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Bt Cotton - Productivity Considerations from India and China

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Abstract

By 2002 the global area planted to Bt cotton has reached 2.2 Mill ha and transgenic varieties become increasingly popular in developing countries. The main cotton producing countries China and India gave commercial approval for Bt cotton in 1997 and 2002, respectively and today Bt varieties have reached an estimated 50 % of the total cotton area in China. The Bt technology aims at preventing crop loss due to lepidopteran cotton pests, hence reducing the application of chemical pesticides and lowering production costs.

Previous studies, which assess the technology, claim a sharp reduction in pesticide use accompanied by significant human health and environmental benefits. But none of these studies captures long-term productivity effects or the stochastic nature of main parameters. A recent study on Bt cotton productivity in India does not even consider the production costs and product prices at all. Moreover, the validity to generalize study results from one region is questionable and analyses mainly based on short-term empirical studies might lead to wrong conclusions about the net benefits of Bt crops.

The analysis presented in this paper uses farm level data from Bt case studies in China and India (financial support was provided by the FAO). Based on plot level input data for cotton, production functions are estimated separately for each country. A damage control function following the approach of LICHTENBERG and ZILBERMANN is incorporated to account for the special nature of the Bt trait that is not directly yield increasing but prevents pest induced crop loss.

To adequately assess the farm level economic viability of the Bt technology it is necessary to account for uncertainty of main parameters. Some variables fluctuate following an underlying probability distribution (e.g. pest pressure and precipitation which determine the required irrigation or pesticide application and hence influence production costs). These variables are included as stochastic parameters in the simulation of gross margins.

The approach presented here complements existing analyses by including uncertainty aspects in the assessment of Bt cotton productivity.

Keywords: Bt cotton, productivity, technology assessment, uncertainty