Crop Yield and Financial Investment of Sub-Surface Drip Irrigation over the Life of the System

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Historically, information in North Carolina has been limited comparing corn (*Zea mays* L), cotton (*Gossypium hirsutum* L.), and peanut (*Arachis hypogaea* L.) response to sub-surface drip irrigation (SDI) and the financial viability this approach to water delivery. A SDI system was installed in North Carolina on a Norfolk loamy sand soil near Lewiston-Woodville in 2001 to determine response of these crops to SDI in various trials through 2013. In this abstract we discuss results over the life of the system (13 years) when comparing SDI to dryland production. Over the life of the system (e.g., 13 years), the number of crop cycles for corn, cotton, and peanut was 5, 11, and 7, respectively. Peanut in North Carolina often are grown in rotation with corn and/or cotton with at least 2 years between peanut plantings. The ratio of years of corn and cotton to peanut was 2.3:1 over the 13 years. However, plantings during the 13 years were not designed to represent a consistent rotation sequence of these crops and reflect individual experiments that were important at the time.

Cost of installing the system was estimated at $1,619/acre with cost of installation annualized over 13 years for a yearly cost of $125/acre. Annual maintenance was set at 3% of installation cost for a yearly cost of $49/acre. Total cost of SDI was $174/acre. Fixed and variable costs other than SDI for corn, cotton, and peanut was set at $453/acre, $613/acre, and $925/acre, respectively. Low, medium, and high pricing structures were compared for corn, cotton, and peanut. Low, medium, and high price for corn was $3/bushel, $5/bushel, and $7/bushel, respectively. Prices for cotton in these respective structures was $0.6/lb lint, $0.8/lb lint, and $1/lb lint. The low, medium, and high price for peanut was $0.24/lb, $0.27/lb, and $0.3/lb, respectively. Estimated financial return for each pricing structure was calculated as the product of crop yield and price, minus total cost of production including SDI.

Corn yield was 150 to 240 percent greater in years 2008 to 2011 under SDI compared with dryland production while cotton yield under SDI was 130 to 220 percent greater than dryland production in six of 11 years. Peanut yield was 120 to 150 percent greater under SDI than grown without irrigation in four of 7 years. When pooled over years, corn yield was 85 bushels/acre under dryland production and 136 bushels/acre under SDI. Cotton yield for these respective irrigation treatments was 800 pounds/acre and 1050 pounds/acre. Peanut yield increased from 3010 pounds/acre to 3600 pounds/acre when SDI supplemented rain. No significant difference in estimated financial return was noted regardless of pricing structure when comparing dryland and SDI systems. When estimated financial return was pooled over years and crops, there was also no difference noted for the low and medium pricing structures. Total revenue in the SDI system across crops and years was $-4589/acre (low prices), $-89/acre (medium prices), and $4386/acre (high prices). Revenue across crops and years for dryland production was $-3974/acre, $-668/acre, and $2616/acre for these respective pricing structures.