

Yield Variability and Irrigation: Analysis of Irrigated Corn Production Adoption Decisions in Alabama

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Corn prices and production are increasing due to expanding ethanol markets and related supports for corn production. Persistence of this trend will likely lead to adoption of more intensive production practices and expansion of corn acreage to marginal areas. Alabama, unlike many traditionally agricultural states, has relatively abundant water supply that permits sustainable irrigated crop production but may also strain the natural resources. It is therefore important to know how private (producer) decisions on adoption of irrigated practices are likely to be affected by market conditions (prices, costs) and producer characteristics (risk attitudes, production scale and mix).

The use of simulated yield data for this research is necessitated by the absence of reliable irrigated yield data from the area with predominantly rainfed crop production. The variability of simulated yields is derived from inter- and intra-annual climate/weather variability. The simulated yield series, combined with enterprise budget data on variable costs for both practices, irrigation investment costs, and other economic data, are used to generate stochastic profits from corn production. Based on these profit data, profitability of irrigated and rainfed corn production is compared for different assumed producer risk attitudes, corn prices, and interest/internal discount rates. Viability/Profitability comparison is done on the basis of certainty equivalent profits calculated by calibrating a CARA utility function parameters for different risk premium values.

Comparison of the simulated and historic yield series provides some evidence of their similarities. The results of profit analysis show that the certainty equivalent profit premium from irrigated production increases with risk aversion and with output prices. Raising corn prices magnifies rainfed yield volatility more than that of irrigated yield, making irrigated production more desirable. According to numerical simulation results, investment in irrigation does not pay off at the price of \$3.25/bu at all reasonable risk premiums and discount rates but becomes preferable for relatively low risk aversion levels when the price reaches \$3.75/bu. Adoption of irrigated production is quite profitable at the current high prices of about \$4.75/bu, even when the yield data are transformed to proxy for farm supports, which reduces yield variability and makes the cheaper rainfed production more attractive.

These results may help explain the observed lack of irrigation in Alabama. They also can be useful in evaluating (the effects of) potential adoption of corn irrigation practices in areas with traditionally low irrigation levels due to the expanding ethanol markets.

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