Box: Bt cotton in developing countries

- Bt cotton contains a gene from a common soil bacterium, Bacillus thuringiensis
- The 'Bt gene' confers a degree of protection against a family of insect pests known as bollworms.
- Bt cotton is the only major GM crop that has been commercialised in developing countries.
- The crop has been grown in China since 1997, South Africa since 1998 and India, officially, since 2002.
- In 2007, Bt cotton was grown by about 10.9 million farmers in China and India, as well as a few thousand smallholders in South Africa.

More reading

Undying Promise: Agricultural Biotechnology's Pro-poor Narrative, Ten Years On, STEPS Working Paper 15 by Dominic Glover (2009) ISBN-13: 978 1 85864 580 8

Made by Monsanto: the Corporate Shaping of GM Crops as a Technology for the Poor, STEPS Working Paper 11 by Dominic Glover (2008). ISBN 978 1 85864 548 4

Pathways to Sustainability: an overview of the STEPS Centre approach by Melissa Leach, Ian Scoones and Andy Stirling. ISBN – 13: 978 1858646561

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Credits

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About the STEPS Centre

The STEPS Centre (Social, Technological and Environmental Pathways to Sustainability) is an interdisciplinary global research and policy engagement hub uniting development studies with science and technology studies. We aim to develop a new approach to understanding, action and communication on sustainability and development in an era of unprecedented dynamic change. The STEPS Centre is based at the Institute of Development Studies and SPRU Science and Technology Policy Research at the University of Sussex with a network of partners in Asia, Africa and Latin America and is funded by the Economic and Social Research Council. Find out more: www.steps-centre.org

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Transgenic cotton: a 'pro-poor' success?

From STEPS Working Paper 15: Undying Promise: Agricultural Biotechnology's Pro-poor Narrative, Ten Years On

STEPS briefing 15

Many policy makers, journalists and politicians are keen to celebrate the 'pro-poor success' of genetically modified (GM, transgenic) crops in developing countries. However, a detailed look at the evidence reveals that the impacts of GM crop varieties have actually been very mixed. Although some farmers have captured substantial benefits, others, especially smaller-scale and poorer farmers who lack access to key resources like irrigation and credit, have not. Consequently, the picture emerging from farmers' fields is one of complex, contingent and highly differentiated impacts.

GM crop technology is certainly not a 'silver bullet' against hunger and poverty. By themselves, transgenic seeds cannot guarantee a good harvest or create a sustainable and productive farm livelihood.

India, farmers buying seeds / GMB Akash / Panos

The impacts of GM technology depend more heavily on socio-economic contexts, institutional frameworks and agronomic factors than on the technical performance of an individual transgenic trait. The addition of one or two new genes to a crop plant will not make much difference if the variety is not already well-adapted for local farming conditions.

Nevertheless, the simplistic storyline of GM crops as a successful 'pro-poor' technology has proved to be entrenched. It has persisted because a substantial number of economic studies have claimed that transgenic, insect-resistant 'Bt' cotton has proved to be a technological and socio-economic success among smallholder farmers in China, India and South Africa.

"Bt cotton appears to be a pro-poor success because encouraging results have been emphasised, while negative and equivocal ones have been played down"

Assessing Bt cotton

Bt technology works, in the limited, technical sense that crops that contain the Bt gene do produce the insecticidal Bt toxin. In addition, economic studies carried out in China, India and South Africa have claimed that the adoption of the technology produced two types of benefits for smallholder farmers:

- A reduction in pesticide use, leading to lower environmental impacts and fewer incidents of pesticide poisoning among farmers.
- Improved yields, higher productivity and better profits.

These outcomes seem plausible – after all, they are the kinds of impacts many people predicted. However, there are several reasons to look again at these conclusions.

First, reductions in pesticide use have never been convincingly attributed to the performance of Bt cotton. In fact, some farmers have continued to use high levels of toxic pesticides after having adopted the technology, while others have significantly reduced their use of chemical pesticides without adopting it. In other words, Bt cotton may not be necessary or sufficient to reduce pesticide applications. This means that we have no firm reason to suppose that the widespread adoption of Bt technology will necessarily, or sustainably, reduce pesticide use.

"Selective and misleading interpretation of farmers' experiences has distorted public debate and impeded the development of sound, evidence-based policy"

Second, the apparent productivity and profitability advantages of Bt technology also need to be examined closely:

Yield. Bt is not an intrinsically yield-enhancing technology. It is more accurate to say that the trait provides some protection against crop losses in seasons with heavy pest pressure, so that the trait can help to stabilise yields from season to season.

Cost. Bt cotton is typically more expensive than non-GM cotton, because the technology is proprietary. Even if economic theory suggests that an 'average' farmer should benefit from Bt technology, the financial reality for many may be that they cannot afford to buy the new seeds in the first place.

Financial risk. The Bt trait protects cotton against just one kind of threat, but the crop is just as vulnerable as non-Bt cotton to a range of other threats, such as drought. Since the seeds are generally more expensive, farmers who adopt the technology are exposed to a greater downside risk in case the crop fails – especially if they have to borrow money in order to buy Bt seeds.

Cotton bolls coming to maturity on a farm in Vizianagram District, Andhra Pradesh, India / Dominic Glover

Limits of Bt technology. When farmers have to struggle with poor soils or a lack of irrigation, Bt technology makes very little difference; cotton yields remain low. Farmers also depend heavily on supportive institutions. Without them, cotton farming remains a precarious enterprise, especially for smallholders.

Widespread assurances that GM crops have been demonstrated to be good for the poor are not well supported by the evidence. But one has to read the Bt cotton impact studies very carefully in order to see these complex and nuanced realities. The impression of Bt cotton as a pro-poor success has been created because encouraging results have been emphasised, while negative and equivocal ones have been played down. Impact studies have focused on the positive story told by average values and glossed over the very wide variability that has been seen in the impacts of Bt cotton between different farms, regions and seasons. This selective and misleading interpretation of farmers' experiences has distorted public debate and impeded the development of sound, evidence-based policy.

"Policy should begin with the problems and constraints that farmers face and then consider the range of technical, institutional and policy changes that might help them"

A rigorous approach

We urgently need a more rigorous, balanced and dispassionate evaluation of Bt cotton technology, measured against alternative kinds of interventions. Instead of focusing on a particular kind of technology and looking for opportunities where it might be deployed, agrarian development policy should begin with the problems and constraints that farmers face and then consider the range of technical, institutional and policy changes that might help them to address those challenges.