Biotech In focus

Cooperative Extension Service
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College of Tropical Agriculture and Human Resources
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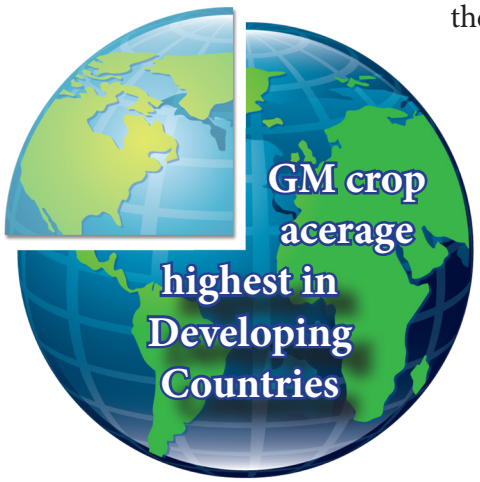
GMOs Go Global

What image comes to mind when you think of a farmer planting genetically modified crops? You might not have guessed, but in 2013 James Clive reported in ISAAA Brief No. 46 that more than 90 percent of the 18 million growers that produced biotech crops were resource-poor farmers in developing countries.

Since the commercial introduction of GM crops in 1994, their global acreage has increased 100-fold, to over 175 million hectares, or about one-eighth of Earth's farmable land. Of the 27 countries that grew GM crops in 2013, only 8 are industrialized. Developing countries make up more than three-quarters of the 19 nations with the highest GM crop acreages.

Bt cotton, a variety that produces one or more proteins that target insect pests, was grown by 7.5 million farmers in China and another 7.3 million in India in 2013.



Clearly, GM crops are popular in the developing world, where most of the planet's people live and where most future population growth is expected. Why are farmers adopting these technologies? And will the use of new, patented crops grown from commercial seed bought each year displace traditional crops and disrupt rural communities?

Let's examine these questions using India as an example. GM foods are not grown in India, but more than 90 percent of the country's cotton acreage is genetically engineered to produce Bt insecticidal proteins. Farming of Bt cotton officially began in 2002–2003. Over the next five years, yields increased by 70 percent and have since stabilized at near-historic levels, with cotton production up 75 percent since Bt cotton's official introduction. Other factors, including irrigation and fertilizer use, have also changed, so Bt cotton is not India's only source of yield improvements. Still, data indicate that Bt cotton alone accounts for a yield increase of at least 19 percent. Once reliant on cotton imports to feed its textile industry, India now exports cotton.

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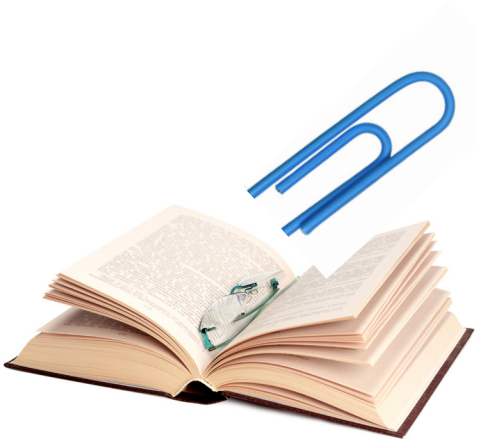
Offset Costs

While Bt cotton's production costs are higher than conventional cotton because GM seeds cost more, these costs are offset by increased yields and reduced use of pesticides. Bt cotton growers have seen a 50 percent average increase in profits, or an estimated $80 to $350 more per hectare. Because Bt hybrid seed offers reliably improved harvests, most farmers are willing to pay for it each year, even though Indian law gives farmers the right to sow, share, or sell seeds that they've saved. There are inherent problems associated with harvesting inbred seed – the plants those seeds produce do not have the same consistency in genetic traits that the original seed had, because of outcrossing. This is true for any hybrid seed that growers use; it is not an issue specific to GE crops. Thus saving commercial seed does not provide any true benefit to the grower.

Lowering Pesticides



In 2001, growers in India applied about 6 grams of pest-killing ingredients for each kilogram of cotton they produced. That's about six paper clips' weight in poison for a large dictionary's weight in cotton. By 2010, less than one gram of active pesticide (weighing less than one paper clip) was needed to grow a kilo of cotton.

Improving Health

Spraying less has improved farmers' health as well as their profits. In a country where most pesticides are sprayed by hand without protective gear, the risk of pesticide poisoning is 90 percent lower for farmers that grow Bt cotton vs. conventional cotton.

Avoiding Hazards

At least 2.4 million instances of pesticide poisoning per year are avoided by growing a crop that kills many of its pests.

Bt cotton has increased the yields, productivity, and profits of India's growers while decreasing their exposure to pesticides. Despite these improvements, it's fair to ask whether cotton is the right crop for India. Cotton is a "thirsty" plant, and most Indian farmers rely on monsoon rains to water their fields. If those rains are made increasingly unpredictable by climate change, will drought-tolerant food plants provide more benefits than a water-intensive fiber crop?

There are claims that the use of Bt cotton in India has caused severe economic problems and has resulted in massive suicide rates among farmers there. We will address this in the next bulletin.

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