Energy Prices Are Topsy-Turvy But Irrigation Still Pays The Bills

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Increased energy costs ratchet up farming costs in many ways: diesel to run our equipment is higher and cost is added to fertilizers, drying, and hauling prices. However, for the irrigator the highest fuel bill on his farm is probably the one for running those irrigation pumps.

Also, energy costs are frustratingly fickle making it hard to strategize. Three weeks ago I wrote an article saying not to choose propane power units, and instead use diesel if electricity wasn't an option. Since then diesel prices have risen 70 cents a gallon, now making propane more economical then diesel. With higher fuel costs and volatile prices the first reaction may be to cut irrigation off. However, doing so would be like throwing the baby out with the water. Irrigation is still paying for itself.

One excellent way to examine the bang we are getting for our irrigation buck is to look at the irrigation use efficiency (IUE). IUE is the amount of supplemental yield we get from irrigation divided by the inches of irrigation water applied. For example, assume a farmer made 180 bu/ac inside his pivot, 115 bu/ac in the dry pivot corners, and had applied 10 inches of irrigation water. IUE would be (180 bu/ac – 115 bu/ac) / 10 in = 6.5 bu/ac per inch.

IUE is a good analysis tool since it isolates the investment cost of pumping along with its derived yield benefit. The cost of pumping an acre-inch of water depends on (a) fuel source and (b) method of irrigation. Electricity still remains the cheapest energy source. The most recent survey (Mar 12, 2008) of fuel costs in Southeast Missouri (SEMO) is seen in Table 1.

The cost of water for pivots will be higher then the cost for flood irrigation due to the added pressure requirements. Although individual situations vary, the average cost for an acre-inch of water for pivot and flood based on the above fuel costs is seen in Figure 1. Costs range from a low of $0.95 per ac-in for electricity on flood to a high of $3.66 for diesel (500 gallon bulk) with pivots.

The important question now is whether the added yield we make from each acre-inch offsets the costs in Figure 1. Data from the annual Bootheel Irrigation Surveys (BIS) seems to indicate that it does. First, Table 2 shows IUE data from these surveys.

Table 3 shows the gross returns stemming from an acre-inch of irrigation water. Using a low commodity price (the left hand side on each commodity column) we see that gross returns for the four crops range from a low of $10.09 (for full-season soybeans) to $18.88 (for cotton). Using the high commodity price, more typical of current prices, the range is $23.74 (for full-season soybeans) to $37.76 (for cotton). Clearly, even when using low commodity prices, all crops showed profit, even with the most expensive irrigation water, the pivot on diesel.

Actually, the expected gross returns per acre-inch of irrigation could actually be higher then shown in Table 3, especially for soybeans. This is because the dataset used to estimate IUE goes back to 1997 when irrigated soybean yields were not like they are today.

Although the above argues for applying irrigation, almost every year in SEMO there will be certainly irrigated fields that make no more, or even less, yield then the dryland portions of that field. Even the best irrigators find that this occasionally happens to them. Using BIS data since 1997 we see that number of instances when dryland yields were as great or greater then irrigated yields was 4.0 percent for double-crop soybeans, 5.6 percent for corn, 8.2 percent for full-season soybeans, and 9.3 percent for cotton. However, even when factoring in these off years, and even with the current high energy costs, irrigation remains profitable. Averaging the commodity values in Table 3 (the higher ones is used since it is closer to today's prices) and using $3.66/acre-inch, which represents the highest possible water cost, we see that the returns on pumping costs are about 700 percent. Δ

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Table 1. The cost per fuel unit for various sources.

ELECTRIC	DIESEL (500 gal load)	DIESEL (7,000 gal load)	PROPANE
$ 0.11 / kwh	$ 3.52 / gal	$ 3.39 / gal	$ 1.97 / gal

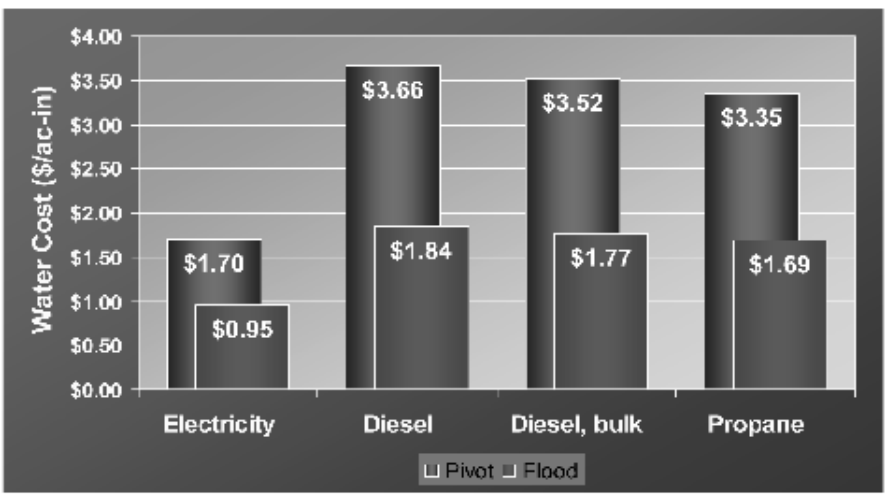

Fig. 3. – The cost of an acre-inch of water for flood and pivot systems for various energy sources. Costs are based on a pump efficiency of 50% (except electric on flood which is 45%). Pump efficiencies could be as high as 75%, which would decrease the costs 1/3. Motor and engine efficiencies assumed to be average.

Table 2. Irrigation Use Efficiency for the Southeast Missouri region, 1997 - 2005 (Bootheel Irrigation Survey)

CORN	COTTON	SOYBEAN (full season)	SOYBEAN (double crop)
8.0 bu/ac/in n = 145	47.2 lbs/ac/in n = 81	2.4 bu/ac/in n = 62	3.1 bu/ac/in n = 105

Table 3. Value from 1 Acre-Inch of Irrigation Water based on a Low and High Commodity Prices, Southeast Missouri region, 1997 - 2005

CORN		COTTON		SOYBEAN (full season)		SOYBEAN (double crop)	
$2.25 / bu	$4.00 / bu	$0.40 / lb	$0.80 / lb	$4.25 / bu	$10.00 / bu	$4.25 / bu	$10.00 / bu
$ / acre-inch of irrigation							
$ 17.94	$ 31.89	$ 18.88	$ 37.76	$ 10.09	$ 23.74	$ 13.35	$ 31.41