Biotech Facts & Trends | India

In 2010

- Adoption of Bt cotton soared to a record 9.4 million hectares, equivalent to 86% of the record 11 million hectare cotton crop planted in the country.

- Gain of 1 million hectare in Bt cotton, from 8.4 million hectares in 2009 to 9.4 million hectares in 2010
- Bt cotton farmed by 6.3 million farmers in 2010 from 5.6 million farmers in 2009 - an additional 0.7 million farmers
- Overall, the increase from 50,000 hectares of Bt cotton in 2002, (when Bt cotton was first commercialized) to 9.4 million hectares in 2010 represents an unprecedented 188-fold increase in nine years.

Bt Cotton Adoption

- India has achieved unparalleled progress in cotton on three fronts in 2010; the highest ever area of cotton, 11 million hectares under cultivation; the largest ever cotton production equivalent to 32.5 million bales; a sustained high cotton yield of more than 500 kg per hectare despite significant increases in cotton hectarage.
- A total of 780 Bt cotton introductions (779 hybrids and one variety) were approved for planting in 2010 compared with 522 Bt cotton hybrids in 2009.
- In 2010, 6.6 million hectares (70%) were planted with multiple gene Bt cotton hybrids as compared to 2.8 million hectares (30%) of single gene Bt cotton hybrids. Multiple gene Bt cotton hybrids provides additional protection Spodopetra (a leaf eating tobacco caterpillar) as well as to both American bollworm, Pink bollworm and Spotted bollworm.
- The major states growing Bt cotton in 2010 were Maharashtra (3.71 million hectares) representing 40% of all Bt cotton in India in 2010, Gujarat (1.78 million hectares or 19%), Andhra Pradesh (1.65 million hectares or 18%), Northern Zone (1.16 million hectares or 12%), Madhya Pradesh (610,000 hectares or 7%), and the balance in Karnataka, Tamil Nadu and other states.
- In 2010, four cotton events expressing insect resistance and herbicide tolerance in the cotton plant were field-tested in different cotton growing locations in the country. Two out of the four events had stacked traits: insect resistance (IR) with single/multiple genes and herbicide tolerance (HT) to effectively control both the bollworm complex and control of weeds.

Population: **1,186.2 million**
GDP: **US$1,159 billion**
GDP per Capita: **US$1,020**
Agriculture as % GDP: **17%**
Agricultural GDP: **US$197 billion**
% employed in agriculture: **64%**
Arable Land (AL): **177.5 million hectares**
Ratio of AL/Population*: **0.60**

*Ratio: % global arable land / % global population

Major crops:
- **Sugarcane**
- **Rice, paddy**
- **Wheat**
- **Vegetables, fresh**
- **Potato**
- **Cotton**

Commercialized Biotech Crops: **Bt Cotton**
Total area under biotech crops and (%) increase in 2010:
9.4 Million Hectares **(+12%)**
Farm income gain from biotech, 1996-2009: **US$7.0 billion**

Benefits of Biotech Crops in India

- Bt cotton transformed cotton production in India by increasing yield, decreasing insecticide applications and through welfare benefits contributed to the alleviation of poverty for over 6 million small resource-poor farmers in 2010 alone.

- India has enhanced farm income from Bt cotton by US$7.0 billion in the period 2002 to 2009 and US$1.9 billion in 2009 alone (Brookes and Barfoot 2011).
- Yield gains were approximately 31%, a significant 39% reduction in the number of insecticide sprays, which led to an 88% increase in profitability, equivalent to a substantial increase of approximately US$250 per hectare.
- Bt cotton technology increased yield between 30-40% and reduced insecticide quantities by about 50% on average, and generated an additional income of US$156 per hectare or more (Subramanian et al. 2009)
- Studies by Subramanian & Qaim (2010) showed that the main beneficiaries of the direct and spill-over effects of Bt cotton are vulnerable farmers whose household income gains are 134% higher than farmers farming conventional cotton, and provided important positive socioeconomic effects in the small farm sector.

Biotech Crop Investments in India

- Crop biotech investments from both the public and private sectors in India have increased significantly in recent years which total US$500 million per year:
- Public sector had US$1.5 billion over the last five years, or US$300 million per year.
- Private sector investments were up to US$200 per year.

Future of Biotech Crops

- Biotech crops being developed by the public sector include brinjal, cotton, groundnut, mustard, papaya, potato, rice, sorghum, sugarcane, tomato and watermelon.
- The private sector is developing eight biotech crops: brinjal, cabbage, cauliflower, cotton, maize, okra, rice and tomato.
- There were 16 biotech crops in field trials in India including Bt maize, HT maize and Bt/HT maize which, subject to regulatory approval could be deployed commercially within 2 to 3 years.
- By-products of Bt cotton: oil and meal has been safely consumed as food and feed for nine years. Increased Bt cotton production could lessen the dependence of the country from imported oil.

Excerpts from:
James, Clive. 2010. Global Status of Commercialized Biotech/ GM Crops: 2010. *ISAAA Brief* No. 42. ISAAA: Ithaca, New York.

Other Sources:
The World Bank. http://www.worldbank.org/
Food and Agriculture Organization of the United Nations. http://www.fao.org/countryprofiles/

For more information, contact:

ISAAA *SEAsia*Center
c/o IRRI, DAPO Box 7777
Metro Manila, Philippines
Phone: +63 2 845 0563
Telefax: +63 49 5367933
Email: knowledge.center@isaaa.org

Or visit: **http://www.isaaa.org/**