Nebraska Cooperative Extension CC 371
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Estimated Irrigation Costs, 2001

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Irrigation costs were estimated with the aid of the Irrigation System Cost Analysis computer program[1]. Energy prices used in the cost computations are those which were expected to occur in 2001. Irrigation equipment and well drilling costs were collected by a telephone survey from selected dealers. These costs do not include sales tax, personal property tax, insurance, or labor costs for irrigating.

Costs were calculated at four well depths for a gravity system which has an output of 1,000 gpm and irrigates 100 acres. Costs of a low pressure (35 psi) center pivot system with output of 800 gpm and coverage of 130 acres were also calculated for four well depths. The investments required for two example systems are shown in *Table 1*.

Table 1. Component investment costs for example irrigation systems.

	Gravity System	Center Pivot System
System Specifications		
Unit Size (acres)	100	130
Towers		7
Pumping Rate (gpm)	1,000	800
Pressure (psi)	10	35
Lift (ft)	125	125
Total Operation Head (ft)	148	206
Continuous Brake HP required	61	80
Power Unit Size, bhp diesel engine	80	80
System Investment		
Well and site components*		
Well (250') Drilling and Casing	$14,168	$14,168
Column Pipe (200')	8,160	8,160
Fuel Tank, Filter & Fuel Line (2,000 gal)	2,375	2,375
Leveling or Land Shaping	20,000	4,000
Pump Base, Engine Stand	1,683	1,958
Pump		
Pump (Bowls)	2,898	3,335
Gear head and Spicer Shaft	2,085	2,085
Power		
Power Unit (diesel engine)	7,707	7,707
Delivery System		
Pipe (2,970 ft) and Fittings	5,435	-0-
Sprinkler System (7-tower electric drive)	-0-	***34,000
Electric Generator	-0-	2,100
Pipe Trailer	800	-0-
Reuse		
Reuse Pit	**2,162	-0-
Reuse System (Electric Motor Pump & Buried PVC Pipe, ¼ mile, 6")	**8,974	-0-
Total Investment	$76,447	$79,888

* Includes site components for which depreciation is calculated based on years in place regardless of actual use. Leveling and shaping costs are for illustration only. Actual costs will be site-specific.

** Reduced by cost share on pipe and digging pit of $2,477 and $1,698, respectively.

*** 10 Tower C-P System would be about $4,500 more.

[1] *Irrigation System Cost Analysis Version 2001.*

Irrigation ownership costs (depreciation and interest on the investment) were calculated from the investment costs using the depreciation rates reported in *Table 2*. Depreciation was calculated using a zero salvage value for all items.

Table 2. Budgeted Life of Irrigation System Components

	Life*
Well and site	
Well Drilling and Casing	25 yrs
Column Pipe	18 yrs
Electric Switches	20 yrs
Electric Service	50 yrs
Fuel tanks and Lines	20 yrs
Leveling and Shaping	50 yrs
Pump Base and Engine Stand	25 yrs
Pump	
Bowls	15,750 hrs (18 yrs)
Gearhead	13,125 hrs (15 yrs)
Motors/engines	
Natural Gas or propane	5,250 hrs (6 yrs)
Diesel	10,500 hrs (12 yrs)
Electric	17,500 hrs (20 yrs)
Pipe Delivery System	
Pipe	15 yrs
Pipe Trailer	20 yrs
Pivot	
Sprinkler System	13,125 hrs (15 yrs)
Generator	17,500 hrs (20 yrs)
Reuse System	25 yrs

* Components specified with a useful life in hours are depreciated based upon the hours of use. The years to wear-out when pumping 875 hours per year is shown in parenthesis.

Interest was figured at a "real" interest rate of 5.0% on average investment for all items. The "real" interest rate is the market rate less the anticipated rate of inflation.

Irrigation operating costs (energy, lubrication, repairs, and service labor) were calculated using engineering formulas and anticipated 2001 energy prices. Pumping plants were assumed to be operating at 100% of the Nebraska Performance Criteria. Labor for operating irrigation systems was not included here. Energy prices used in the calculations are reported in *Table 3*.

Table 3. Energy Prices and Annual Charges

	Energy	Annual
Electricity	\$.0572 per kwh	\$8.50/hp
Natural Gas	6.10 per 1000 cu ft (MCF)	\$100/well
Propane	.85 per gallon	
Diesel	1.00 per gallon	
Engine Oil	4.00 per gallon	
Gear Drive, Electric Motor Oil	3.60 per gallon	

Interest and depreciation based on years useful life are reported in Tables 4-8 on an annual basis. Depreciation based on hours useful life and energy and repairs are reported per hour and per acre-inch (AI).

Using the Tables:

Example 1. *Budgeted costs of owning and operating a diesel-powered, gravity system pumping 875 hours from 125 feet (lift) are reported as System 2 in* Tables 5 and 6. *What would be the change in costs of adding a reuse system and one-third of the water pumped from the well is retrieved with the reuse system?*

It requires approximately 450 GPM to pump 1 acre-inch of water (1 inch of water applied over each acre). If the system is pumping 1,000 GPM from the well, it will pump 1,000/450 = 2.22 acre-inch (AI) per hour. Therefore, operating the system 875 hours as assumed in *Tables 5 and 6* would result in pumping 2.22 AI per hour x 875 hours = 1,943 AI or 19.43 AI per acre for 100 acres. If 60% of the water pumped remains in the root zone, i.e. a 60% application efficiency, 19.43 × 0.6 = 11.7 AI/acre of the water pumped would be available for crop use. Reducing the number of gates that are opened per set will increase the flow rate per row and using the same set time will push water through the row ends to be captured by the reuse pit. If a 75% application efficiency is achieved and the same 11.7 AI/acre of water applied remains in the root zone, 11.7/0.75 = 15.6 AI/acre or 1560 AI per 100 acres would be pumped from the main well. Pumping from the main well would be reduced from 1943 AI to 1560 AI for a savings of 383 AI. Recovering 1/3 of the water pumped would result in 15.6/3 = 5.2 AI/acre or 520 AI recovered from 100 acres and pumped out of the reuse pit. The cost savings for the main system would be \$0.15 + 0.33 + 0.36 + 1.42 = \$2.26/AI due to reductions in pump depreciation, power unit depreciation, total system repairs, and fuel & oil respectively. See the estimated cost per AI in parenthesis highlighted in *Tables 5 and 6*. At \$2.26/AI, reducing pumping 383 AI would result in a cost savings of \$2.26/AI x 383 AI = \$866 annually. The reuse system costs would be (See *Table 4*):

Depreciation and interest costs	= \$1,010
Repairs and electricity 520 AI @ \$0.63/AI	= 328
Annual connect charges	= 64
Total reuse system costs per year	\$1,402

Therefore, the additional cost of the reuse system exceeds the \$866 savings from the reduced pumping from the well. Either a greater application efficiency would be required (87% would be a break-even in the above example) or an increase in crop yield from more uniform infiltration would be required to pay for the reuse system in this example. The reuse system may still be needed, however, to meet legal requirements concerning runoff.

Example 2. What would the estimated costs be for a diesel-powered, gravity system pumping from 125 feet and serving 80 acres?

Assuming no adjustment is made in pumping capacity, the system costs reported in *Table 5* can be modified to reflect a smaller field based on the pipe used and pumping hours required. The interest costs, for example, are calculated for the system based on $56 interest per year per 1,000 feet of pipe. The pipe cost can, therefore, be adjusted for the total amount of pipe used.

The depreciation on the pump and power unit are assumed to be use-related while the well-site components and pipe are assumed to depreciate regardless of the amount of water pumped. Repairs and fuel and oil costs are also use-related as illustrated below. See repairs and fuel and oil costs per hour next to the highlighted text in *Table 6* , $0.80 per hour for repairs and $3.15 per hour for fuel and oil. Calculating the costs using 2,500 feet of pipe and 700 hours of pumping time is illustrated below:

Interest			
Well and site	=	$1,200	
Pump	=	132	
Power	=	209	
Pipe 2,500 ft @ $56/1,000	=	140	
Interest Subtotal			$1,681
Depreciation			
Well and site	=	$1,606	
Pump 700 hours @ $0.34	=	238	
Power 700 hours @ 0.73	=	511	
Pipe 2,500 ft @ $135/1,000	=	338	
Depreciation Subtotal			$2,693
Repairs 700 hours @ $0.80	=	560	
Fuel & oil 700 hours @ $3.15	=	2,205	
Repairs, fuel & oil Subtotal			$2,765
Grand Total			**$7,139**

The above costs would change if the well capacity were reduced in proportion to the acres served.

Example 3. *What would be the effect upon costs of switching the system in Example 2 to electricity?*

The switching of power sources would involve salvaging the fuel tanks, gearhead, and engine; replacing the engine with a motor; bringing electrical service to the site and wiring the system. The cost differences in owning and operating the two systems can be determined as follows.

	Cost per hour	
Depreciation	Diesel	Electric
Pump including gearhead	$ 0.34	$0.18
Power	0.73	0.16
Power repairs	0.60	0.33
Energy	3.15	2.42
Total	4.82	3.09

The difference in cost per hour of $4.82 – 3.09 = $1.73 for 875 hours is $1,514 per year. The yearly costs based on 2,500 ft of pipe of

	Diesel	Electric
Interest	$1,681	$1,482
Well and site depreciation	1,606	1,554
Annual hookup		425
Total	$3,287	$3,461

reduce the savings using electricity by $3,287 – 3,461 = $174 per year for a total savings of $1,514 – 174 = $1,340 per year. These savings would be reduced if the undepreciated value of the existing system is not realized upon replacement.

Example 4. What are the costs of irrigating an adjoining 80 with a center pivot that is now operated as a half circle?

The system budgeted in Tables 7 and 8 is for a 7-tower pivot that is irrigating 130 acres and operating 875 hours annually. As illustrated in the above example, ownership and operating costs are also shown in the tables by component so that costs can be budgeted for any operating time. Actual fuel (energy) and oil costs would typically be split based on the proportion of the time spent irrigating each 80. Alternatively, for a 125-foot lift and 35 PSI, Table 8 indicates, for example, that 49.72 kw would be used per hour of operation of an electric pivot. The estimated fuel requirement for other energy sources and lifts are also reported in Table 8, both per hour and per AI. In summary, fuel costs can be shared based on the actual fuel consumption or estimated based on hours of operation or the water pumped.

Since actual repair costs vary so much from year-to-year, the owner of the system should be reimbursed for normal repairs regardless of the actual repair experience in a particular year. The total repair costs for this system are estimated to be $0.91 per hour of operation (See Table 8). Also, operation of the system will use up some of the remaining service life of moving parts so that depreciation for the pump, power unit, and pivot should be determined, which for our example are $0.21, 0.22, and $2.58 per hour, respectively (See shaded numbers in Table 7). Costs that will vary with use are therefore estimated to be $0.91 + 0.21 + 0.22 + 2.58 = $3.92 per hour. If a water meter is available, the cost per AI could be used (See numbers in parentheses in Table 7 and 8). Use 27,154 gallons per AI to convert water pumped from gallons to acre-inches.

The $3.92 per hour covers the estimated additional costs of circling the pivot through the adjoining 80. The interest on the investment ($2,040), depreciation on the well ($1,386), and the annual connect charges ($638) would all be incurred whether or not the additional 80 is irrigated with the pivot. How much of these fixed costs that would be shared is negotiable. Certainly the owner must recover some of these fixed costs if irrigating the additional 80 is going to be attractive economically.

Example 5. How does the cost of irrigating at 125 foot lift with a diesel gravity system compare with using a diesel center pivot system?

This comparison requires some assumptions on the area to be irrigated and the efficiency of application for the two systems. In the comparison made here we consider two gravity systems serving 80 acres each versus one center pivot serving 130 acres with 30 acres remaining dryland. Irrigation water applied that remains in the root zone is assumed to be 12 AI/acre for both the gravity and pivot systems. The cost estimates below are based on systems assumed in Tables 5-8. The yield from irrigated acres is assumed the same for both systems.

This comparison indicates the reduced cost from switching to a pivot does not offset the loss in revenue in the pivot corners. This result will depend upon a number of factors including the number of acres each system serves. A 2-bushel yield increase on the 130 acres irrigated by the pivot would make up for the yield loss in the corners in this example.

	Gravity**	Pivot	
Irrigated Acres	160	130	
Head	148 ft.	206 ft.	
Application Efficiency	60%	90%	
Acre-Inches pumped/acre	20	13.3	
GPM	1,000	800	
Pumping Hours	1,440*	973*	
Repairs/hour	$0.80	$1.16	
Fuel and Lube/hour	$3.15	$3.76	
Operator labor, hours/acre	1.5	0.4	
Annual Irrigation Costs			
Interest	$3,378	$2,114	
Depreciation	3,860	4,994	
Repairs	1,152	1,129	Pivot
Fuel and lube	4,536	3,658	Reduced
Labor @ $10/hour	2,400	520	Costs
Total	$15,325	$12,416	$2,909
Pivot Corners	Gravity	Dryland	
Corn yield (bu)	155	90	
Price/bu	$2.40	$2.40	
Revenue/acre	$372	$216	Pivot
Operating cost and use-related depreciation/acre***	$194	$154	Revenue
Net per Acre	$178	$62	Loss
30 Acres	$5,338	$1,860	$3,478

*Pumping hours are calculated based on 1 hour to pump 1 acre-inch at 450 GPM. For example for the gravity system:

$$1\ hour \times \frac{450\ gpm}{1{,}000\ gpm} \times 20\ AI \times 160\ acres = 1{,}440\ hours$$

** Interest and depreciation cost for the gravity system are from *Table 5* using 2 wells, pumps, and power units and 5,280 feet of pipe.

*** Excluding irrigation costs, see Nebraska Crop Budgets EC01-872.

Table 4. 2001 Reuse System Cost: (7.5 bhp electric, 100 acres, 360 GPM or 1.247 hrs/AI)

Interest per year	$349	
Depreciation per year	661	
Annual ownership costs	$1,010	
Repairs per hour (per AI)	$0.31	(0.39)
Electricity per hour @ $0.0572/kwh (per AI)	0.19	(0.24)
Total operating costs per hour (per AI)	$0.50	(0.63)
Annual Connect Charge	$64	

Table 5. Gravity Irrigation Ownership Costs, 2001

(System is 2,970 feet of gated pipe, 19.43 inches water pumped per acre for 100 acres @ 10 PSI, 1,000 gpm, 875 pumping hours, reuse costs listed in Table 4)

	1	2	3	4
Well (feet)	**200**	**250**	**300**	**400**
Column (feet)	**150**	**200**	**250**	**325**
Lift (feet)	**50**	**125**	**200**	**275**
Head (feet)	**73**	**148**	**223**	**298**
Diesel				
System Interest per year @ 5%	**$1,553**	**$1,707**	**$1,895**	**$2,225**
Well and site per year	1,072	1,200	1,327	1,555
Pump per year	106	132	154	192
Power per year	209	209	248	312
Pipe per year per 1,000 ft	56	56	56	56
System Depreciation per year	**$2,668**	**$2,950**	**$3,350**	**$4,027**
Well and site per year	1,379	1,606	1,833	2,229
Pump per hour (per AI)	0.28 (0.13)	0.34 (0.15)	0.40 (0.18)	0.50 (0.22)
Power per hour (per AI)	0.73 (0.33)	0.73 (0.33)	0.87 (0.39)	1.10 (0.49)
Pipe per year per 1,000 ft	135	135	135	135
Electric				
System Interest per year @ 5%	**$1,321**	**$1,508**	**$1,714**	**$1,997**
Well and site per year	1,059	1,194	1,357	1,588
Pump per year	50	76	90	116
Power per year	46	72	101	127
Pipe per year per 1,000 ft	56	56	56	56
System Depreciation per year	**$1,918**	**$2,253**	**$2,607**	**$3,110**
Well and site per year	1,322	1,554	1,825	2,222
Pump per hour (per AI)	0.12 (0.05)	0.18 (0.08)	0.22 (0.10)	0.28 (0.13)
Power per hour (per AI)	0.10 (0.05)	0.16 (0.07)	0.22 (0.10)	0.28 (0.12)
Pipe per year per 1,000 ft	135	135	135	135
Propane				
System Interest per year @ 5%	**$1,419**	**$1,572**	**$1,740**	**$2,018**
Well and site per year	1,010	1,137	1,265	1,493
Pump per year	106	132	148	180
Power per year	137	137	161	179
Pipe per year per 1,000 ft	56	56	56	56
System Depreciation per year	**$2,692**	**$2,974**	**$3,373**	**$3,938**
Well and site per year	1,260	1,487	1,714	2,110
Pump per hour (per AI)	0.28 (0.13)	0.34 (0.15)	0.38 (0.17)	0.46 (0.21)
Power per hour (per AI)	0.90 (0.40)	0.90 (0.40)	1.05 (0.47)	1.17 (0.53)
Pipe per year per 1,000 ft	135	135	135	135
Natural Gas				
System Interest per year @ 5%	**$1,416**	**$1,569**	**$1,735**	**$2,012**
Well and site per year	1,010	1,137	1,265	1,493
Pump per year	106	132	148	180
Power per year	134	134	156	173
Pipe per year per 1,000 ft	56	56	56	56
System Depreciation per year	**$2,674**	**$2,956**	**$3,343**	**$3,908**
Well and site per year	1,260	1,487	1,714	2,110
Pump per hour (per AI)	0.28 (0.13)	0.34 (0.15)	0.38 (0.17)	0.46 (0.21)
Power per hour (per AI)	0.88 (0.39)	0.88 (0.39)	1.02 (0.46)	1.13 (0.51)
Pipe per year per 1,000 ft	135	135	135	135

Table 6. Gravity Irrigation Operating Costs, 2001

(System is 2,970 feet of gated pipe, 19.43 inches water pumped per acre for 100 acres @ 10 PSI, 1,000 gpm, 875 pumping hours, reuse costs listed in Table 4)

	1	2	3	4
Well (feet)	**200**	**250**	**300**	**400**
Column (feet)	**150**	**200**	**250**	**325**
Lift (feet)	**50**	**125**	**200**	**275**
Head (feet)	**73**	**148**	**223**	**298**
Diesel Power Unit bhp	**80**	**80**	**105**	**150**
Repairs				
Power per hour (per AI)	$0.60 (0.27)	$0.60 (0.27)	$0.69 (0.31)	$0.86 (0.39)
Pipe per hour (per AI)	0.20 (0.09)	0.20 (0.09)	0.20 (0.09)	0.20 (0.09)
Total System Repairs per hour (per AI)	$0.80 (0.36)	$0.80 (0.36)	$0.89 (0.40)	$1.06 (0.48)
Fuel & Oil				
Diesel gal per hour (per AI)	1.44 (0.65)	2.96 (1.33)	4.48 (2.02)	6.00 (2.70)
Fuel per hour (per AI) @ $1.00 per gal	$1.44 (0.65)	$2.96 (1.33)	$4.48 (2.02)	$6.00 (2.70)
Engine oil per hour (per AI)	0.08 (0.04)	0.16 (0.07)	0.25 (0.11)	0.33 (0.15)
Oil for gear drive per hour (per AI)	0.02 (0.01)	0.03 (0.01)	0.05 (0.02)	0.07 (0.03)
Fuel and oil per hour (per AI)	$1.54 (0.69)	$3.15 (1.42)	$4.78 (2.15)	$6.40 (2.88)
Electric Power Unit bhp	**25**	**50**	**75**	**100**
Repairs				
Power per hour (per AI)	$0.32 (0.14)	$0.33 (0.15)	$0.35 (0.16)	$0.36 (0.16)
Pipe per hour (per AI)	0.20 (0.09)	0.20 (0.09)	0.20 (0.09)	0.20 (0.09)
Total System Repairs per hour (per AI)	$0.52 (0.23)	$0.53 (0.24)	$0.55 (0.25)	$0.56 (0.25)
Energy & Oil				
Elec KW per hour (per AI)	20.34 (9.15)	41.81 (18.81)	63.28 (28.48)	84.75 (38.14)
Elec per hour (per AI) @ $0.0572 per KWH	$1.16 (0.52)	$2.39 (1.08)	$3.62 (1.63)	$4.85 (2.18)
Oil for Elec Motor per hour (per AI)	0.02 (0.01)	0.03 (0.01)	0.05 (0.02)	0.07 (0.03)
Elec and oil per hour (per AI)	$1.18 (0.53)	$2.42 (1.09)	$3.67 (1.65)	$4.92 (2.21)
Connect Charge Per Well	**$213**	**$425**	**$638**	**$850**
Propane Power Unit bhp	**70**	**70**	**95**	**125**
Repairs				
Power per hour (per AI)	$0.77 (0.35)	$0.77 (0.35)	$0.83 (0.37)	$0.90 (0.41)
Pipe per hour (per AI)	0.20 (0.09)	0.20 (0.09)	0.20 (0.09)	0.20 (0.09)
Total System Repairs per hour (per AI)	$0.97 (0.44)	$0.97 (0.44)	$1.03 (0.46)	$1.10 (0.50)
Fuel & Oil				
LP gal per hour (per AI)	2.61 (1.17)	5.37 (2.42)	8.13 (3.66)	10.89 (4.90)
Fuel per hour (per AI) @ $0.85 per gal	$2.22 (1.00)	$4.56 (2.05)	$6.91 (3.11)	$9.26 (4.17)
Engine oil per hour (per AI)	0.09 (0.04)	0.19 (0.09)	0.28 (0.13)	0.38 (0.17)
Oil for gear drive per hour (per AI)	0.02 (0.01)	0.03 (0.01)	0.05 (0.02)	0.07 (0.03)
Fuel and oil per hour (per AI)	$2.33 (1.05)	$4.78 (2.15)	$7.24 (3.26)	$9.71 (4.37)
Natural Gas Power Unit bhp	**70**	**70**	**95**	**125**
Repairs				
Power per hour (per AI)	$0.77 (0.35)	$0.77 (0.35)	$0.83 (0.37)	$0.90 (0.41)
Pipe per hour (per AI)	0.20 (0.09)	0.20 (0.09)	0.20 (0.09)	0.20 (0.09)
Total System Repairs per hour (per AI)	$0.97 (0.44)	$0.97 (0.44)	$1.03 (0.46)	$1.10 (0.50)
Fuel & Oil				
NGas MCF per hour (per AI)	0.29 (0.13)	0.60 (0.27)	0.91 (0.41)	1.22 (0.55)
Fuel per hour (per AI) @ $6.10 per MCF	$1.77 (0.80)	$3.66 (1.65)	$5.55 (2.50)	$7.44 (3.35)
Engine oil per hour (per AI)	0.09 (0.04)	0.19 (0.09)	0.28 (0.13)	0.38 (0.17)
Oil for gear drive per hour (per AI)	0.02 (0.01)	0.03 (0.01)	0.05 (0.02)	0.07 (0.03)
Fuel and oil per hour (per AI)	$1.88 (0.85)	$3.88 (1.75)	$5.88 (2.65)	$7.89 (3.55)
Season Charge Per Well	**$100**	**$100**	**$100**	**$100**

Table 7. Center Pivot Irrigation Ownership Costs, 2001

(System is 7 tower Pivot, 12 inches water pumped per acre for 130 acres @ 35 PSI, 800 gpm, 875 pumping hours)

	1	2	3	4
Well (feet)	**200**	**250**	**300**	**400**
Column (feet)	**150**	**200**	**250**	**325**
Lift (feet)	**50**	**125**	**200**	**275**
Head (feet)	**131**	**206**	**281**	**356**
Diesel				
System Interest per year @ 5%	**$1,959**	**$2,114**	**$2,315**	**$2,633**
Well and site per year	671	800	927	1,154
Pump per year	117	143	178	204
Power per year	209	209	248	312
Pivot	962	962	962	962
System Depreciation per year	**$4,354**	**$4,637**	**$5,062**	**$5,712**
Well and site per year	1,070	1,297	1,524	1,920
Pump per hour (per AI)	0.31 (0.17)	0.37 (0.21)	0.46 (0.26)	0.52 (0.29)
Power per hour (per AI)	0.73 (0.41)	0.73 (0.41)	0.87 (0.49)	1.09 (0.62)
Pivot per hour (per AI)	2.70 (1.52)	2.70 (1.52)	2.70 (1.52)	2.70 (1.52)
Electric				
System Interest per year @ 5%	**$1,823**	**$2,040**	**$2,224**	**$2,543**
Well and site per year	783	945	1,076	1,356
Pump per year	62	88	114	127
Power per year	72	100	127	153
Pivot	906	906	906	906
System Depreciation per year	**$3,648**	**$4,030**	**$4,362**	**$4,930**
Well and site per year	1,114	1,386	1,612	2,102
Pump per hour (per AI)	0.15 (0.08)	0.21 (0.12)	0.27 (0.15)	0.31 (0.17)
Power per hour (per AI)	0.16 (0.09)	0.22 (0.12)	0.28 (0.16)	0.33 (0.19)
Pivot per hour (per AI)	2.58 (1.45)	2.58 (1.45)	2.58 (1.45)	2.58 (1.45)
Propane				
System Interest per year @ 5%	**$1,827**	**$2,007**	**$2,183**	**$2,532**
Well and site per year	610	737	865	1,092
Pump per year	117	147	178	204
Power per year	138	161	178	274
Pivot	962	962	962	962
System Depreciation per year	**$4,378**	**$4,804**	**$5,200**	**$6,204**
Well and site per year	952	1,178	1,405	1,802
Pump per hour (per AI)	0.31 (0.17)	0.38 (0.21)	0.46 (0.26)	0.52 (0.29)
Power per hour (per AI)	0.89 (0.50)	1.05 (0.59)	1.16 (0.65)	1.79 (1.01)
Pivot per hour (per AI)	2.70 (1.52)	2.70 (1.52)	2.70 (1.52)	2.70 (1.52)
Natural Gas				
System Interest per year @ 5%	**$1,823**	**$2,002**	**$2,178**	**$2,526**
Well and site per year	610	737	865	1,092
Pump per year	117	147	178	204
Power per year	134	156	173	268
Pivot	962	962	962	962
System Depreciation per year	**$4,360**	**$4,774**	**$5,171**	**$6,161**
Well and site per year	952	1,178	1,405	1,802
Pump per hour (per AI)	0.31 (0.17)	0.38 (0.21)	0.46 (0.26)	0.52 (0.29)
Power per hour (per AI)	0.87 (0.49)	1.02 (0.57)	1.13 (0.64)	1.74 (0.98)
Pivot per hour (per AI)	2.70 (1.52)	2.70 (1.52)	2.70 (1.52)	2.70 (1.52)

Table 8. Pivot Irrigation Operating Costs, 2001

(System is 7 tower Pivot, 12 inches water pumped per acre for 130 acres @ 35 PSI, 800 gpm, 875 pumping hours)

	1	2	3	4
Well (feet)	**200**	**250**	**300**	**400**
Column (feet)	**150**	**200**	**250**	**325**
Lift (feet)	**50**	**125**	**200**	**275**
Head (feet)	**131**	**206**	**281**	**356**
Diesel Power Unit bhp	**80**	**80**	**105**	**150**
Repairs				
Power per hour (per AI)	$0.60 (0.34)	$0.60 (0.34)	$0.69 (0.39)	$0.86 (0.48)
Pivot per hour (per AI)	0.56 (0.32)	0.56 (0.32)	0.56 (0.32)	0.56 (0.32)
Total System Repairs per hour (per AI)	$1.16 (0.65)	$1.16 (0.65)	$1.25 (0.70)	$1.42 (0.80)
Fuel & Oil				
Diesel gal per hour (per AI)	2.32 (1.31)	3.52 (1.98)	4.72 (2.66)	5.92 (3.33)
Fuel per hour (per AI) @ $1.00 per gal	$2.32 (1.31)	$3.52 (1.98)	$4.72 (2.66)	$5.92 (3.33)
Engine oil per hour (per AI)	0.13 (0.07)	0.20 (0.11)	0.26 (0.15)	0.33 (0.19)
Oil for gear drive per hour (per AI)	0.03 (0.02)	0.04 (0.02)	0.05 (0.03)	0.07 (0.04)
Fuel and oil per hour (per AI)	$2.48 (1.40)	$3.76 (2.12)	$5.03 (2.83)	$6.32 (3.56)
Electric Power Unit bhp	**50**	**75**	**100**	**125**
Repairs				
Power per hour (per AI)	$0.33 (0.19)	$0.35 (0.20)	$0.36 (0.20)	$0.38 (0.21)
Pivot per hour (per AI)	0.56 (0.32)	0.56 (0.32)	0.56 (0.32)	0.56 (0.32)
Total System Repairs per hour (per AI)	$0.89 (0.50)	$0.91 (0.51)	$0.92 (0.52)	$0.94 (0.53)
Energy & Oil				
Elec KW per hour (per AI)	32.77 (18.43)	49.72 (27.97)	66.67 (37.50)	83.62 (47.04)
Elec per hour (per AI) @ $0.0572 per KWH	$1.87 (1.05)	$2.84 (1.60)	$3.81 (2.15)	$4.78 (2.69)
Oil for Elec Motor per hour (per AI)	0.03 (0.02)	0.04 (0.02)	0.05 (0.03)	0.07 (0.04)
Elec and oil per hour (per AI)	$1.90 (1.07)	$2.88 (1.62)	$3.86 (2.17)	$4.85 (2.73)
Connect Charge Per Well	**$425**	**$638**	**$850**	**$1,063**
Propane Power Unit bhp	**70**	**95**	**125**	**140**
Repairs				
Power per hour (per AI)	$0.77 (0.43)	$0.83 (0.47)	$0.90 (0.51)	$0.94 (0.53)
Pivot per hour (per AI)	0.56 (0.32)	0.56 (0.32)	0.56 (0.32)	0.56 (0.32)
Total System Repairs per hour (per AI)	$1.33 (0.75)	$1.39 (0.78)	$1.46 (0.82)	$1.50 (0.84)
Fuel & Oil				
LP gal per hour (per AI)	4.21 (2.37)	6.39 (3.59)	8.56 (4.82)	10.74 (6.04)
Fuel per hour (per AI) @ $0.85 per gal	$3.58 (2.01)	$5.43 (3.06)	$7.28 (4.09)	$9.13 (5.14)
Engine oil per hour (per AI)	0.15 (0.08)	0.22 (0.12)	0.30 (0.17)	0.37 (0.21)
Oil for gear drive per hour (per AI)	0.03 (0.02)	0.04 (0.02)	0.05 (0.03)	0.07 (0.04)
Fuel and oil per hour (per AI)	$3.76 (2.11)	$5.69 (3.20)	$7.63 (4.29)	$9.57 (5.38)
Natural Gas Power Unit bhp	**70**	**95**	**125**	**140**
Repairs				
Power per hour (per AI)	$0.77 (0.43)	$0.83 (0.47)	$0.90 (0.51)	$0.94 (0.53)
Pivot per hour (per AI)	0.56 (0.32)	0.56 (0.32)	0.56 (0.32)	0.56 (0.32)
Total System Repairs per hour (per AI)	$1.33 (0.75)	$1.39 (0.78)	$1.46 (0.82)	$1.50 (0.84)
Fuel & Oil				
NGas MCF per hour (per AI)	0.47 (0.26)	0.71 (0.40)	0.96 (0.54)	1.20 (0.68)
Fuel per hour (per AI) @ $6.10 per MCF	$2.87 (1.61)	$4.33 (2.44)	$5.86 (3.29)	$7.32 (4.12)
Engine oil per hour (per AI)	0.15 (0.08)	0.22 (0.12)	0.30 (0.17)	0.37 (0.21)
Oil for gear drive per hour (per AI)	0.03 (0.02)	0.04 (0.02)	0.05 (0.03)	0.07 (0.04)
Fuel and oil per hour (per AI)	$3.05 (1.71)	$4.59 (2.58)	$6.21 (3.49)	$7.76 (4.37)
Season Charge Per Well	**$100**	**$100**	**$100**	**$100**