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Technology Adoption under Heterogeneity and Uncertainty: the Case of Bt-cotton Production in Karnataka, India

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Abstract

Bollworm resistant Bt cotton varieties were introduced in India in 2002 with great expectations with regard to a reduction in the use of insecticides.

A panel of 100 early adopters of Bt cotton in Karnataka State in South India was studied to investigate the adoption and productivity of the new varieties. Data used in the analysis is from farm level interviews with early adopters conducted in 2002/2003 (the first Bt cotton season) and the same group of farmers supplemented by a control group in 2004/2005. The impact of Bt varieties on insecticide use and output is assessed using production function analysis within a damage control framework. In addition, a stochastic partial budgeting model is used to assess the net benefits of different bollworm control options. The assumptions for this modelling exercise are partly derived from the descriptive findings of the case study. Furthermore, the marginal productivities from the econometric modelling have been linked to the simulation model.

Contrary to widespread perceptions, results indicate considerable pesticide overuse and good damage control effects at low levels of insecticide use and for Bt and non-Bt cotton users. Simulations to assess the comparative performance of different pest management strategies indicate that potential pest damage and potential yield are important determinants of pest control profitability. The model confirms the observed disadoption behaviour for Bt varieties among many farmers in Karnataka state. The simulation results also suggest that need based integrated pest management (IPM) strategies outperform other strategies in most of the scenarios.

Keywords: Bt-cotton, India, panel data, production function estimation, stochastic simulation