

# Energy Costs to Pump Water

Electricity and diesel fuel are the most common energy sources for pumping irrigation water. During the last 18 months, the cost of farm-delivered diesel fuel has increased tremendously. Irrigators with diesel- or propane-powered pumps will see their pumping costs for the coming growing season almost double, compared with just two years ago. Irrigation electric rates have stayed relatively constant during the last three years and probably won't increase much.

Figures 1 and 2 show the costs of pumping 1 acre-inch of water for a high-, medium- and low-pressure pumping plant. These graphs apply mainly to center-pivot sprinkler systems that obtain water from wells, and since the water has to be applied to the field, the energy to power the center pivot (whether electric or hydraulic) has been included in the pumping costs.

## Electric Pumping Costs

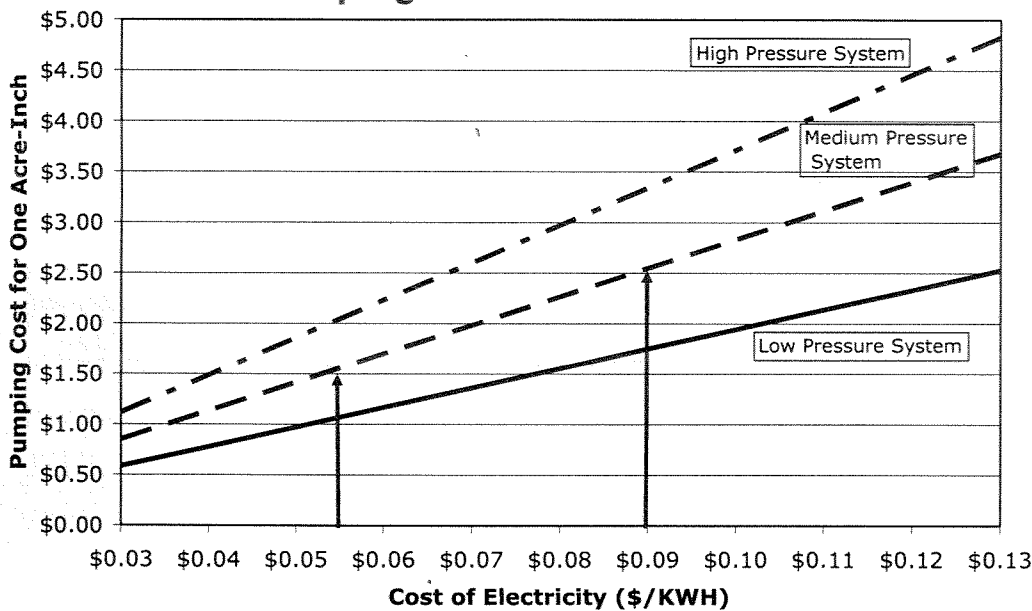


Figure 1. Electric pumping costs for a high-, medium- and low-pressure irrigation pumping plant. The two arrows show the pumping costs for 5.5- and 9-cent-per-kwh electricity on a medium-pressure pumping plant are \$1.50 and \$2.50 per acre-inch, respectively.

## Diesel Pumping Costs

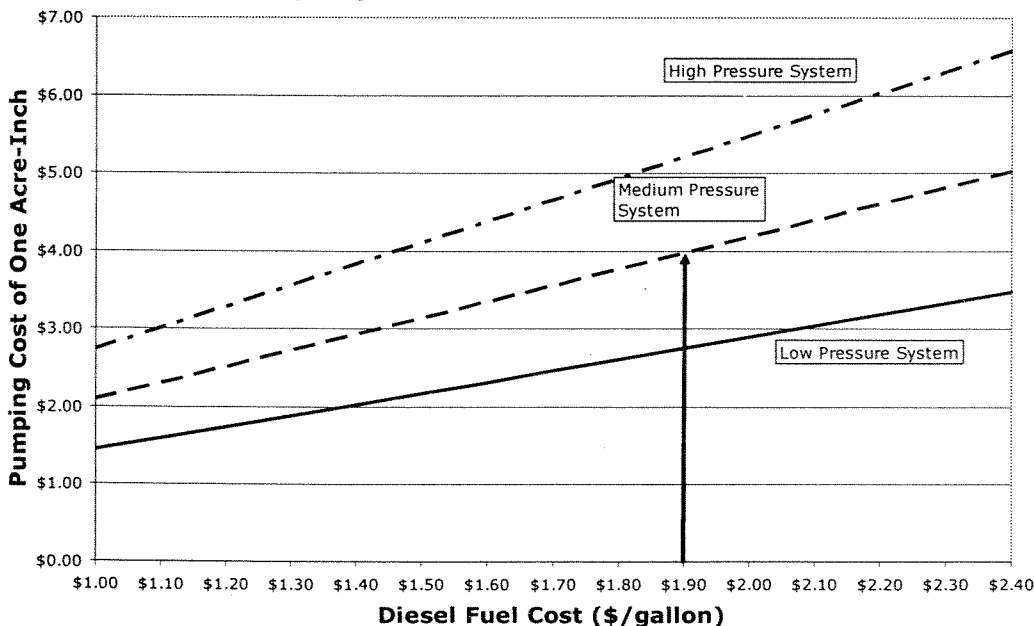


Figure 2. Diesel pumping costs for a high-, medium- and low-pressure irrigation pumping plant. The arrow shows that with farm-delivered diesel fuel cost of \$1.90 per gallon, pumping an acre-inch of water through medium-pressure irrigation system will cost \$4.

## **Fertilizer**

- Proper nitrogen management of malt barley is critical.
- The general guideline for nitrogen application is 1 to 1.2 pounds of total nitrogen per bushel of yield goal. Excess nitrogen will cause high protein and may lead to lodging problems.
- The amount and uniformity of fertilizer application are important factors. The nitrogen must be used prior to the plant reaching the milk stage. Nitrogen options include urea, ammonium sulfate and anhydrous ammonia. Make a selection based on individual conditions. Although more costly, urea may allow for a more uniform application.
- The nitrogen may be broadcast and tilled into the soil or applied in a band offset from the seed row during planting. Producers seem to prefer the broadcast method.
- The desirable soil test level of phosphate should be above 16 parts per million, but a somewhat lower level may be acceptable. Potassium should be above 200 parts per million. Many producers apply fertilizer prior to or during seeding.

## **Irrigation (water requirements)**

- A high-yielding barley crop that will meet malt specifications requires a total of 16 to 18 inches of effective moisture per year. The actual amount used will vary, depending on field and climate conditions, which requires an accurate irrigation scheduling program.
- Although the effective depth of the root system is 36 to 42 inches, for irrigation scheduling purposes, it should be considered to be about 24 inches under center pivots.
- The moisture content of the soil under pivots should be maintained slightly below field capacity to allow for storage of precipitation. The critical times are tillering (two- to four-leaf), heading and early seed fill. Depending on the growth stage, research has shown the yield can be reduced by 2 percent to 6.4 percent for every 10 percent reduction in water use resulting from soil moisture deficits below 50 percent allowable depletion, even for short times. Use an irrigation scheduling method.

- Limited moisture at tillering will reduce the number of heads, and a moisture deficit at flowering will reduce the number of kernels per head.
- The soil should be moist to at least 18 to 24 inches at planting.
- The peak water use will be 0.3 to 0.35 inch per day. To achieve the requirement, the pumping rate through a low-pressure center pivot irrigation system should be approximately 7.5 gallons per minute per acre irrigated. Lower pumping rates of 6 to 8 gallons per minute per acre may be adequate under normal temperature and rainfall.
- If the amount of rainfall is very low in warmer years, the irrigation system likely will run continuously from late May or early June until the crop reaches the soft dough stage.
- The irrigation should be discontinued at the soft dough stage with the soil profile filled to field capacity to achieve the best yields. In areas where fusarium head blight is a concern, consider making adjustments in irrigation water management.
- On sandy soils with relatively low-moisture holding capacity, irrigating after the soft dough stage may be necessary. However, this will increase the potential for disease, lodging and kernel staining.

## **Weed control**

- A number of herbicides are available to control most weeds in barley. The North Dakota State University Extension Service's latest "Crop Production Guide" provides a guide for herbicide selection, or contact a crop consultant. Wild oats may be a dominant problem due to the inability to separate them from the barley.

## **Fungicide**

- At least one fungicide application may be necessary to control fusarium, which may occur during the boot stage. Inspect crops and consult with a chemical company representative. Be sure to vary chemistries of all pesticide applications to delay resistance.