

Managing Water Resources of the Seymour Aquifer Using Subsurface Drip Irrigation

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Executive Summary

A long-term management program for water conservation and utilization is essential if irrigated production agriculture is to survive in the Texas Rolling Plains. Subsurface drip irrigation (SDI) is the most efficient (nearly 100 percent) water delivery system to roots of plants and can be considered one component of precision agriculture. Frequently, crop yields equal or exceed those of some traditional irrigation methods while requiring less water, thus saving valuable water resources. The Seymour Aquifer is a fragmented, shallow aquifer that underlies portions of the Texas Upper Rolling Plains and whose recharge is mainly through rainfall. During dry seasons, excessive pumping can deplete underground water resources to the point that wells are no longer functional. Also, during these dry periods, a lowering of the water table often results in reduced water quality; i.e. increased salinity. An additional problem is that nitrates levels in the ground water frequently exceed government standards for water quality.

Due to SDI's water delivery efficiency and labor savings, SDI will play an increasing role in Rolling Plain's agriculture in the near future. The goal of the proposed study is to maximize crop production through prudent management of limited ground water resources that results in economic gain for producers and rural communities. The objective of the current effort is to develop a SDI system at the Chillicothe Research Station to educate producers, through science-based research, on the benefits and utility of SDI as an alternative and superior irrigation technology to less efficient traditional systems (particularly furrow) currently in use.

Initial efforts were to 1) identify and prepare the SDI site at the Chillicothe Research Station, 2) develop additional groundwater resources (well) to augment existing water resources and thereby dedicate a well to SDI research, and 3) construct a building near the drip site to house electronic controllers, sand media filters, pumps, valves, acid injection equipment, and a storage tank. Following completion of these items, plans to bid the installation of 72 individually-controlled SDI research plots at the Chillicothe Station will be developed in November through December 2005. Installation should commence this winter with the system completed prior to the 2006 planting season. Initial research will focus on deficit irrigation as a means to enhance water-use efficiency and conserve ground water resources. Research results from SDI plots at the former Munday Station showed that a 50 percent reduction in irrigation water (based on Potential Evapotranspiration) resulted in only a 20 percent reduction in yield. Deficit irrigation combined with conservation tillage could potentially extend the groundwater resources of the Seymour Aquifer and perhaps mitigate nitrate movement within the soil profile. Additional research is needed to verify early results on deficit irrigation in a second cotton production region of the Rolling Plains.

Current Progress

A 15-acre site was identified and kept fallow throughout the summer of 2005. A new well was completed and tied into existing underground mains (see figure below). This allowed an older, but higher capacity well, to be dedicated to SDI research, and will permit drip research to be expanded to an additional 15 to 20 acres in the future. The higher capacity well is located near the control building and should reduce installation costs since electrical power is adjacent to the new building. In addition, underground water mains will only be a short distance from the well to the controller building which further reduces installation costs. The foundation of the controller building has also been completed (see figure). By establishing the location of the building, bidders will be able to better determine installation costs. During the preliminary phase of SDI development, a technician was assigned to help in completing some of the ground work. A significant portion of the grant funds were used for technical help.

Drip irrigation was showcased at the Chillicothe Fall Field Day with nearly 200 participants. Representatives from a SDI company were on hand to answer producers' questions. One news article: "Drip Irrigation Opens New Frontier for Research on the Rolling Plains" (AgNews-News and Public Affairs, TAMU System Agricultural Program, Oct. 18, 2005) was written concerning the proposed SDI research effort at Chillicothe. Another news article is being prepared emphasizing the potential of this new irrigation technology.

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