ALABAMA A&M AND AUBURN UNIVERSITIES

ALABAMA COOPERATIVE Extension SYSTEM

ANR-1044

Tow Pivot for Farm or Wastewater Irrigation

This publication describes a typical irrigation system, evaluates its adaptability to Alabama conditions for farm and/or wastewater irrigation, and analyzes its initial and annual cost.

Description

The 40-acre center pivot system in Figure 1 is designed to tow between two pivot points. With this system, a total of 80 acres can be irrigated.

This system uses surface water. For farm irrigation, surface water would be a stream, a creek, or a pond. For wastewater irrigation, surface water would be either a single- or two-stage animal waste treatment lagoon. In areas where wells are practical, well cost should be determined. Whether to dig a well, or to develop surface water, or to use a combination of both will depend on local conditions.

The pumping system in this example uses an electric power source. This should be three-phase power, where available, or single-phase-powered phase convertors, depending on the electrical utility serving the location. Call your electrical supplier for availability of electric power to the site. In some cases, there may be additional line extension charges for service or additional monthly billing charges based on motor horsepower (generally above 50 hp). Discuss these details with your electric power supplier as you begin planning.

Component requirements for the towable system in Figure 1 are basically the same as for a single 40-acre system. The only additional components are the 1,500 extra feet of pipe and the second pivot point. For wastewater irrigation, a float is needed to position the pump suction about 18 inches below the lagoon surface (but above the lagoon floor) to prevent solids pickup.

Adaptability

A tow pivot is practical in many areas in Alabama where large pivots cannot be used because of field size and shape. Towing systems are most adaptable to a multiple crop farm where water demand for each crop occurs at different times during the growing season. This allows using the system on one circle, finishing the crop irrigation there, then moving to a second circle for that crop's seasonal irrigation. An example of this would be a corn-peanut or a corn-cotton situation. In the wastewater situation, a tow pivot allows the reduced labor associated with a pivot to be used in smaller fields.

While the design described in this publication is not necessarily a recommended layout, it is one example. Each farm or wastewater irrigation site must be evaluated on an individual basis to determine the exact design and component requirements and to develop a cost analysis for that particular location.

Cost Analysis

The cost per acre to purchase, install, and operate an irrigation system will depend on the design requirements for each individual unit. When two irrigation sites have similar characteristics, such as water source, land clearing requirements, field size, shape, and elevation, the component requirements and cost analysis of one site may be used to get an idea of the requirements for the second site.

For the example system discussed here, typical initial costs for each component are indicated and annual per acre ownership and operating cost are estimated. Annual costs are calculated for the 20-year useful life of the equipment and for a much shorter 7-year loan repayment period for comparison. Available tax credits, other tax advantages, and federal or state cost-share for animal waste management systems are not figured in this example, but would reduce ownership costs when available.

The loan repayment period for purchasing irrigation equipment is usually much shorter than the 20-year useful life used for calculating ownership cost. When this is true, annual ownership cost based on useful life will underestimate actual cash flow needed to meet loan obligations during the repayment period by as much as 30 to 40 percent. An alternative to direct purchase of irrigation equipment is equipment leasing. This may be

desirable in some cash flow situations. Purchasing used but re-conditioned pivot equipment at 50 to 60 percent of the cost of new may also be an alternative to consider.

A breakdown of component costs is shown on pages 2, 3, and 4 for the irrigation system illustrated on page 2. Annual per acre ownership, including 7-year 9 percent annual interest loan repayment and annual per acre operating costs are also calculated.

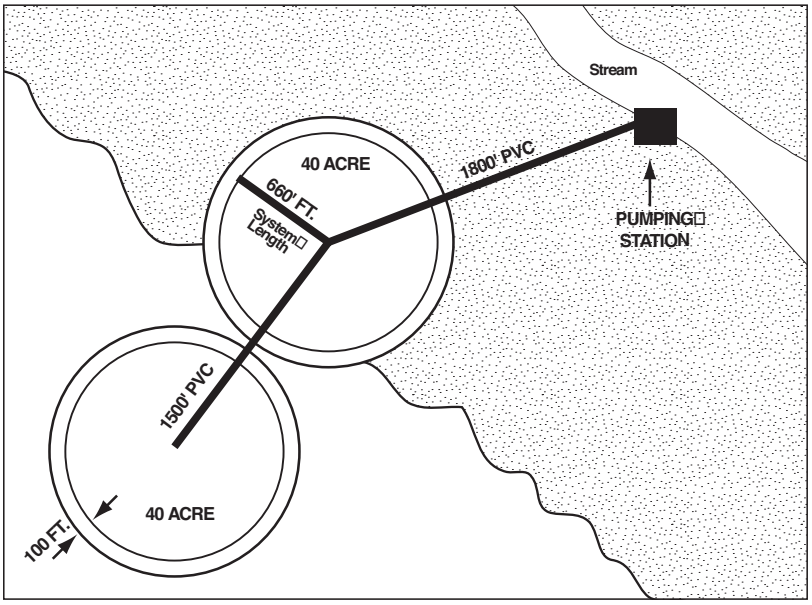

Figure 1. A center pivot irrigation system (80-acre coverage, 2 pivot points).

Cost Analysis of a Center Pivot Irrigation System

	Initial Cost	Years Useful Life	Yearly Depreciation
A. Basic System-Investment Cost			
1. System, Electric Drive * Length = 660 feet End gun coverage = 100 feet	$34,320	20	$1,716
2. Freight, Installation	12,000	20	600
3. Power Unit and Pump, ELECTRIC 23 Horsepower- Minimum Continuous Centrifugal Pump 300 gpm @ 187 TDH	13,466	20	672
4. Generator For Pivot, N/A kw. + 3,300' of safety wire @ $5/ft-	16,500	20	825
5. PVC Pipe (installed) 6 inch 3,280 feet x $7.06/foot	23,157	20	1,158
6. Pipe Valves, Fittings, Concrete	5,000	20	250
7. Miscellaneous (including soil moisture monitoring equipment	3,342	----	----
Total Cost	**$107,764**		**$5,221**
Total Cost Per Acre	**$1,347**		**$65**

B. Annual Ownership Costs	Yearly Costs	Loan Repay
1. Yearly Depreciation (Straight line) OR Annual Loan Payment (7 years @ 9%)	$5,221	21,412
2. Interest on Average Investment (9%)	4,837	----
3. Insurance on Average Investment (.7%)	376	360
Total Annual Ownership Cost	**$10,434**	**$21,772**
Total Annual Ownership Cost Per Acre	**$130.43**	**$272.15**

C. Annual Operating Costs (Per Acre-Inch of Water Applied @ 85% application efficiency)**	
1. Electricity-$0.12 per KWH @ 1188 KWH to NET 1 acre-inch of water	$3.56
2. Bearing Lubrication (15% of power cost)	0.54
3. Repairs-Power Unit (0.06% of electric power unit initial cost, 0.17% for diesel)	0.020
4. Repairs-Irrigation Unit (0.16% of irrigation system initial cost)	1.37
5. Labor ($8.00/hour)	0.1
Total Operating Cost Per Acre-Inch	**$5.77**
Total Operating Cost for Year Requiring 10 Acre-Inches of Water	**$15,050**

D. Annual Total Costs for Owning and Operating an Irrigation System During Year Requiring 10 Acre-Inches of Water Based on Useful Life Depreciation OR 7-year Loan Repay		
Total Annual Cost Per System	**$15,050**	**$26,387**
Total Annual Cost Per Irrigated Acre	**$188.12**	**$329.84**

Additional yield worth at least $188 per acre but closer to $330 per acre would be required to cover the ownership and operating cost for this system. To use this tow pivot between two risers where the crop grown under each needs water at the same time (corn, cotton, peanuts, or a peanut/cotton combination grown under both riser locations) would require increased costs for more GPM (larger pump and motor); 8" buried pipe instead of 6", and increased labor for towing the pivot between risers during each irrigation event. Total investment cost would rise around $20,000 with loan payment increasing proportionally. Total annual cost per irrigated acre would raise the depreciation cost scenario to $208 and to $377 for the loan repay scenario. This would mean more yield response necessary to cover costs.

*System options include end gun, running lights, automatic end gun control, automatic stop, booster pump, sprinkler and towing package, and low pressure shut-off.

**Additional production costs resulting from higher fertilizer rates, additional seed, increased harvesting and drying costs, etc., incurred due to intensified irrigation would also have to be covered in order to offset all additional expenses. Nutrient value of wastewater may reduce higher fertilizer costs.

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Adapted December 1977 from Curtis, Larry M., Larry W. Roberts, and Ted W. Tyson. 1986. Irrigation System Cost Analysis '85 - '86. Timely Information EE85-86-2. Alabama Cooperative Extension System. Auburn University, AL.

For more information, call your county Extension office. Look in your telephone directory under your county's name to find the number.

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