



Pakistan planted Bt cotton for the fifth consecutive year in 2014.

In 2014, Pakistan achieved an 88% adoption rate of Bt cotton, or 2.9 million hectares of the national total area planted to cotton which is 3.2 million hectares, a 4% growth rate over 2013.

In August 2014, the Ministry of National Food Security and Research (MNFS&R) introduced the Seed (Amendment) Act of 2014 in the National Assembly of Pakistan. This Act amends the Seed Act 1976 (XXIX of 1976), and aims to fulfill the requirements of modern seed industries, and boost the development, certification, registration, and commercialization of improved open pollinated varieties and hybrid seeds in Pakistan.

Around ~700,000 small, resource-poor farmers in Pakistan planted and benefited from Bt cotton in 2014.

It is estimated that the economic gains from Bt cotton in Pakistan for 2010 to 2013 is was US\$1,615 million, and US\$368 million for 2013 alone.

BIOTECH CROP APPROVALS AND ADOPTION

Around 30 open pollinated and 2 hybrid Bt cotton varieties were approved for planting in 4 cotton growing provinces of Pakistan from 2010 to 2014.

The Pakistan Central Cotton Committee (PCCC) of the Ministry of Textile Industry estimated cotton production at 15 million bales in the 2014–2015 Kharif season.

The Punjab Seed Council (PSC) approved for the first time the commercial cultivation of 8 insect resistant Bt cotton varieties and 1 hybrid variety on March 31, 2010. In 2011, the PSC conditionally approved the renewal of 4 Bt cotton varieties which were conditionally approved for one year in 2010.



COUNTRY PROFILE

Population: 176.7 million

GDP: US\$210 billion

GDP per Capita: US\$1,190

Agriculture as % GDP: 22%

Agricultural GDP: US\$37.2 billion

% employed in agriculture: 45%

Arable Land (AL): 21.5 million hectares

Ratio of AL/Population*: 0.5

Major crops:

- Cotton
- Wheat
- Sugarcane
- Rice
- Maize

Commercialized Biotech Crops: Bt Cotton

Total biotech crop area and (%) increase in 2014:

2.9 Million Hectares (+4%)

Increased farm income, 2010-2013: US\$1,615 million

*Ratio: % global arable land / % global population



In February 2012, the PSC officially approved 8 new insect resistant Bt cotton varieties, including 4 new unconditional approval for insect resistant Bt cotton varieties, and one year conditional approval for four additional Bt cotton varieties.

Similarly, the PSC also renewed 3 insect resistant Bt cotton varieties which received one year conditional approval in 2011.

In 2013, the PSC approved 15 Bt cotton varieties and permission for renewal of 8 provisionally approved varieties expiring in 2013.

The National Biosafety Committee (NBC) endorsed the approval of 15 Bt cotton varieties approved for commercial cultivation by the PSC from 2010 to 2013.

Of the approved 32 Bt cotton varieties in Pakistan, almost half were developed by private sector seed companies, while the remaining half were developed by public sector research institutes.

BENEFITS OF Bt COTTON IN PAKISTAN

The results of a 2012 study conducted by Hina Nazli and colleagues indicate a positive impact of Bt cotton on the wellbeing of farmers in Pakistan.

Also in 2012, Kouser and Qaim on their research study "Valuing a financial, health and environmental benefits of Bt cotton in Pakistan",

concluded that Bt cotton adoption results in significantly lower chemical pesticide use, higher yields, and higher gross margins, which is consistent with the results from other countries.

The study noted that the lower pesticide use brings about significant health advantages in terms of reduced incidence of acute pesticide poisoning, and environmental advantages in terms of higher farmland biodiversity and lower soil and groundwater contamination.

The authors noted that "These positive externalities are valued at US\$79 per acre (US\$195/hectare), which adds another 39% to the benefits in terms of higher gross margins. Adding up financial and external benefits results in total benefits of US\$284 per acre (US\$701/hectare), or US\$1.7 billion for the entire Bt cotton area in Pakistan."

FUTURE PROSPECTS

In recent years, Pakistan built more biotech insitutions to conduct further research. The crops under genetic transformation by different public sector institutions are: wheat, rice, sugarcane, cotton, soybean, chickpea, groundnut, brassica, potato, tomato and chili.

The NBC has approved large scale field trials of various cotton events, including stacked traits of insect resistance and herbicide tolerance.

Notably, between 2010 and 2013 there were approvals of second year large scale field trials of BGI1 cotton, BGI1RRF cotton and Bt/HT maize.

It is estimated that with the expected release of stacked traits of biotech cotton before 2015, Pakistan could gain significant benefits of approximately US\$800 million per year to its farm economy, at 90% adoption of biotech cotton. Increased adoption of biotech cotton would substantially reduce insecticide sprays, less exposure of farmers and farm laborers to insecticides, higher quality of cotton and higher return to cotton farmers, and overall gains to the farm economy at national level.

SOURCES

- James, Clive. 2014. Global Status of Commercialized Biotech/GM Crops: 2014. *ISAAA Brief* No. 49. ISAAA: Ithaca, New York.
- Food and Agriculture Organization of the United Nations.
<http://www.fao.org/countryprofiles/>
- The World Bank.
<http://www.worldbank.org/>

For more information, contact:

ISAAA SEAsiaCenter
GS Khush Hall, IRRI
Los Baños, Laguna 4031 Philippines
Telefax: +63 49 5367216
Email: knowledge.center@isaaa.org

www.isaaa.org



South Africa planted 2.5 million hectares of biotech crops in 2014

The total biotech crop area in South Africa in 2014 was 2.7 million hectares, down from 2.9 million in 2013, a modest 7% reduction.

The total maize area in South Africa for 2014 is estimated at 2.5 million hectares, 58% white and 42% yellow. Of the total maize area, 86% or 2.14 million hectares will be biotech; 83% of total white maize is biotech and 90% for total yellow maize.

The total soybean plantings increased from 520,000 hectares in 2013, to 600,000 hectares in 2014. Herbicide tolerant soybean is estimated at 552,000 hectares, or 92% of the total area planted to soybean.

The area planted to cotton in 2014 increased to 9,000 hectares from 8,000 in 2013, with adoption rate still at 100%.

The economic gains from biotech crops for South Africa for the period 1998 to 2013 was US\$1,153 million and US\$313 million for 2013 alone (Brookes and Barfoot, 2014).



BIOTECH CROP ADOPTION

Maize

In 2014, 2.14 million hectares of the total maize area in South Africa is biotech. 83% of total white maize area is biotech, and 90% for total yellow maize.

Of the total biotech maize area, 28% or 0.60 million hectares were insect resistant, of which 20% is estimated to be the single Bt insect resistance gene, and 80% two stacked Bt genes, 19% or 0.41 million hectares herbicide tolerant, and 53% or 1.13 million hectares stacked insect resistance and herbicide tolerance genes.

The white maize crop of 1.247 million hectares comprised 83% biotech or 1.04 million hectares

COUNTRY PROFILE

Population: 50.5 million

GDP: US\$408 billion

GDP per Capita: US\$8,070

Agriculture as % GDP: 2%

Agricultural GDP: US\$8.16 billion

% employed in agriculture: 5%

Arable Land (AL): 12.2 million hectares

Ratio of AL/Population*: 1.4

Major crops:

- Sugarcane
- Maize
- Wheat
- Grapes
- Potato

Commercialized Biotech Crops:

- HT/Bt/HT-Bt Cotton
- HT/Bt/HT-Bt Maize
- HT Soybean

Total biotech crop area and (%) increase in 2014:

2.7 Million Hectares (-7%)

Increased farm income, 1998-2013: US\$1,153 million

*Ratio: % global arable land / % global population



with the single Bt gene accounting for 30% or 0.31 million hectares, herbicide tolerance for 13% or 0.14 hectares, and IR/HT stacks at 57% or 0.59 million hectares.

The yellow maize area of 0.90 million hectares is 90% biotech, or 0.81 million hectares; the biotech share represented by 25.7% insect resistance or 0.21 million hectares, 25.5% or 0.20 million hectares herbicide tolerance and 48.8% or 0.40 million hectares stacked insect resistance-herbicide tolerance.

Three trends emerged from these data: first, that adoption of biotech is very similar for white and yellow maize; second, that adoption of traits is similar for white and yellow; and, third, that adoption is reaching saturation.

Soybean

A total soybean plantings of 600,000 hectares was reached in 2014, with biotech herbicide tolerant soybean planted at 552,000 hectares, or 92% of total area planted.

Cotton

Cotton production continued to decline in recent years, but the area planted to cotton in 2014 marginally increased to 9,000 hectares, compared to 8,000 in 2013.

All of the 9,000 hectares were biotech, with 95% stacked (Bt/Bt/HT) and 5% HT used in refugia.

APPROVAL OF BIOTECH CROPS

The GMO regulatory framework is based on a permit system. There were 220 GMO permits granted from January to July 2014, of which maize accounted for 91.3%, soybeans for 5.2%, cotton for 6.%, and soybean for 2.7%. There were no new permits for GM vaccines.

Maize seed import permits for 2014 (to July 31) for commercial planting covered 5 permits for 579 MT and 7 seed export permits for 3,950 MT.

Commodity maize export permits granted up to July numbered 48 for over 2 million MT of maize grain. Approval has been given for maize trial release (contained field trials) for PhP34378, PhP36827, Bt11xTC1507xGA21, and Bt11xMIR162xTC507xGA21.

BIOSAFETY REGULATIONS IN SOUTH AFRICA

The mandatory labeling of GM/GMO "goods", ingredients or components, as prescribed in

Regulation 7 of the Consumer Protection Act of 2008 that should have entered into force in 2011, has elicited ongoing criticism from stakeholders in the food chain due to its ambiguity and complexity. There has been no effort from the Department of Trade and Industry to proceed with this regulation that might be seen by trading partners as a technical barrier to trade.

SOURCES

- James, Clive. 2014. Global Status of Commercialized Biotech/GM Crops: 2014. *ISAAA Brief No. 49*. ISAAA: Ithaca, New York.
- Food and Agriculture Organization of the United Nations. <http://www.fao.org/countryprofiles/>
- The World Bank. <http://www.worldbank.org/>

For more information, contact:

ISAAA SEAsiaCenter
GS Khush Hall, IRRRI
Los Baños, Laguna 4031 Philippines
Telefax: +63 49 5367216
Email: knowledge.center@isaaa.org

www.isaaa.org



BIOTECH COUNTRY FACTS & TRENDS

Uruguay

HT soybean occupies 100% of Uruguay's national soybean hectareage at 1.55 million hectares

Uruguay increased its biotech plantings of soybean and maize to 1.64 million hectares in 2014, an increase of over 7% from 1.47 million hectares in 2013.

Herbicide tolerant soybean now occupies 100% of the national soybean hectareage at more than 1.55 million hectares.

Biotech maize occupied 90,000 hectares in 2014 — the 11th year for Uruguay to plant biotech maize. Of the 90,000 hectares of biotech maize, 80% was the stacked Bt/HT product.

ADOPTION OF BIOTECH CROPS

Uruguay introduced biotech soybean in 1996, followed by Bt maize in 2003. In 2014, a significant increase in herbicide tolerant soybean hectareage was recorded.

The country approved five events on the same day in early 2011.

In September 2012, Uruguay approved 3 stacked insect resistant (IR) and herbicide tolerant (HT) biotech corn, 2 HT soybean and 1 stacked IR/HT soybean for commercialization.

One stacked IR/HT corn, 1 HT soybean and 1 stacked HT/HT soybean are still under field trials.

BENEFITS OF BIOTECH CROPS IN URUGUAY

Uruguay is estimated to have enhanced farm income from biotech soybean and maize of US\$147 million in the period 2000 to 2013 and the benefits for 2013 alone is estimated at US\$25 million.

SOURCES

James, Clive. 2014. Global Status of Commercialized Biotech/GM Crops: 2014. *ISAAA Brief* No. 49. ISAAA: Ithaca, New York.
Food and Agriculture Organization of the United Nations.
<http://www.fao.org/countryprofiles/>
The World Bank.
<http://www.worldbank.org/>

For more information, contact:

ISAAA *SEAsia*Center
GS Khush Hall, IRRI
Los Baños, Laguna 4031 Philippines
Telefax: +63 49 5367216
Email: knowledge.center@isaaa.org

www.isaaa.org

COUNTRY PROFILE

Population: 3.4 million

GDP: US\$46.7 billion

GDP per Capita: US\$15,080

Agriculture as % GDP: 8.2%

Agricultural GDP: US\$3.8 billion

% employed in agriculture: 13%

Arable Land (AL): 1.8 million hectares

Ratio of AL/Population*: 2.4

Major crops:

- Rice
- Maize
- Soybean
- Wheat
- Barley

Commercialized Biotech Crops:

- HT Soybean
- Bt Maize

Total biotech crop area and (%) increase in 2014:

1.6 Million Hectares (+7%)

Increased farm income, 2000-2013: US\$147 million

*Ratio: % global arable land / % global population



BIOTECH COUNTRY FACTS & TRENDS

Bolivia

Bolivia grew 1.0 million hectares of biotech soybean in 2014

RR[®]soybean was grown on 1.0 million hectares in 2014 in Bolivia – similar to the country's hectareage in 2013.

The adoption rate of RR[®]soybean in 2014 was 83% of the total 1.2 million hectares.

ADOPTION OF BIOTECH CROPS

There are approximately 2 million hectares of cropland in Bolivia, and soybean is a major crop in the eastern region.

According to FAO (2014), Bolivia ranks eighth in the world with 1.2 million hectares, after the USA (31 million hectares), Brazil (28), Argentina (19), India (12), China (6.6), Paraguay (3), and Canada (1.8). In 2008, Bolivia became the tenth country to officially grow RR[®]soybean of 600,000 hectares.

The "Law of the Productive Revolution" introduced on June 26, 2011 prohibits the introduction of modified organisms if Bolivia is the centre of origin and diversity. This law may have implications on future production of RR[®]soybean.

This leaves open the option of introducing transgenic crops for which Bolivia is not the center of

origin. Farmers are encouraging Government to introduce biotech varieties of crops such as cotton, rice, sugarcane, which are of interest to Bolivian farmers.

BENEFITS OF BIOTECH CROPS IN BOLIVIA

Exports of soybean from Bolivia in 2011 were worth US\$309 million – the most important agricultural export and 3rd largest of all Bolivian exports.

The partial budget analysis study by Paz et al. in 2008 indicates that the net benefits favor RR[®]soybean over conventional, which is approximately US\$200 (US\$196) per hectare. The principal benefits include a 30% increase in yield, a 22% savings on herbicides and more modest savings in labor and other variable costs.

It is estimated that the economic gains from biotech crops for Bolivia

for the period 2008 to 2013 was US\$538 million, and US\$103 million for 2013 alone.

SOURCES

James, Clive. 2014. Global Status of Commercialized Biotech/GM Crops: 2014. *ISAAA Brief No. 49*. ISAAA: Ithaca, New York.
Food and Agriculture Organization of the United Nations.
<http://www.fao.org/countryprofiles/>
The World Bank.
<http://www.worldbank.org/>

For more information, contact:

ISAAA SEAsiaCenter
GS Khush Hall, IRRI
Los Baños, Laguna 4031 Philippines
Telefax: +63 49 5367216
Email: knowledge.center@isaaa.org

www.isaaa.org

COUNTRY PROFILE

Population: 10.1 million

GDP: US\$23.9 billion

GDP per Capita: US\$5,100

Agriculture as % GDP: 10%

Agricultural GDP: US\$2.4 billion

% employed in agriculture: 32%

Arable Land (AL): 3.9 million hectares

Ratio of AL/Population*: 2.0

Major crops:

- Soybean
- Maize
- Coffee
- Cocoa
- Sugarcane
- Cotton
- Potato

Commercialized Biotech Crop: HT Soybean

Total biotech crop area and (%) increase in 2014:

1.0 Million Hectares (0%)

Increased farm income, 2008-2013: US\$538 million

*Ratio: % global arable land / % global population



BIOTECH COUNTRY FACTS & TRENDS

Philippines

415,000 small, resource-poor farmers in the Philippines planted 831,000 hectares of biotech maize in 2014

In 2014, the area planted to biotech maize in the Philippines increased to 831,000 hectares, up 5% from the 795,000 hectares planted in 2013.

The area occupied in 2014 by the stacked traits of Bt/HT maize reached 761,000 hectares compared with only 721,000 hectares in 2013, with the stacked trait maize occupying 95% of total biotech maize hectares in 2014.



The number of small resource-poor farmers, growing on average 2 hectares of biotech maize in the Philippines in 2013 was estimated at 415,000 up significantly by 17,500 from 397,500 in 2013.

BIOTECH CROPS ADOPTION IN THE PHILIPPINES

The total hectareage planted to the single trait Bt maize decreased by 76% in 2012, and in 2013 and 2014, no single trait Bt maize has been planted.

Single trait herbicide tolerant (HT) maize was planted on 70,000 hectares in 2013, which is only 8.4% of the total biotech maize hectareage.

On a percentage basis, biotech yellow maize has consistently increased by about 5% of the total yellow maize hectareage every single year from the

first year of commercialization in 2003, reaching the highest level of 63% in 2014 (up from 62% in 2013).

BIOTECH MAIZE APPROVALS

A total of 13 events of biotech maize have been approved for commercial planting in the Philippines since 2002: 3 single Bt, 4 single HT, 2-two Bt genes stacked, and 4 Bt/HT stacked trait.

In addition, a total of 75 biotech crops and products currently approved for direct use as food, feed and for processing in the Philippines that include alfalfa, canola, cotton, maize, potato, rice, soybean, and sugar beet.

BIOTECH CROP DEVELOPMENT

The future acceptance prospects for biotech crops in the Philippines

COUNTRY PROFILE

Population: 94.9 million

GDP: US\$225 billion

GDP per Capita: US\$2,370

Agriculture as % GDP: 13%

Agricultural GDP: US\$41.1 billion

% employed in agriculture: 33%

Arable Land (AL): 5.4 million hectares

Ratio of AL/Population*: 0.3

Major crops:

- Sugarcane
- Maize
- Pineapple
- Coconut
- Banana
- Mango
- Rice
- Cassava

Commercialized Biotech Crop: Bt/HT/Bt-HT Maize

Total biotech crop area and (%) increase in 2014:

0.813 Million Hectares (+2.2%)

Increased farm income, 2003-2013: US\$470 million

*Ratio: % global arable land / % global population



continue to look promising with new biotech crop products being developed by national and international institutions.

Golden Rice (GR), is a biofortified rice being developed by the Philippine Rice Research Institute (PhilRice) and the International Rice Research Institute (IRRI). IRRI has reported that as of March 2014, the research, analysis, and testing of beta-carotene-enriched GR continues, in collaboration with national research agencies in the Philippines, Indonesia, and Bangladesh.

The fruit and shoot borer resistant Bt eggplant project is led by the Institute of Plant Breeding of the University of the Philippines Los Baños (IPB-UPLB). The proponents already completed field trials of promising hybrid varieties in the approved multi-location trial sites in Luzon and Mindanao in 2012.

In May 2012, Greenpeace and other anti-biotech environmentalists and politicians lodged a petition to the Supreme Court calling for the imposition of *Writ of Kalikasan* and issuance of a Temporary Environmental Protection Order (TEPO) opposed to the conduct of the Bt eggplant field trials.

The petition was remanded by the Supreme Court to the Court of Appeals (CA) which heard the case. After almost a year of proceedings, the CA issued a decision on May 17, 2013 granting the petition for a *Writ of Kalikasan* against the Bt eggplant

field trial, directing the respondents to cease and desist from conducting field trials. Respondents filed a motion for reconsideration, but the CA re-affirmed its earlier decision. Respondents appealed the case to the Supreme Court.

Biotech papaya with delayed ripening and papaya ring spot virus (PRSV) resistance, by IPB-UPLB, has already been tested in confined field trials in 2012.

Bt cotton for the first time was tested in a confined field trial in 2010 and has started multi location field trials in 2012. In 2013, data to complete regulatory dossiers were collected for commercialization purposes in two years' time. In mid 2014, the bioefficacy of Bt cotton hybrids against the cotton bollworm were reaffirmed in another field trial.

Initiatives in other crops include the development of a virus resistant sweet potato through collaborative activities between the Visayas State University (VSU) and IPB-UPLB and the initial efforts to generate transgenic lines of virus resistant abaca (*Musa textilis*) by the Fiber Industry Development Authority in collaboration with the University of the Philippines.

The Philippine Department of Agriculture Biotechnology Program Office and the Department of Science and Technology have been very supportive of research and development activities on biotech crops and have been eager to

support the public sector biotech products that will emerge in the near future.

BENEFITS FROM BIOTECH CORN IN THE PHILIPPINES

The farm level economic benefit of planting biotech maize in the Philippines in the period 2003 to 2013 is estimated to have reached US\$470 million. For 2013 alone, the net national impact of biotech maize on farm income was estimated at US\$92 million.

SOURCES

- James, Clive. 2014. Global Status of Commercialized Biotech/GM Crops: 2014. *ISAAA Brief* No. 49. ISAAA: Ithaca, New York.
- Food and Agriculture Organization of the United Nations.
<http://www.fao.org/countryprofiles/>
- The World Bank.
<http://www.worldbank.org/>

For more information, contact:

ISAAA SEAsiaCenter
GS Khush Hall, IRRI
Los Baños, Laguna 4031 Philippines
Telefax: +63 49 5367216
Email: knowledge.center@isaaa.org

www.isaaa.org