

A close-up photograph of a person wearing a white lab coat, carefully examining a cotton plant. The person's hands are visible, one holding a branch of the plant and the other holding a large, fluffy white cotton boll. The background is a soft-focus green, suggesting a field of cotton plants.

# Benefits of Plant Biotechnology

“Our lifestyles have improved greatly with the introduction of biotechnology ... Most importantly, we’ve been able to protect our crops from the menace of insect pests. This has led to better production and better profits. [Biotech] cotton has truly brought in a revolution in the production of cotton.”

– Guntupalli Sai Vara Prasad, Bandarupalli Village, Andhra Pradesh

**P**lant biotechnology delivers significant and tangible benefits to farmers, consumers and the environment around the globe. It has improved farm incomes by tens of billions of dollars through increased crop yields and reduced use of agrochemicals; protected natural habitats by increasing production on existing cropland; and allowed for greater use of conservation tillage, improving waterways and reducing soil erosion. Biotech crop varieties have significantly increased plant productivity while reducing farmers’ footprint on the environment.

For farmers in India, the benefits of biotechnology have had far-reaching effects on their families and communities as well. For example, Indian villages growing *Bacillus*

*thuringiensis* (*Bt*) cotton have increased their income, improving their access to telephones, electricity, drinking water and markets for their products. In addition, *Bt* cotton farmers send their children to school at higher rates and have better health-care than conventional cotton farmers.<sup>1</sup> Higher cotton yields provide more employment opportunities for agricultural labourers, especially for women,<sup>2</sup> and boost rural transport and trading businesses. Income gains among farm workers also result in more demand for food and non-food items. Each dollar of direct benefits of cotton is associated with over US\$0.80 of additional indirect benefits in the local economy.

With over 90 percent of farmers worldwide, including millions in India, repurchasing biotech seeds year after year, it’s clear they recognize the benefits of plant biotechnology.<sup>3</sup>

## » FAST FACTS

### Worldwide:

- Global farm incomes increased by US\$78.4 billion from 1996-2010 due to higher yields and reduced input costs from biotech crops.<sup>3</sup>
- Biotech crops have protected natural habitats by increasing production on existing farmland, thus saving 91 million hectares of additional land from being put into agricultural production.<sup>4</sup>
- Since 1996, biotech crop yields have added 97.5 million tonnes of soybeans, 159.4 million tonnes of maize and 12.5 million tonnes of cotton to global production.<sup>5</sup>
- Biotech crop adoption has reduced global carbon dioxide emissions by 19 billion kilograms since 1996, equivalent to removing 9 million cars from roads.<sup>5</sup>

### India:

- Farm income gains from 2002-2010 due to *Bt* cotton are estimated at US\$9.4 billion, with US\$2.5 billion in farm income gains in 2010 alone.<sup>5</sup>
- *Bt* cotton farmers earn between US\$378 and US\$520 more per hectare than growers using conventional cotton varieties.<sup>6</sup>
- *Bt* cotton contributed to the doubling of yields from 2002 to 2009.<sup>7</sup>
- Insecticide applications in India have fallen by 54 percent since *Bt* cotton was introduced in 2002.<sup>7</sup>
- Compared with conventional cotton, *Bt* cotton in India has generated additional employment, raising the total wage income by US\$40 per hectare – the largest increase is for hired females with an average income gain of 55 percent.<sup>8</sup>

<sup>1</sup> Indicus Analytics. 2007. Socio-economic appraisal of *Bt* cotton cultivation in India. Indicus Analytics Study. <http://www.indicus.net/media/index.php/blogspace/171-Two%20Studies%20show%20benefits%20of%20BT%20Cotton%20in%20India>

<sup>2</sup> Subramanian, Arjunan et al. 2010. GM crops and gender issues. *Nature Biotechnology* 28, 404-406. <http://www.nature.com/nbt/journal/v28/n5/full/nbt0510-404.html>

<sup>3</sup> Biotechnology Industry Organization Fact Sheet. "Agricultural Biotechnology Delivering Benefits for Farmers, Consumers, and the Environment." [http://www.getbiotechsmart.com/sites/default/files/student/agricultural\\_biotechnology\\_delivering\\_benefits\\_for\\_farmers\\_consumers\\_and\\_the\\_environment.pdf](http://www.getbiotechsmart.com/sites/default/files/student/agricultural_biotechnology_delivering_benefits_for_farmers_consumers_and_the_environment.pdf)

<sup>4</sup> James, Clive. 2011. Global Status of Commercialized Biotech/GM Crops: 2011. ISAAA Brief No. 43. ISAAA: Ithaca, NY. <http://www.isaaa.org/resources/publications/briefs/43/executivesummary/default.asp>

<sup>5</sup> Brookes, Graham and Barfoot, Peter. 2012. Forthcoming. GM Crops: Global socio-economic and environmental impacts 1996-2010, PG Economics Ltd, Dorchester, UK.

<sup>6</sup> Choudhary, Bhagirath and Guar, Kadambini. 2010. "Bt Cotton in India: A Country Profile." [http://www.isaaa.org/resources/publications/biotech\\_crop\\_profiles/bt\\_cotton\\_in\\_india-a\\_country\\_profile/download/Bt\\_Cotton\\_in\\_India-A\\_Country\\_Profile.pdf](http://www.isaaa.org/resources/publications/biotech_crop_profiles/bt_cotton_in_india-a_country_profile/download/Bt_Cotton_in_India-A_Country_Profile.pdf)

<sup>7</sup> Brookes, Graham and Barfoot, Peter. 2011. GM crops: global socio-economic and environmental impacts 1996-2009. <http://www.pgeconomics.co.uk/page/29/sustainable,-profitable-and-productive-agriculture-continues-to-be-boosted-by-the-contribution-of-biotech-crops>

<sup>8</sup> Subramanian, Arjunan and Qaim, Matin. 2009. Village-Wide Effects of Agricultural Biotechnology: The Case of *Bt* Cotton in India. Department of Agricultural Economics and Rural Development, Georg-August-University of Goettingen, Germany. [http://www.merit.unu.edu/MEIDE/papers/2008/1200659074\\_AS.pdf](http://www.merit.unu.edu/MEIDE/papers/2008/1200659074_AS.pdf)

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The Global Industry Coalition (GIC) receives input and direction from trade associations representing thousands of companies from all over the world. Participants include associations representing and companies engaged in a variety of industrial sectors such as plant science, seeds, agricultural biotechnology, food production, animal agriculture, human and animal health care and the environment.