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UPDATE ON DRIP IRRIGATION

James P. Bordovsky
Texas Agricultural Experiment Station
Lubbock/Halfway, TX

Abstract

Irrigated cotton producers in the Texas High Plains will continue to face declines in the availability of irrigation water due to the depletion of the Ogallala Aquifer, increases in pumping costs and/or changes in water policy. The most efficient irrigation method available in this area is subsurface drip irrigation (SDI). SDI has been successfully used for over 20 years in Howard and Glasscock counties where pumping capacities have been very low for years. SDI is currently used on approximately 150,000 of the 2,000,000 acres of irrigated High Plains cotton with producer interest increasing due to limited irrigation water, the development and promotion of new SDI products, and increases in State and Federal matching funds for the installation of water efficient irrigation systems.

Phenomenal cotton yields have been produced with SDI systems. At the Texas Agricultural Experiment Station at Halfway, one 4-acre experimental area produced in excess of 2000 lb lint/ac in 2002 with total irrigation of only 15.15 inches. At the same location, after harsh spring weather in 2003, production averaged 1882 lb lint/ac with 17.31 inches of irrigation. High cotton yields, however, were not limited to SDI systems as production under LEPA irrigation in certain tests have also exceeded 3.5 bales per acre at the TAES facility in both 2002 and 2003. In addition, the use of SDI does not guarantee high lint yields. Problems with poor crop germination, emitter plugging, and the lack of understanding related to crop input management have resulted in cotton yields of less than 1000 lb/ac on SDI fields in the area.

Research is being conducted at the TAES research facility to address issues related to water use efficiency of SDI compared to other irrigation systems, crop germination in dry years, crop input management, root zone management, and SDI system maintenance. Research has shown that relative lint yields of low elevation spray and LEPA to be 70% and 85%, respectively, of SDI at irrigation capacities of 1.8 gpm/ac, and 80 and 88% of SDI, at 3.6 gpm/ac irrigation capacity. Simulated "zero rainfall" at planting showed that alternate furrow SDI could germinate cottonseed planted in a 40-inch bed with 6 inches of pre-plant irrigation. However, plant germination of only 70 to 80% occurred in a 40-acre SDI field following pre-plant irrigations of 7 inches in the rain short years of 2002 and 2003. Over the past two growing seasons, the SDI management strategy of concentrating limited crop resources in a smaller area (high input) produced significantly higher lint yields than spreading those inputs over a larger area (normal input). Numerous experiments have highlighted that the root zone of SDI irrigated cotton, particularly at limited irrigation capacities, can be quite small and the successful management of inputs, from nutrients to irrigation scheduling following rainfall, requires recognition of this basic fact. In an unplanned research study in 2002, manganese plugged SDI emitters were cleared by injecting H_2O_2 in 6.5-pH irrigation water at elevated system operating pressures. The SDI system remained clean through 2003 with continuous injection of low levels of H_2O_2 in buffered irrigation water.

Continued research will help develop criteria for optimum placement and management of SDI in the Texas High Plains and ultimately increase the value of our limited water resources.