4,430	\$5,615	\$395	8.92%
200'	\$7,400	\$6,990	\$6,745	\$410	5.87%
300'	\$9,960	\$8,825	\$9,720	\$1,135	12.86%
400'	\$12,200	\$11,445	\$13,345	\$755	6.60%
500'	\$15,475	\$14,265	\$17,635	\$1,210	8.48%
600'	\$18,937	\$18,330	\$18,885	\$607	3.31%
700'	\$21,842	\$21,235	\$21,010	\$607	2.86%
<b>Electric</b>					
50'	\$1,080	\$835	\$1,420	\$245	29.34%
100'	\$1,620	\$1,430	\$2,020	\$190	13.29%
200'	\$3,130	\$2,600	\$3,230	\$530	20.38%
300'	\$5,625	\$2,920	\$5,765	\$2,705	92.64%
400'	\$7,740	\$5,735	\$5,995	\$2,005	34.96%
500'	\$10,970	\$8,625	\$7,040	\$2,345	27.19%
600'	\$11,395	\$5,835	\$9,815	\$5,560	95.29%
700'	\$11,820	\$9,500	\$11,800	\$2,320	24.42%