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GM Crops and Poverty Reduction

by

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GM Crops and Poverty Reduction

To the Editor:

Despite the increasing use of genetically modified (GM) crops around the world¹, agricultural biotechnology remains contentious in some countries, especially in Europe². Influenced by biased reports, Europeans tend to overrate GM crop risks, while underrating the benefits³. Claims that the technology is needed to ensure food security and poverty reduction are often considered empty promises and are dismissed as industry propaganda. On the contrary, there are widespread public concerns about negative social implications in developing countries⁴. The GM crop opposition in Europe is hurting European farmers and researchers⁵. More seriously, through trade relations and lobbying efforts of anti-biotech groups, European attitudes spill over to developing countries, where they seriously impede biotechnology developments as well⁶. Hence, it is important to rectify some of the misconceptions. Here, we summarize our recent research on the socioeconomic effects of insect-resistant Bt cotton in India^{7,8}, which proves that the technology already contributes to poverty reduction.

Bt cotton was commercialized in India in 2002. In 2008, around five million small-scale farmers had adopted this technology, with an average cotton area of 1.5 ha. Many of them live below the poverty line. Several rounds of a representative farm survey reveal that Bt-adopting farmers use 41% less pesticides and obtain 37% higher yields, resulting in an 89% gain in cotton profits on average⁷. In spite of seasonal and regional variation, these advantages have been sustainable over time. In monetary terms, mean profit gains are US \$135 per ha. For the 7.6 million ha currently under Bt cotton in India, this implies an additional \$1 billion in the hands of small-scale farmers. These are the technology's direct benefits.

Yet, there are also indirect benefits. For instance, higher cotton yields provide more employment opportunities for agricultural laborers and a boost to rural transport and trading businesses. Income gains among farmers and farm workers entail higher demand for food and

non-food items, inducing growth and household income increases also in other local sectors. Using a village modeling approach and taking into account such spillovers to other markets and sectors we found that each ha of Bt cotton creates aggregate incomes that are \$246 higher than those of conventional cotton (Fig. 1)⁸. For the total Bt cotton area in India, this translates into an annual rural income gain of \$1.87 billion. That is, each dollar of direct benefits is associated with over 80 cents of additional indirect benefits in the local economy.

In terms of income distribution, all types of households benefit, including those below the poverty line (Fig. 1). Sixty percent of the gains accrue to the extremely and moderately poor. Bt cotton is also net employment generating, with interesting gender implications: Compared to conventional cotton, Bt increases aggregate returns to labor by 42%, while the returns for hired female agricultural workers increase by 55%⁸. This is largely due to additional labor employed for picking cotton, which is primarily a female activity in India. As is known, women's income has a particularly positive effect for child nutrition and welfare⁹.

Numerous studies show that sizeable direct benefits are also observed for other GM crop applications in developing countries³, albeit a comprehensive evaluation of indirect social effects has not yet been conducted elsewhere. The results reported here cannot be simply extrapolated, as impacts always depend on the conditions in a particular setting. Nonetheless, the fact that a first-generation GM crop like Bt cotton already contributes to poverty reduction and rural welfare growth has not been widely recognized up till now and might further the public debate. Intelligent policies need to ensure that future biotechnology developments will also be pro-poor.

Competing Interests Statement:

The authors declare no competing financial interests.

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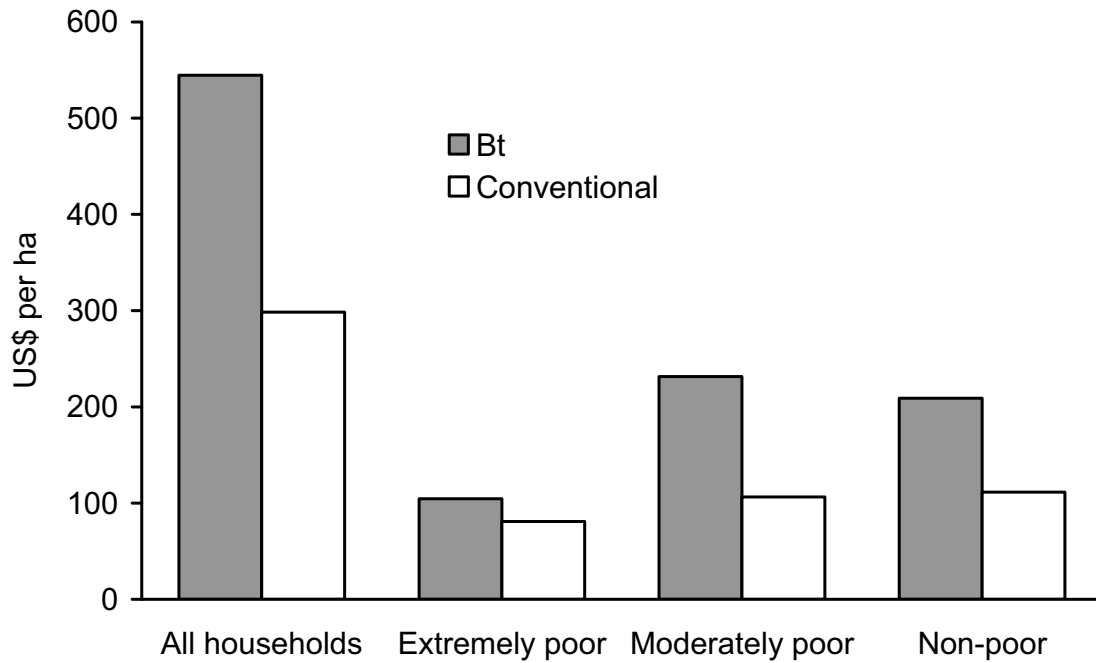


Figure 1 Household income effects of Bt cotton in comparison to conventional cotton in rural India. The results shown include direct benefits among cotton farmers as well as indirect effects through spillovers to other rural markets and sectors. For the evaluation of income distribution effects, households were disaggregated using local poverty lines, which are very near to the World Bank’s thresholds of \$1 and \$2 a day (purchasing power parity) for extreme and moderate poverty, respectively (ref. 8).