ECONOMIC AND RISK ANALYSIS COMPARISON OF COTTON TILLAGE SYSTEMS WITH DIFFERENT IRRIGATION LEVELS

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Abstract

Identifying management practices that conserve and protect water resources while improve economics returns and reduce economic risk are very important to a wide variety of stakeholders within semiarid environment. The southern US Great Plains region is facing challenges for the declining water resources. An economically efficient irrigation system and cropping practice that save soil moisture, reduce soil wind, and water erosion is significant valuable in the region.

The objective of this study was to develop an economic and risk comparison of four cotton production systems, Conventional tillage, Reduce tillage, No-Till, and No-Till with Cover Crops for different water management strategies in Vernon, Texas. Three irrigation levels given the percentage of evapotranspiration irrigated were used: Low, Medium, and High. Cotton production results from previous treatments done for 11 years by Dr. Paul DeLaune (2008 to 2018) at the Texas A&M Research Center located in Locket, Texas, were used in this analysis for Low and Medium Irrigation levels, and 9 years for High Irrigation levels.

Enterprise budgets for the Rolling Plains area in Texas were used to calculate the net income of each production system. Empirical distribution for production yields were used from previous 11 years yields for each production system and each irrigation level. Net income results for each production system and irrigation level were simulated using a Monte Carlo simulation model given each yield's empirical distribution. Risk alternatives were ranked for risk averse decision makers using the Stochastic Efficiency Respect to a function model. Absolute risk aversion coefficients were calculated based on the net income mean of each irrigation level. Results indicate higher net income for No-Till and No-Till with Cover Crops in most irrigation levels, even with a higher risk aversion coefficient.

Low level irrigation results indicate a significant higher net income for No-Till with Cover Crops (126.69 $/acre), No-Till (128.74 $/acre), and Reduce Till (101.67 $/acre) production systems when compared to Conventional tillage (52.85 $/acre). No-till with Cover Crops premium decrease by only 10.52 $/acre when compared to Conventional Till for extremely risk averse decision makers (Risk Averse Coefficient of 4), probably due to the benefits of the cover crops reducing the evapotranspiration and increasing water retention in a low irrigated environment. Other production systems premiums reduction were greater when compared to Conventional tillage. No-Till production system premium decreased 81.52 $/acre and Reduce Till production system decreased 26.97 $/acre decision makers with a risk aversion coefficient (RAC) of 4.

Medium level irrigation results indicate a significant higher net income for No-till (240.43 $/acre) and No-Till with Cover Crops production system (209.57 $/acre) when compared to Reduce Till (151.78 $/acre) and Conventional Till (145.50 $/acre). All premiums per acre declined for extremely risk averse decision makers although No-Till and No-Till with Cover Crops still positive when compared to Conventional tillage. No-till with Cover Crops premium decrease by 10.61 $/acre, No-Till production system premium decreased 43.41 $/acre and Reduce Till production system decreased 37.58 $/acre.

High level irrigation results indicate a significant higher net income for No-Till (242.62 $/acre) and Reduce Till production system (228.23 $/acre) when compared to Conventional Till (192.79 $/acre) and No-Till with Cover Crops (200.47 $/acre) when water was not a limitation. All premiums per acre declined for extremely risk averse decision makers. No-Till and Reduce Till still have positive premiums when compared to Conventional Tillage. No-Till crop risk premium decrease by 29.78 $/acre for extremely risk averse decision makers while Reduce Till premium decreased by 26.75 $/acre.