The Determinants of Farmer Bt-Cotton Technology Adoption Behavior in China

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Abstract: Since having been first approved for commercial production in China in 1997, Bt-cotton planting area has increased rapidly from 2000 hectares in 1997 to 15 million hectares in 2001. To identify the determinants of this rapid extension, this paper examined farmer Bt-cotton technology adoption behavior using an updated rural survey database collected by the Center for Chinese Agricultural Policy (CCAP) during 2000 — 2001. The updated survey data came from a set of interviews of 428 cotton farmers who plant Bt-cotton, Non-Bt-cotton or both. The sample encompassed cotton farmers from eight counties in Henan, Anhui and Jiangsu Provinces, and covered the two major cotton-producing regions with the highest and lowest rates of bollworm infection: the Yellow River, Huai River and Hai River valley plain, and the middle and lower reaches of the Yangtze River valley, respectively. In addition to farmers' Bt-cotton adoption data during 2000 — 2001, the survey also collected basic socio-economic data in the counties surveyed, including population, arable land, farmer education level, non-agricultural labor, and agro-ecological indicators. Probit and Tobit models were used to estimate the effects of various factors on farmers' Bt-cotton adoption behavior.

The Probit model was used to explain the discrete Bt-cotton adoption choice (adoption vs. not adoption), whereas the Tobit model was used to explain the choice of the proportion of Bt-cotton area to total cotton area. The basic empirical conclusions are as following: 1) The higher output / input ratio of Bt-cotton is one of the most important reasons farmers adopted it. The average yield of Bt-cotton is 402 kg • hm^{-2} higher than that of non-Bt-cotton, whereas the average input of Bt-cotton is only 1402 Yuan • hm^{-2} higher than that of non-Bt-cotton. 2) Reduction in the quantity and frequency of pesticide application required to control bollworm was another main factor behind that farmers' choice to adopt Bt-cotton. The average required quantity of pesticide input for Bt-cotton is 37.5 kg • hm^{-2} less than that of non-Bt-cotton, and Bt-cotton requires on average 12 applications of pesticides less than non-Bt-cotton. 3) Level of farmer education significantly and positively affected Bt-cotton adoption rates; the higher a farmer's level of education, the earlier he adopted Bt-cotton and the larger the proportion of his total cotton area planted Bt-cotton. 4) Risk-reduction appeared to be another key motivation driving the adoption of Bt-cotton. Our econometric results indicated that heavy infection of bollworm in the first year had a significant and positive impact on the proportion of farmers who planted Bt-cotton the following year.

Key words: Bt-cotton; farmer; technology; adoption; behavior