ISAAA
INTERNATIONAL SERVICE FOR THE ACQUISITION OF AGRI-BIOTECH APPLICATIONS

EXECUTIVE SUMMARY

BRIEF 34

Global Status of Commercialized Biotech/GM Crops: 2005

by

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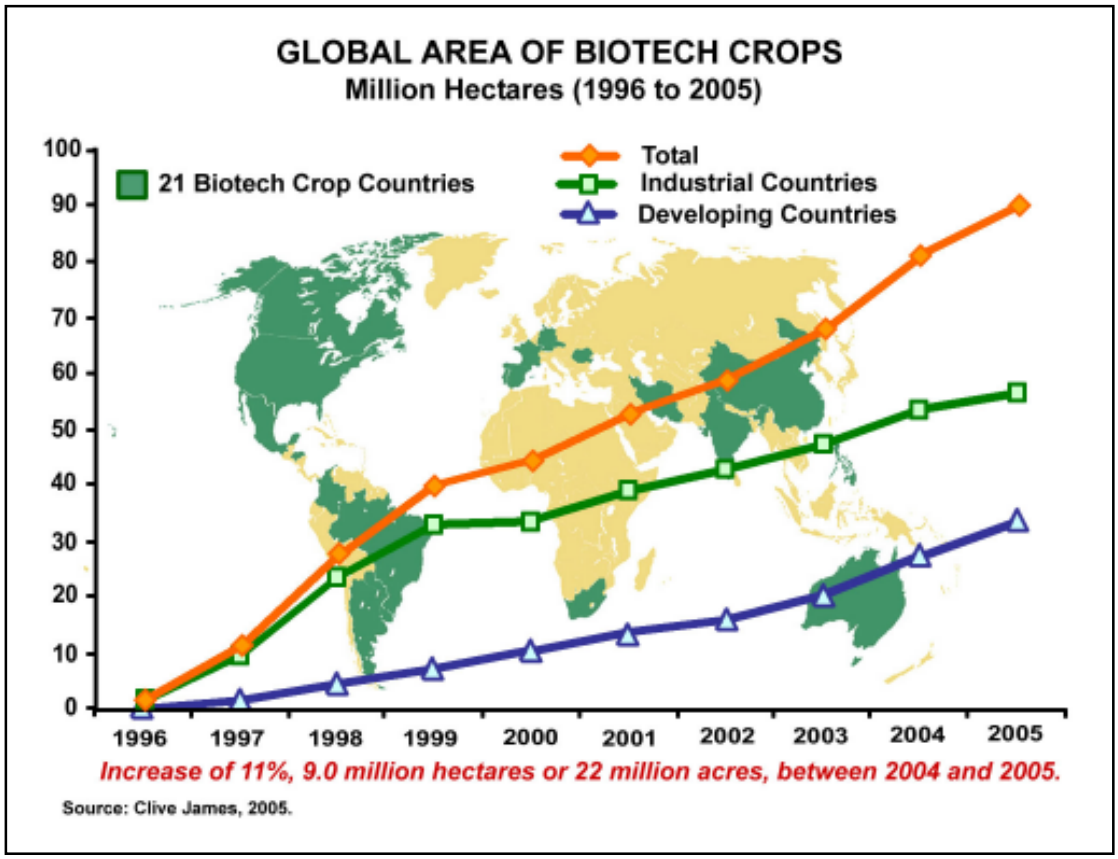
Chair, ISAAA Board of Directors



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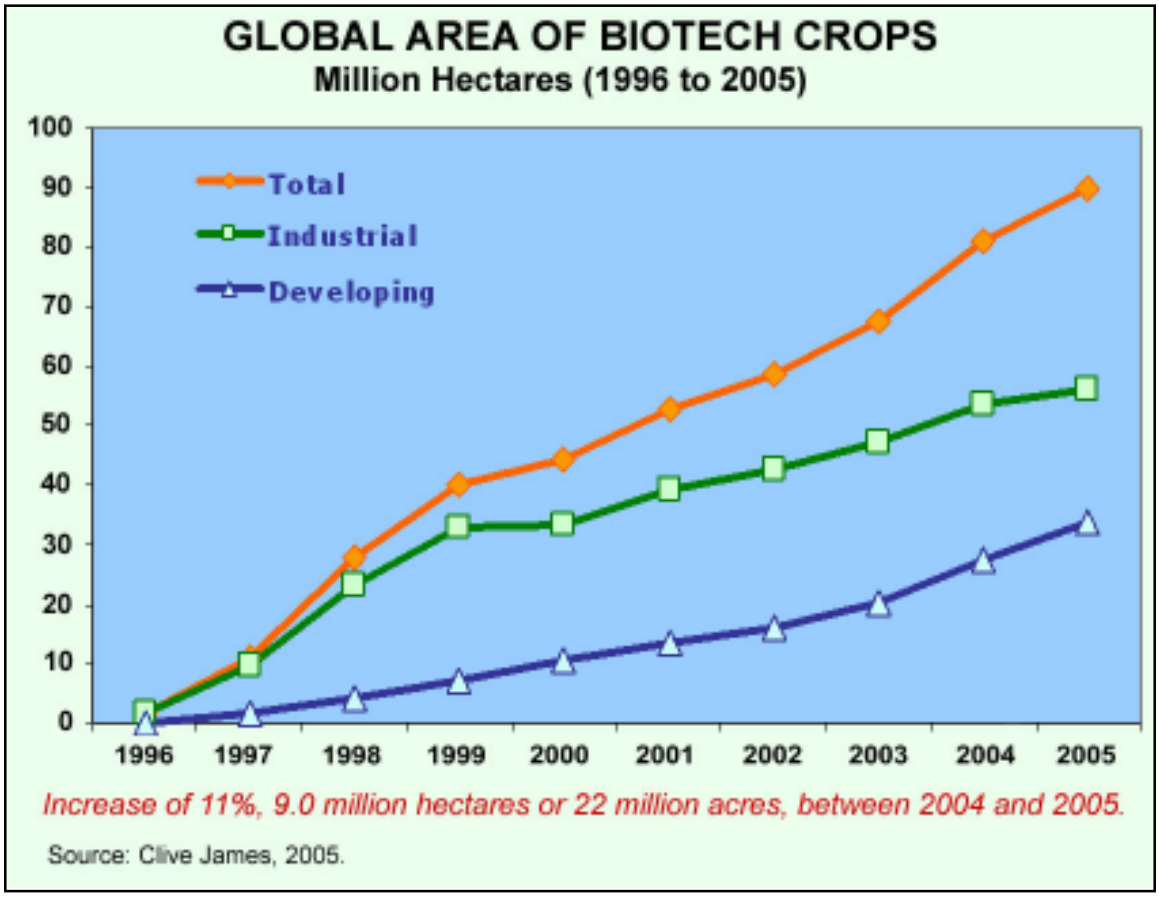
GLOBAL STATUS OF BIOTECH/GM CROPS IN 2005

- 2005 marks the tenth anniversary of the commercialization of genetically modified (GM) or transgenic crops, now more often called biotech crops, as referred to consistently in this Executive Summary. In 2005, the billionth acre, equivalent to the 400 millionth hectare of a biotech crop, was planted by one of 8.5 million farmers, in one of 21 countries. This unprecedented high adoption rate reflects the trust and confidence of millions of farmers in crop biotechnology. Over the last decade, farmers have consistently increased their plantings of biotech crops by double-digit growth rates every single year since biotech crops were first commercialized in 1996, with the number of biotech countries increasing from 6 to 21 in the same period. Remarkably, the global biotech crop area increased more than fifty-fold in the first decade of commercialization.

- The global area of approved biotech crops in 2005 was 90 million hectares, equivalent to 222 million acres, up from 81 million hectares or 200 million acres in 2004. The increase was 9.0 million hectares or 22 million acres, equivalent to an annual growth rate of 11% in 2005.



- A historic milestone was reached in 2005 when 21 countries grew biotech crops, up significantly from 17 countries in 2004. Notably, of the four new countries[1] that grew biotech crops in 2005, compared with 2004, three were EU countries, Portugal, France, and the Czech Republic whilst the fourth was Iran.

- Portugal and France resumed the planting of Bt maize in 2005 after a gap of 5 and 4 years respectively, whilst the Czech Republic planted Bt maize for the first time in 2005, bringing the total number of EU countries now commercializing modest areas of Bt maize to five, viz: Spain, Germany, Portugal, France and the Czech Republic.

- Bt rice, officially released in Iran in 2004, was grown on approximately four thousand hectares in 2005 by several hundred farmers who initiated commercialization of biotech rice in Iran and produced supplies of seed for full commercialization in 2006. Iran and China are the most advanced countries in the commercialization of biotech rice, which is the most important food crop in the world, grown by 250 million farmers, and the principal food of the world's 1.3 billion poorest people, mostly subsistence farmers. Thus, the commercialization of biotech rice has enormous implications for the alleviation of poverty, hunger, and malnutrition, not only for the rice growing and consuming countries in Asia, but for all biotech crops and their acceptance on a global basis. China has already field tested biotech rice in pre-production trials and is expected to approve biotech rice in the near-term.

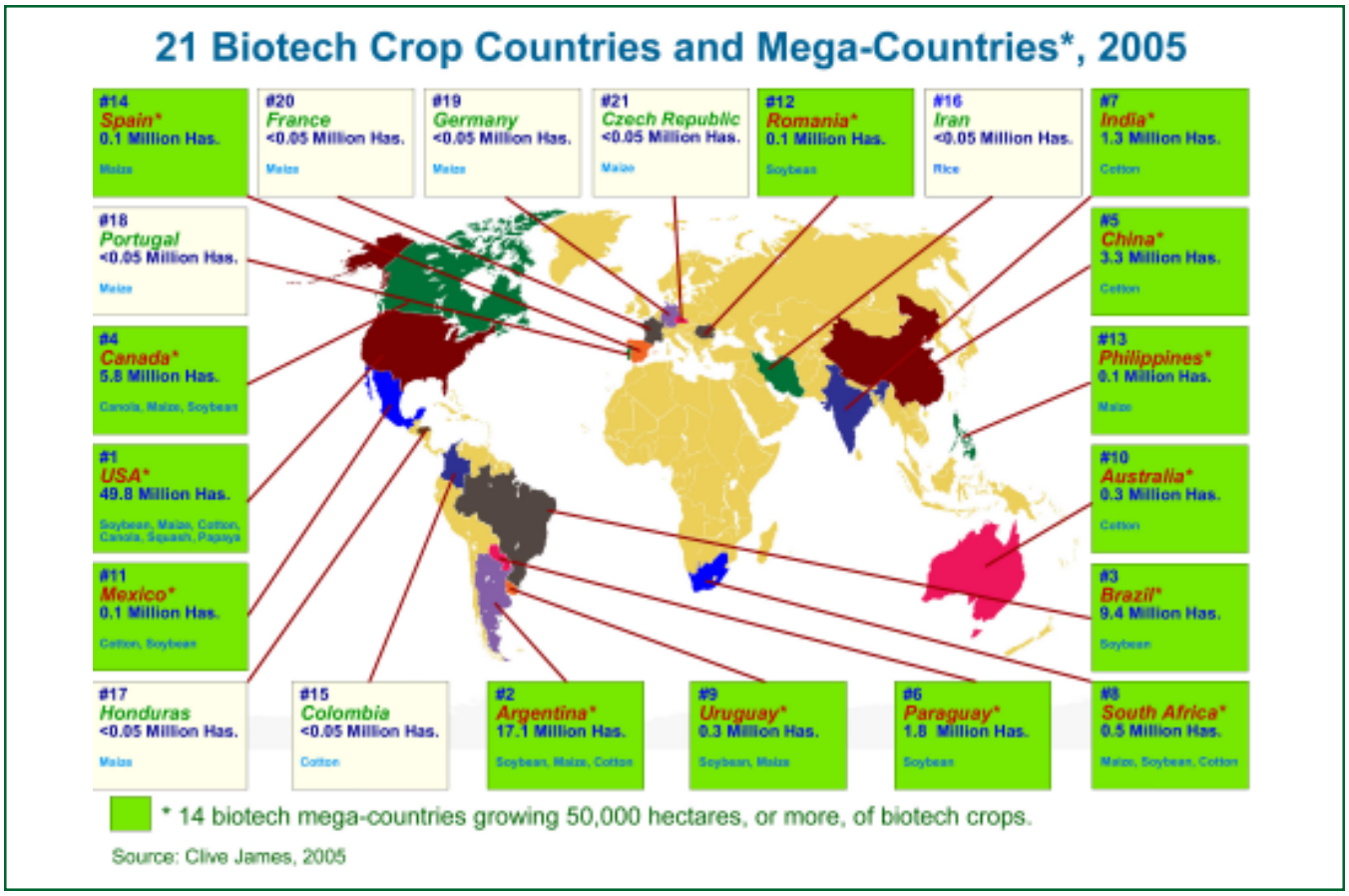
- In 2005, the US, followed by Argentina, Brazil, Canada and China continued to be the principal adopters of biotech crops globally, with 49.8 million hectares planted in the US (55% of global biotech area) of which approximately 20% were stacked products containing two or three genes, with the first triple gene product making its debut in maize in the US in 2005. The stacked products, currently deployed in the US, Canada, Australia, Mexico, and South Africa and approved in the Philippines, are an important and growing future trend which is more appropriate to quantify as "trait hectares" rather than hectares of adopted biotech crops. Number of "trait hectares" in US in 2005 was 59.4 million hectares compared with 49.8 million hectares of biotech crops, a 19% variance, and globally 100.1 million "trait hectares" versus 90 million hectares, a 10% variance.

- The largest increase in any country in 2005 was in Brazil, provisionally estimated at 4.4 million hectares (9.4 million hectares in 2005 compared with 5 million in 2004), followed by the US (2.2 million hectares), Argentina (0.9 million hectares) and India (0.8 million hectares). India had by far the largest year-on-year proportional increase, with almost a three-fold increase from 500,000 hectares in 2004 to 1.3 million hectares in 2005.

- Biotech soybean continued to be the principal biotech crop in 2005, occupying 54.4 million hectares (60% of global biotech area), followed by maize (21.2 million hectares at 24%), cotton (9.8 million hectares at 11%) and canola (4.6 million hectares at 5% of global biotech crop area).

- During the first decade, 1996 to 2005, herbicide tolerance has consistently been the dominant trait followed by insect resistance and stacked genes for the two traits. In 2005, herbicide tolerance, deployed

[1] *Highlighted at the end of this Executive Summary in 4 boxes with photos*



in soybean, maize, canola and cotton occupied 71% or 63.7 million hectares of the global biotech 90.0 million hectares, with 16.2 million hectares (18%) planted to Bt crops and 10.1 million hectares (11%) to the stacked genes. The latter was the fastest growing trait group between 2004 and 2005 at 49% growth, compared with 9% for herbicide tolerance and 4% for insect resistance.

- Biotech crops were grown by approximately 8.5 million farmers in 21 countries in 2005, up from 8.25 million farmers in 17 countries in 2004. Notably, 90% of the beneficiary farmers were resource-poor farmers from developing countries, whose increased incomes from biotech crops contributed to the alleviation of their poverty. In 2005, approximately 7.7 million poor subsistence farmers (up from 7.5 million in 2004) benefited from biotech crops – the majority in China with 6.4 million, 1 million in India, thousands in South Africa including mainly women Bt cotton farmers, more than 50,000 in the Philippines, with the balance in the seven developing countries which grew biotech crops in 2005. This initial modest contribution of biotech crops to the Millennium Development Goal of reducing poverty by 50% by 2015 is an important development which has enormous potential in the second decade of commercialization from 2006 to 2015.

- In 2005, the 21 countries growing biotech crops included 11 developing countries and 10 industrial countries; they were, in order of hectarage, USA, Argentina, Brazil, Canada, China, Paraguay, India, South Africa, Uruguay, Australia, Mexico, Romania, the Philippines, Spain, Colombia, Iran, Honduras, Portugal, Germany, France and the Czech Republic.

Table 1. Global Area of Biotech Crops in 2005: by Country (Million Hectares)

Rank	Country	Area (million hectares)	Biotech Crops
1*	USA	49.8	Soybean, Maize, Cotton, Canola, Squash, Papaya
2*	Argentina	17.1	Soybean, Maize, Cotton
3*	Brazil	9.4	Soybean
4*	Canada	5.8	Canola, Maize, Soybean
5*	China	3.3	Cotton
6*	Paraguay	1.8	Soybean
7*	India	1.3	Cotton
8*	South Africa	0.5	Maize, Soybean, Cotton
9*	Uruguay	0.3	Soybean, Maize
10*	Australia	0.3	Cotton
11*	Mexico	0.1	Cotton, Soybean
12*	Romania	0.1	Soybean
13*	Philippines	0.1	Maize
14*	Spain	0.1	Maize
15	Colombia	<0.1	Cotton
16	Iran	<0.1	Rice
17	Honduras	<0.1	Maize
18	Portugal	<0.1	Maize
19	Germany	<0.1	Maize
20	France	<0.1	Maize
21	Czech Republic	<0.1	Maize

Source: Clive James, 2005.
* 14 biotech mega countries growing 50,000 hectares, or more, of biotech crops
Note: All data re hectares are rounded off to the nearest 100,000 hectares and in some cases this leads to insignificant variances. More detailed descriptions of the status of biotech crops in each country are given in the full version of Brief 34.

- During the period 1996 to 2005, the proportion of the global area of biotech crops grown by developing countries has increased every year. More than one-third (38%, up from 34% in 2004) of the global biotech crop area in 2005, equivalent to 33.9 million hectares, was grown in developing countries where growth between 2004 and 2005 was substantially higher (6.3 million hectares or 23% growth) than industrial countries (2.7 million hectares or 5% growth). The increasing collective impact of the five principal developing countries (China, India, Argentina, Brazil and South Africa) representing all three continents of the South, Asia, Latin America and Africa, is an important continuing trend with implications for the future adoption and acceptance of biotech crops worldwide.

- In the first decade, the accumulated global biotech crop area was 475 million hectares or 1.17 billion acres, equivalent to almost half of the total land area of the USA or China, or 20 times the total land area of the UK. The continuing rapid adoption of biotech crops reflects the substantial and

consistent improvements in productivity, the environment, economics, and social benefits realized by both large and small farmers, consumers and society in both industrial and developing countries. The most recent survey[2] of the global impact of biotech crops for the nine-year period 1996 to 2004, estimates that the global net economic benefits to crop biotech farmers in 2004 was $6.5 billion, and $27 billion ($15 billion for developing countries and $12 billion for industrial countries) for the accumulated benefits during the period 1996 to 2004; these estimates include the benefits associated with the double cropping of biotech soybean in Argentina. The accumulative reduction in pesticides for the period 1996 to 2004 was estimated at 172,500 MT of active ingredient, which is equivalent to a 14% reduction in the associated environmental impact of pesticide use on these crops, as measured by the Environmental Impact Quotient (EIQ) – a composite measure based on the various factors contributing to the net environmental impact of an individual active ingredient.

- There is cause for cautious optimism that the stellar growth in biotech crops, witnessed in the first decade of commercialization, 1996 to 2005, will continue and probably be surpassed in the second decade 2006-2015. The number of countries adopting the four current major biotech crops is expected to grow, and their global hectarage and number of farmers planting biotech crops are expected to increase as the first generation of biotech crops is more widely adopted and the second generation of new applications for both input and output traits becomes available. Beyond the traditional agricultural products of food, feed and fiber, entirely novel products to agriculture will emerge including the production of pharmaceutical products, oral vaccines, specialty and fine chemicals and the use of renewable crop resources to replace non-renewable, polluting, and increasingly expensive fossil fuels. In the near term, in the established industrial country markets growth in stacked traits, measured in "trait hectares" of biotech crops, will continue to grow with the introduction of new input and output traits stacked to create value and to meet the multiple needs of both consumers and producers who seek more nutritional and healthier food and feed at the most affordable prices. Adherence to good farming practices with biotech crops will remain critical as it has been during the first decade and continued responsible stewardship must be practiced, particularly by the countries of the South, which will be the major deployers of biotech crops in the coming decade.

(1 hectare = 2.47 acres)

THE GLOBAL VALUE OF THE BIOTECH CROP MARKET

In 2005, the global market value of biotech crops, estimated by Cropnosis, was $5.25 billion representing 15% of the $34.02 billion global crop protection market in 2005 and 18% of the ~$30 billion 2005 global commercial seed market. The $5.25 billion biotech crop market comprised of $2.42 billion for biotech soybean (equivalent to 46% of global biotech crop market), $1.91 billion for biotech maize (36%), $0.72 billion for biotech cotton (14%), and $0.21 billion for biotech canola (4%). The market value of the global biotech crop market is based on the sale price of biotech seed plus any technology fees that apply. The accumulated global value for the ten-year period, since biotech crops were first commercialized in 1996, is estimated at $29.3 billion. The global value of the biotech crop market is projected at over $5.5 billion for 2006.

[2] *GM Crops: The Global Socio-economic and Environmental Impact of the First Nine Years 1996-2004 by Graham Brookes and Peter Barfoot, P.G. Economics. 2005*

FRANCE Bt Maize

BRIEF BACKGROUND

France resumed planting of Bt maize in 2005 after a four-year gap. France planted Bt maize in 1998 (1,500 hectares), 1999 (150 hectares), and 2000 (<100 hectares). In 2005, approximately 500 hectares were planted of which 200 hectares were for environmental monitoring, 100 hectares for experimental use, and 200 hectares for purely commercial purposes.

Source: MAIZEUROP - 2005

As an EU Member State, France authorizes a number of biotech products for imports under the EU approval process. With a large trade deficit for soybean meal, used in animal feed rations, France imports large quantities of soybean meal and soybeans for crushing. In 2003/04, France imported 4.55 million MT of soybean meal and 470,000 MT of soybeans with Brazil having displaced the US as France's largest supplier. France does not import maize gluten feed for animal feed. There are almost no food products labeled as derived from biotech available on the market.

VALUE OF AGRICULTURAL GDP: $39 billion

MAJOR CROPS:

1. wheat
2. cereals
3. sugar beets
4. potatoes
5. wine grapes

NATIONAL MAIZE AREA (2004): 1.8 million hectares

COEXISTENCE AND PRODUCT AUTHORIZATION:

France implements EU regulations on agricultural biotechnology, most importantly regulations covering traceability and labeling. The government is currently finalizing its Biotech Law which should be enacted before the end of 2006 and will include a coexistence policy, as well as evaluation procedures for crop biotech products.

BIOTECH CROP FIELD TRIALS*

Maize: Herbicide tolerance; insect resistance; herbicide tolerance/insect resistance; better grain quality and composition; more efficient nitrogen fixation; improved photosynthesis under drought conditions; lignin modification; medical use (gastric lipase in seeds)

Grape: virus-resistance

Poplar: lignin modification

Tall fescue (grass): herbicide tolerance and a hypolignified phenotype

Sugar beet: virus resistance

Tobacco: virus resistance

(Source: http://gmoinfo.jrc.it/gmp_browse_geninf.asp)

* Under Directive 2001/18/EC (after 17 October 2002)

PORTUGAL Bt Maize

BRIEF BACKGROUND

Portugal resumed planting of Bt maize after a five-year gap. Portugal planted an introductory area of approximately 1,000 hectares in 1999 for one year. In 2005, approximately 750 hectares were planted to Bt maize. As a member country of the EU, Portugal's resumption of the cultivation of Bt maize is an important development.

Source: Centro de Informação de Biotecnologia – Portugal

VALUE OF AGRICULTURAL GDP: $3 billion

MAJOR CROPS:

1. grains
2. potatoes
3. olives
4. grapes

NATIONAL MAIZE AREA (2004): 135,000 hectares

COEXISTENCE AND PRODUCT AUTHORIZATION:

The government has just passed a decree which requires a minimum distance of 200 meters between biotech and conventional maize and 300 meters between biotech maize and organic maize; buffer zones can substitute for these distances. The decree is also designed to facilitate the establishment of biotech-free zones. Implementation of coexistence laws will probably result in biotech maize being grown in the central and southern regions of Portugal where the farms are bigger, and where coexistence distances can be accommodated. All biotech varieties approved in the EC catalogue can be grown in Portugal.

BIOTECH CROP FIELD TRIALS*

Maize: herbicide tolerance; herbicide tolerance and insect resistance
(Source: http://gmoinfo.jrc.it/gmp_browse_geninf.asp)

* Under Directive 2001/18/EC (after 17 October 2002)

CZECH REPUBLIC Bt Maize

BRIEF BACKGROUND

The Czech Republic approved the commercial production of a biotech crop for the first time in 2005 and grew 150 hectares of Bt maize. The Czech Republic imports soybean meal and soybean oil from RR soybeans. Even though statistics show most imports originate from Germany, the soybean meal comes from other countries, mostly the U.S. and Brazil. In 2004, the Czech Republic imported over 600,000 MT, a 100% increase since 2001. A small quantity of maize is also imported from the U.S. (in 2004 about 500 MT). The Czech Republic is increasing its maize area in order to reduce the need for maize imports. In 1999, the Czech Republic imported 76,000 MT of maize while in 2004, it was only 10,000 MT. Over 90% of total imported maize comes from Slovakia.

VALUE OF AGRICULTURAL GDP: $2 billion

MAJOR CROPS:

1. wheat
2. potatoes
3. sugar beets
4. hops
5. fruit

NATIONAL MAIZE AREA (2004): 100,000 hectares

COEXISTENCE AND PRODUCT AUTHORIZATION:

As a member of the EU, the Czech Republic follows the EU's legislative framework for biotechnology. Since the EU accession on May 1, 2004, biotech food and feed products approved by the EU are valid in the Czech Republic. Provisional coexistence rules apply with 100 meters between Bt maize and conventional maize (or alternatively 50 meters and 6 buffer rows) and 600 meters between Bt maize and organic maize (or alternatively 300 meters and 6 buffer rows). These rules are valid only for 2005 as they are expected to be revised in the near term in a new decree.

BIOTECH CROP FIELD TRIALS*

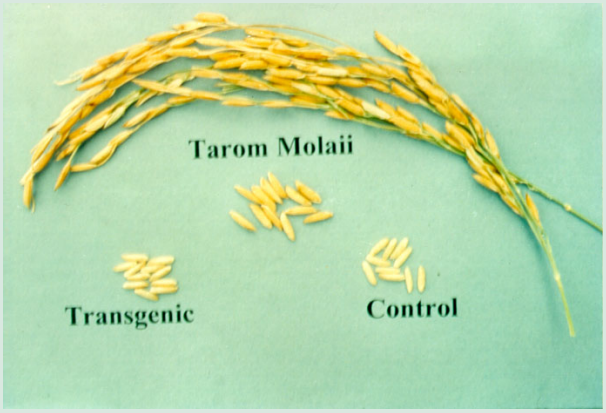
Potatoes: altered starch composition

(Source: http://gmoinfo.jrc.it/gmp_browse_geninf.asp)

* Under Directive 2001/18/EC (after 17 October 2002)

IRAN Bt Rice

BRIEF BACKGROUND



Source: ABRI, Karaj, Iran

In 2005, several hundred farmers grew an estimated 4,000 hectares of Bt rice on their farms in initial commercialization activities and to ensure provision of seed supplies for full commercialization in 2006, when it is planned to deploy the Bt rice on 10,000 to 20,000 hectares. The Bt rice was developed by the Agricultural Biotechnology Research Institute at Karaj and was officially released in Iran in 2004 on 2,000 hectares, to coincide with the International Rice Year. Iran is one of the largest importers of rice in the world, importing about 1 million tons per year, or more. The biotech rice program in Iran is well advanced but is only one of several biotech crop initiatives at 23 institutes, where 141 researchers are working on several biotech crops.

VALUE OF AGRICULTURAL GDP: $13 billion

MAJOR CROPS:

1. wheat
2. rice
3. other grains
4. sugar beets
5. fruit
6. nuts
7. cotton

NATIONAL RICE AREA (2004): 630,000 hectares

BIOSAFETY:

The Islamic Republic of Iran demonstrated its commitment to biosafety issues by joining the Convention on Biological Diversity in August 1996, signing the Cartagena Protocol on Biosafety in April 2001, and eventually ratifying the latter in November 2003. The National Biosafety Committee was formed in August 2000, as part of the Ministry of Science, Research and Technology. The presidential board of this committee consists of the Minister of Science, Research and Technology, the Minister of Health and Medical Education, the Minister for Agricultural Jihad, President of Environment protection organization and three specialists.

(Source: http://www.escwa.org.lb/information/meetings/events/bio/docs/BiosafetyInIran.pdf)

BIOTECH CROP FIELD TRIALS

Sugar beet: virus resistance
Canola: herbicide tolerance

(Source: Stone, R., Science in Iran: An Islamic Science Revolution?, *Science* 2005 309:1802-1804)

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