Reversible Tile Subsurface Drainage and Irrigation

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There are more than 900,000 acres of class IIw land and 800,000 acres of class IIIw land in Kentucky. All of this land is suitable for row crop farming if it can be drained. Most of the problems are with internal drainage, some of which can be improved by installing drainage tile.

A system that is being tested by the University of Kentucky and the Soil Conservation Service on some farmers' fields is the reversible irrigation-drainage system using these same underground drainage tiles. During wet weather, the tile outlets are left open to allow excess water to drain out. Then, during the growing season before the soil becomes dry, the outlets are closed and water is forced back through the tile to wet the soil by maintaining the water table. The irrigation-drainage system requires a closer tile spacing, a good water supply and a method of controlling the water level in the drain outlets.

The water table in poorly drained soils is low during dry weather and high during wet weather. A good irrigation-drainage system can be used to control the depth of the water table to provide water for crops but keep the soil from becoming too wet. The water table is controlled by either of two methods:

1. Controlling the water level in the ditch into which the tiles drain. Water is allowed to drain from the ditch in wet weather. In dry weather, gates in the ditch are closed and water is pumped into the ditch and forced back through the tiles.

2. Using a "header stand" which is connected in manifold fashion to the tile outlets. The water level in the tiles is controlled by raising or lowering the header stand. During wet weather the header stand is lowered to allow water to drain from the tiles. The header stand is raised during dry weather and water is pumped back into the tiles to water the crop.
These irrigation-drainage systems are energy efficient because they operate under low pressure. The pump only moves water into the ditch or header stand. Water is forced back through the tiles by gravity. The average irrigation-drainage system will require about ten percent of the energy of a center pivot irrigation system. Since the irrigation-drainage system stores the water in the soil, there is some leakage and about ten percent more water is needed than with most overhead systems require.

The irrigation-drainage system of irrigation is in use on at least 3 farms in Kentucky. Although basically the same, each system is designed differently because each situation is different. Two of the systems were designed by the Soil Conservation Service. All three systems seem to be working well and controlling the water table. Although no direct comparisons have been made, farmer results indicate that yields will be similar to those expected from surface irrigation systems. Corn yields observed from the three systems in operation have been 160 bu/ac and above. The one system that has been in operation the longest is an older system originally installed for drainage only. The drainage ditch was plugged and a pump was installed to pump water from the ditch during wet weather and reversed to pump water from the river into the ditch as the weather dictates. This system that was in operation during the very dry year of 1983 produced about 190 bu/ac of corn. The results in other states such as Michigan and the Carolinas are very encouraging also.

It appears that this system has some potential for use in Kentucky. However, the requirements are very specific. The soil must be poorly drained and respond well to tile drainage. There must also be a source of water (river, stream, or well) of sufficient capacity. Research on one of the systems in Kentucky is continuing and should give us a better understanding of the potential in the near future.

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