BIOTECH 201

PLANT BIOTECHNOLOGY

Biotech Crops Around the World
WHAT IS PLANT BIOTECHNOLOGY?

Plant biotechnology is a sophisticated breeding technology that allows plant breeders to precisely introduce beneficial traits into plants. Biotech crops approved for use today have been improved to help farmers fight damaging weeds more efficiently, protect crops from insects and diseases, and improve the nutritional quality and shelf-life of crops. In the future, these crops could offer foods with higher vitamin levels, longer shelf life or the ability to grow even in the face of climate change conditions.

Genetic modification (GM), genetic engineering (GE) and genetically modified organisms (GMO) are a few other terms that are often used to refer to plant biotechnology. Insect-resistant crops, including Bt crops, have been improved through biotechnology to produce proteins that can make the plants more resistant to harmful insects. Ht crops are developed to resist the application of certain herbicides that previously would have destroyed the crop along with the targeted weeds. These types of crops allow farmers to save time and money, and to have more options for targeted weed control.

BIOTECH CROPS AROUND THE WORLD

As it becomes more challenging to feed the world's population, farmers are turning to agricultural innovations like plant biotechnology so they can continue to grow safe, high-yielding crops on ever-scarcer farmland. Biotech crops have been increasingly adopted across the globe for the past 20 years: as of 2014, 18 million farmers in 28 countries planted more than 181 million hectares.

This collection of infographics demonstrates how farmers and consumers worldwide benefit from plant biotechnology, as well as the impact of this technology on our environment.

18 MILLION FARMERS > IN 28 COUNTRIES > PLANTED MORE THAN 181 MILLION HECTARES IN 2014
ARGENTINA

Argentina is one of the top producers of biotech crops and has dedicated more than 24.3 million hectares of acreage to biotech crops like soybeans (20.8 million), maize (3 million), and cotton (0.5 million). Argentina first adopted plant biotechnology in 1996.

ARGENTINA CROPS:

- Soybeans
- Cotton
- Maize

TOTAL BIOTECH ACREAGE:

<table>
<thead>
<tr>
<th>Year</th>
<th>Soybeans</th>
<th>Cotton</th>
<th>Maize</th>
</tr>
</thead>
<tbody>
<tr>
<td>2005</td>
<td>10.5M</td>
<td>0.5M</td>
<td>17.5M</td>
</tr>
<tr>
<td>2006</td>
<td>11.7M</td>
<td>1.1M</td>
<td>24.4M</td>
</tr>
</tbody>
</table>

ARGENTINE FARMS REQUIRE LESS TILLING AND WEEDING thanks to herbicide-tolerant biotech crops.

FARM, FAMILY AND COMMUNITY BENEFITS:

- IN-FIELD BENEFITS:
  - Argentine farms require less tilling and weeding thanks to herbicide-tolerant biotech crops.
  - Insect-resistant biotech maize contains significantly lower levels of dangerous mycotoxins, that can make people sick.

ARGENTINA has nearly TRIPLED ITS ANNUAL EXPORTS of maize since embracing biotech varieties.

1.82 MILLION NEW JOBS added to Argentina’s economy thanks to biotech crops.

NATIONAL BENEFITS:

- TRIPLED ITS ANNUAL EXPORTS
- 1.82 MILLION NEW JOBS
- 17
- 24

PRICE OF SOYBEANS IN 2011

<table>
<thead>
<tr>
<th></th>
<th>WITH BIOTECH</th>
<th>WITHOUT BIOTECH</th>
</tr>
</thead>
<tbody>
<tr>
<td>$/bushel</td>
<td>$13.00</td>
<td>$14.70</td>
</tr>
</tbody>
</table>

Argentina has nearly TRIPLED ITS ANNUAL EXPORTS of maize since embracing biotech varieties.

Sources:
1. ISAAA: http://bit.ly/1OULuk
5. USDA: http://fas.usda.gov/93b/98A
6. FAO Statistics Division
Brazil is one of the largest producers of biotech crops in the world. In 2012, Brazilian farmers grew 42.2 million hectares of biotech soybeans, cotton and maize. These biotech varieties help farmers fight devastating weeds and insects, without harming their crops. Brazil has become one of the world’s largest soybean exporters thanks to biotechnology.

Brazilian farmers grow more food on every hectare than ever before, keeping natural habitats like the rainforest from being converted to farmland.

Sources:
3. Céleres Ambiental: http://bit.ly/1L0No6a
4. FAO Statistics Division
5. USDA: http://usa.gov/1PkdO0d
BURKINA FASO

Burkina Faso has grown Bt cotton for eight years; in 2014, over 143,000 farmers grew 454,000 hectares of the crop. Nicknamed ‘white gold’ by many farmers, these insect-resistant cotton varieties have transformed Burkina Faso’s agriculture sector, which is becoming a model for other developing countries.

The first Bt cotton women farmer’s association was formed in 2014.

“In the income from Bt cotton, I have been able to provide for my children.” Mrs. Azeta Kinda

With biotechnology, farmers have INCREASED PROFITS BY $95/HECTARE—an incredible gain in a country where the average person lives on < $2 a day.

COTTON PRODUCTION SKYROCKETED BY 57.5% in 2012 alone, thanks to biotech.

COTTON NOW ACCOUNTS FOR 20% OF GDP AND 60% OF EXPORTS.

No wonder Bt cotton has become known as “white gold.”

Sources:
3. ISAAA: http://bit.ly/1Qtpq1k
“Because of planting BT corn, we were able to buy a house and lot, farm machineries and even farm land.”

Indalencio Supan, Balitucan, Magalang, Pampanga, Philippines
COTTON INDIA

BIOTECH CROPS:

TOTAL BIOTECH ACREAGE:

IN-FIELD BENEFITS:

After farmers adopt biotech cotton, their fields transform.

HARVESTS GROW
yield improved with Bt cotton by an estimated:

COSTS FALL
reduction of costs for crop protection applications ranged:

LESS LABOR NEEDED
costs decreased with reduced need for insecticide applications

FARM, FAMILY AND COMMUNITY BENEFITS:

Top benefits of growing Bt cotton according to farmers:

say less time
in the field

say peace of mind

say less tension
from cotton cultivation

"I HAVE BEEN ABLE TO STUDY FOR A COLLEGE DEGREE WHILE WORKING ON THE FARM AS WELL."

Srinivasa Reddy
Andhra Pradesh, India

INDIA HAS GONE FROM AN IMPORTER TO THE WORLD’S LARGEST PRODUCER AND EXPORTER OF COTTON.
Indian farmers produce 1/4 of global cotton.

NATIONAL BENEFITS:

(in millions of hectares)

2002
2014
<1
11.6

“HIGHER WAGES FOR WOMEN ON BT COTTON FARMS”

55%
PHILIPPINES

The Philippines were one of the first in Asia to embrace biotechnology, planting Bt maize in 2003. As of 2014, 813,000 hectares have been grown on 415,000 small farms. In addition to Bt maize, there are 75 biotech crops and products approved as food, feed and for processing in the country; these include alfalfa, canola, cotton, maize, potato, rice, soybean, and sugar beet.

PHILIPPINES

In-field benefits:

There is significant reduction in losses to corn borers, which plague yellow corn and can devastate a smallholder farmer’s crop.

Estimated farm income gain from 2003-2013

$470M USD

Farm, family and community benefits:

Farmers have seen their income skyrocket by 200-300% baseline.

“We no longer need to plow and weed, hence, we have more time to find other means of livelihood. Because of higher income, we can also send our children to school and we can even invest in post harvest equipment.”

Delson Sonza of Sara Iloilo, Philippines

National benefits:

Total biotech acreage: (in thousands of hectares)

Other biotech crops being researched:

- RICE: Fortified with beta-carotene, also known as Golden Rice
- MAIZE
- PAPAYA: Virus-resistant

Sources:
(2) ISB News Report: http://1.usa.gov/1KGPWEq

Additional profits have been used to:

- Buy equipment
- Repair homes
- Purchase new land
- Educate children

2008: 400
The United States is a pioneer of biotech agriculture, and was one of the first countries to adopt the technology in 1996. United States farmers grow ten types of biotech crops on 73.1 million hectares of land, including maize, soybeans, canola, cotton, squash, papaya, potato, alfalfa, sugar beets and apples – a larger variety of biotech crops than any other country.

BIOTECH CROPS CAN PROTECT INDUSTRIES

After the devastating ringspot virus invaded Hawaii in 1998, disease-resistant papayas were quickly developed and saved the entire industry from being wiped out!

NO-TILL PRACTICES CAN SAVE UP TO 3.9 GALLONS OF FUEL PER ACRE.

FARM, FAMILY AND COMMUNITY BENEFITS:

BIOTECH FARMERS CAN EVEN HELP THEIR CONVENTIONAL NEIGHBORS!

Farmers growing insect-resistant Bt varieties reduced European corn borer populations so much that nearby farms saw as much as 73% fewer of the devastating insects. This is known as the "halo effect."

BIO-TECH FARM

NEIGHBOR

+ 73% fewer

TIME

MONEY

estimated farm income gain from 2003-2013

$58.4B USD

largest gains of any country

Sources:
5. USDA: http://1.usa.gov/1LIpqXA
6. FAO Statistics Division

TOTAL BIOTECH ACREAGE:
(in millions of hectares)

<table>
<thead>
<tr>
<th>Year</th>
<th>1996</th>
<th>2014</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maize</td>
<td>1.7</td>
<td>49.8</td>
</tr>
<tr>
<td>Soybeans</td>
<td>1.7</td>
<td>21.5</td>
</tr>
<tr>
<td>Canola</td>
<td>1.7</td>
<td>1.2</td>
</tr>
<tr>
<td>Cotton</td>
<td>1.7</td>
<td>2.7</td>
</tr>
<tr>
<td>Squash</td>
<td>1.7</td>
<td>1.2</td>
</tr>
<tr>
<td>Papaya</td>
<td>1.7</td>
<td>2.1</td>
</tr>
<tr>
<td>Potato</td>
<td>1.7</td>
<td>1.7</td>
</tr>
<tr>
<td>Alfalfa</td>
<td>1.7</td>
<td>1.7</td>
</tr>
<tr>
<td>Sugar Beets</td>
<td>1.7</td>
<td>4.7</td>
</tr>
<tr>
<td>Apples</td>
<td>1.7</td>
<td>1.7</td>
</tr>
</tbody>
</table>

IN-FIELD BENEFITS:

Less tilling and weeding saves

UNITED STATES

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Countries utilizing biotechnology:

1. United States
2. Brazil
3. Argentina
4. India
5. Canada
6. China
7. Paraguay
8. Pakistan
9. South Africa
10. Uruguay
11. Bolivia
12. Philippines
13. Australia
14. Burkina Faso
15. Myanmar
16. Mexico
17. Spain
18. Colombia
19. Sudan
20. Honduras
21. Chile
22. Portugal
23. Cuba
24. Czech Republic
25. Romania
26. Slovakia
27. Costa Rica
28. Bangladesh

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**YEAR BIOTECH CROPS ADOPTED**

- 1996-1998
- 1999-2001
- 2002-2004
- 2005-2007
- 2008-2010
- 2011-2013
- 2014

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**TOTAL GLOBAL BIOTECH HECTARAGE**

*In millions of hectares*

- 1996
- 1999
- 2002
- 2005
- 2008
- 2011
- 2014

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Croplife International and its global network are the voice and leading advocates for the plant science industry.

Croplife International champions the role of agricultural innovations in crop protection and plant biotechnology in supporting and advancing sustainable agriculture; helping farmers feed a growing population while looking after the planet; and progressing rural communities. The world needs farmers, and farmers need plant science. CropLife International is proud to be at the heart of helping farmers grow.