I S A A A
INTERNATIONAL SERVICE
FOR THE ACQUISITION
OF AGRI-BIOTECH
APPLICATIONS

EXECUTIVE SUMMARY

BRIEF 44

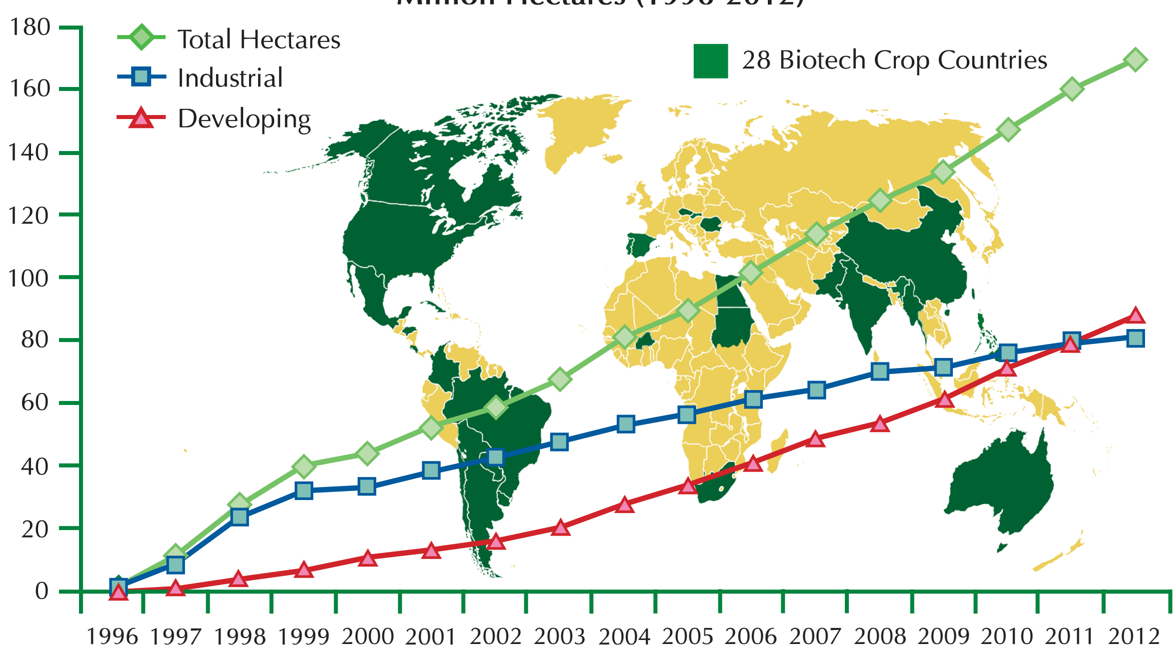
Global Status of Commercialized Biotech/GM Crops: 2012

By

Clive James
Chair, ISAAA Board of Directors

Dedicated by the author to the 1 billion poor and hungry people, and their survival

GLOBAL AREA OF BIOTECH CROPS
Million Hectares (1996-2012)



A record 17.3 million farmers, in 28 countries, planted 170.3 million hectares (420 million acres) in 2012, a sustained increase of 6% or 10.3 million hectares (25 million acres) over 2011.

Source: Clive James, 2012.

No. 44 - 2012

AUTHOR'S NOTE:

Global totals of millions of hectares planted with biotech crops have been rounded off to the nearest million and similarly, subtotals to the nearest 100,000 hectares, using both < and > characters; hence in some cases this leads to insignificant approximations, and there may be minor variances in some figures, totals, and percentage estimates that do not always add up exactly to 100% because of rounding off. It is also important to note that countries in the Southern Hemisphere plant their crops in the last quarter of the calendar year. The biotech crop areas reported in this publication are planted, not necessarily harvested hectarage in the year stated. Thus, for example, the 2012 information for Argentina, Brazil, Australia, South Africa, and Uruguay is hectares usually planted in the last quarter of 2012 and harvested in the first quarter of 2013 with some countries like the Philippines having more than one season per year. Thus, for countries of the Southern hemisphere, such as Brazil, Argentina and South Africa the estimates are projections, and thus are always subject to change due to weather, which may increase or decrease actual planted hectares before the end of the planting season when this Brief has to go to press. For Brazil, the winter maize crop (safrinha) planted in the last week of December 2012 and more intensively through January and February 2013 is classified as a 2012 crop in this Brief consistent with a policy which uses the first date of planting to determine the crop year. ISAAA is a not-for-profit organization, sponsored by public and private sector organizations. All biotech crops hectare estimates reported in all ISAAA publications are only counted once, irrespective of how many traits are incorporated in the crops. Details of the references listed in the Executive Summary are found in the full Brief 44.

EXECUTIVE SUMMARY

BRIEF 44

Global Status of Commercialized Biotech/GM Crops: 2012

By

Clive James
Chair, ISAAA Board of Directors

Dedicated by the author to the 1 billion poor and hungry people, and their survival

ISAAA prepares this Brief and supports its free distribution to developing countries. The objective is to provide information and knowledge to the scientific community and society on biotech/GM crops to facilitate a more informed and transparent discussion regarding their potential role in contributing to global food, feed, fiber and fuel security, and a more sustainable agriculture. The author takes full responsibility for the views expressed in this publication and for any errors of omission or misinterpretation.

Published by: The International Service for the Acquisition of Agri-biotech Applications (ISAAA).

Citation: James, Clive. 2012. Global Status of Commercialized Biotech/GM Crops: 2012. *ISAAA Brief* No. 44. ISAAA: Ithaca, NY.

ISBN: 978-1-892456-53-2

Publication Orders and Price: Please contact the ISAAA *SEAsia*Center to purchase a hard copy of the full version of Brief 44, including the Executive Summary and the Highlights at http://www.isaaa.org. The publication is available free of charge to eligible nationals of developing countries.

ISAAA *SEAsia*Center
c/o IRRI
DAPO Box 7777
Metro Manila, Philippines

Info on ISAAA: For information about ISAAA, please contact the Center nearest you:

ISAAA *Ameri*Center	ISAAA *Afri*Center	ISAAA *SEAsia*Center
105 Leland Lab	PO Box 70, ILRI Campus	c/o IRRI
Cornell University	Old Naivasha Road	DAPO Box 7777
Ithaca NY 14853, U.S.A.	Uthiru, Nairobi 00605	Metro Manila
	Kenya	Philippines

Electronically: or email to info@isaaa.org

For Executive Summaries of all *ISAAA Briefs,* please visit http://www.isaaa.org

EXECUTIVE SUMMARY

Global Status of Commercialized Biotech/GM Crops: 2012

Table of Contents

EXECUTIVE SUMMARY

Global Status of Commercialized Biotech/GM Crops: 2012

By

Clive James, Founder and Chair of ISAAA

Biotech Crop hectares increased by an unprecedented 100-fold, from 1.7 million hectares in 1996, to 170 million hectares in 2012.

Introduction

This Executive Summary focuses on the 2012 biotech crop highlights, which are presented and discussed in detail in ISAAA Brief 44, Global Status of Commercialized Biotech/GM Crops: 2012, and dedicated to the 1 billion poor and hungry people and their survival.

Biotech crops increase in 2012 for the 17th consecutive year

A record 170.3 million hectares of biotech crops were grown globally in 2012, at an annual growth rate of 6%, up 10.3 million from 160 million hectares in 2011. 2012 was the 17th year of commercialization of biotech crops, 1996-2012, when growth continued after a remarkable 16 consecutive years of increases.

Biotech crops fastest adopted crop technology

2012 marked an unprecedented 100-fold increase in biotech crop hectarage from 1.7 million hectares in 1996 to 170 million hectares in 2012 – this makes biotech crops the fastest adopted crop technology in recent history – the reason – it delivers benefits.

Millions of farmers elect to adopt biotech crops due to benefits they offer

In the period 1996 to 2012, millions of farmers in ~30 countries worldwide, adopted biotech crops at unprecedented rates. The most compelling and credible testimony to biotech crops is that during the 17 year period 1996 to 2012, millions of farmers in ~30 countries worldwide, elected to make more than 100 million independent decisions to plant and replant an accumulated hectarage of more than 1.5 billion hectares – an area 50% larger than the total land mass of the US or China – there is one principal and overwhelming reason that underpins the trust and confidence of risk-averse farmers in biotechnology – biotech crops deliver substantial, and sustainable, socio-economic and environmental benefits. The 2011 study conducted in Europe confirmed that biotech crops are safe.

28 countries grow biotech crops with the top ten each growing more than 1 million hectares

Of the 28 countries which planted biotech crops in 2012, 20 were developing and 8 were industrial countries. This compares with 19 developing and 10 industrial in 2011. Thus there are three times as many developing countries growing biotech crops as there are industrial countries. See a listing of countries and hectarages in Table 1 and Figure 1. The top 10 countries each grew more than 1 million hectares providing a broad-based worldwide foundation for diversified growth in the future; in fact, the top nine each grew more than 2 million hectares. More than half the world's population, 60% or ~4 billion people, live in the 28 countries planting biotech crops.

Two new countries plant biotech crops and three countries did not offer biotech seed for purchase by farmers.

Two new countries, Sudan (Bt cotton) and Cuba (Bt maize) planted biotech crops for the first time in 2012. Germany and Sweden could not plant the biotech potato, Amflora because it ceased to be marketed; Poland discontinued planting Bt maize because of regulation inconsistencies in the interpretation of the law on planting approval between the EU and Poland; the EU maintains that all necessary approvals are already in place for planting whereas Poland does not. In 2012, Sudan became the fourth country in Africa, after South Africa, Burkina Faso and Egypt, to commercialize a biotech crop – biotech Bt cotton. A total of 20,000 hectares were planted in both rainfed areas and irrigated schemes. About 10,000 farmers were the initial beneficiaries who have an average of about 1-2.5 hectares of land. In a landmark event Cuba joined the group of countries planting biotech crops in 2012. For the first time, farmers in Cuba grew 3,000 hectares of hybrid Bt maize in a "regulated commercialization" initiative in which farmers seek permission to grow biotech maize commercially. The initiative is part of an ecologically sustainable pesticide-free program featuring biotech maize hybrids and mycorrhizal additives. The Bt maize, with resistance to the major pest, fall armyworm, was developed by the Havana-based Institute for Genetic Engineering and Biotechnology (CIGB).

Over 17 million farmers benefit from biotech crops

In 2012, a record 17.3 million farmers, up 0.6 million from 2011, grew biotech crops – notably, over 90%, or over 15 million, were small resource-poor farmers in developing countries. Farmers are the masters of risk aversion and in 2012, 7.2 million small farmers in China and another 7.2 million small farmers in India, collectively planted a record ~15.0 million hectares of biotech crops. Bt cotton increased the income of farmers significantly by up to US$250 per hectare and also halved the number of insecticide sprays, thus reducing farmer exposure to pesticides.

Developing countries plant more biotech crops than industrial countries

For the first time, developing countries grew more, 52% of global biotech crops in 2012 than industrial countries at 48%. This is contrary to the prediction of critics who, prior to the commercialization of the technology in 1996, prematurely declared that biotech crops were only for industrial countries and would never be accepted and adopted by developing countries. In 2012, the growth rate for biotech crops was at least three times as fast and five times as large in developing countries, at 11% or 8.7 million hectares, versus 3% or 1.6 million hectares in industrial countries. During the period 1996-2011 cumulative economic benefits were high in developing countries at US$49.6 billion compared to US$48.6 billion generated by industrial countries. For 2011 alone, economic benefits for developing countries were higher at US$10.1 billion compared with US$9.6 billion for developed countries for a total of US$19.7 billion.

Table 1. Global Area of Biotech Crops in 2012: by Country (Million Hectares)**

Rank	Country	Area (million hectares)	Biotech Crops
1	USA*	69.5	Maize, soybean, cotton, canola, sugarbeet, alfalfa, papaya, squash
2	Brazil*	36.6	Soybean, maize, cotton
3	Argentina*	23.9	Soybean, maize, cotton
4	Canada*	11.6	Canola, maize, soybean, sugarbeet
5	India*	10.8	Cotton
6	China*	4.0	Cotton, papaya, poplar, tomato, sweet pepper
7	Paraguay*	3.4	Soybean, maize, cotton
8	South Africa*	2.9	Maize, soybean, cotton
9	Pakistan*	2.8	Cotton
10	Uruguay*	1.4	Soybean, maize
11	Bolivia*	1.0	Soybean
12	Philippines*	0.8	Maize
13	Australia*	0.7	Cotton, canola
14	Burkina Faso*	0.3	Cotton
15	Myanmar*	0.3	Cotton
16	Mexico*	0.2	Cotton, soybean
17	Spain*	0.1	Maize
18	Chile*	<0.1	Maize, soybean, canola
19	Colombia	<0.1	Cotton
20	Honduras	<0.1	Maize
21	Sudan	<0.1	Cotton
22	Portugal	<0.1	Maize
23	Czech Republic	<0.1	Maize
24	Cuba	<0.1	Maize
25	Egypt	<0.1	Maize
26	Costa Rica	<0.1	Cotton, soybean
27	Romania	<0.1	Maize
28	Slovakia	<0.1	Maize
	Total	**170.3**	

* 18 biotech mega-countries growing 50,000 hectares, or more, of biotech crops
** Rounded off to the nearest hundred thousand

Source: Clive James, 2012.

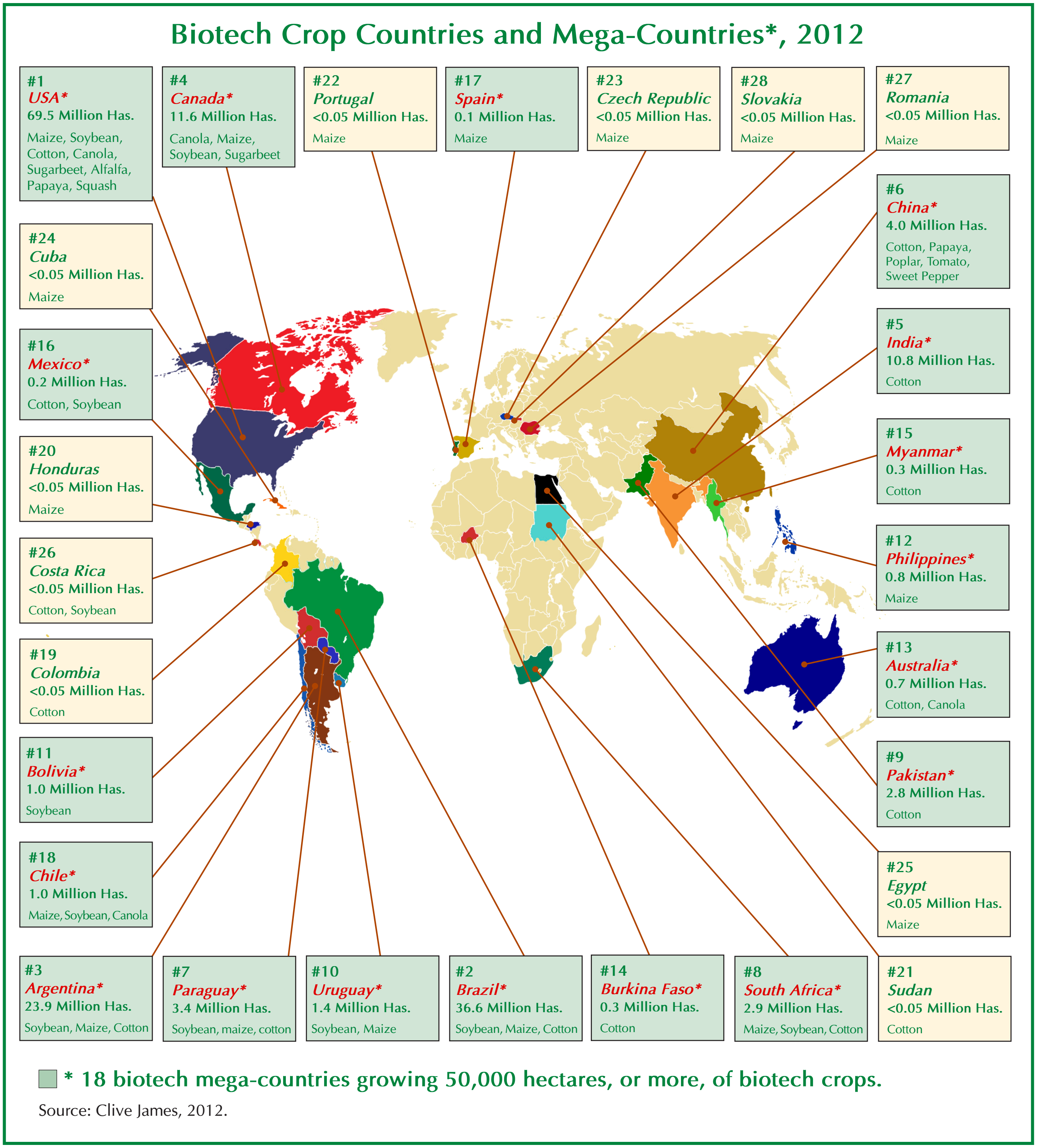


Figure 1. Global Map of Biotech Crop Countries and Mega-Countries in 2012

Stacked traits occupied ~25% of the global 170 million hectares

Stacked traits are an important feature of biotech crops – 13 countries planted biotech crops with two or more traits in 2012. Encouragingly, 10 were developing countries. Around 43.7 million hectares equivalent to 26% of the 170 million hectares were stacked in 2012, up from 42.2 million hectares or 26% of the 160 million hectares in 2011.

The 5 lead biotech developing countries are China, India, Brazil, Argentina and South Africa – they grew 46% of global biotech crops, and have ~40% of world population

The five lead developing countries in biotech crops are China and India in Asia, Brazil and Argentina in Latin America, and South Africa on the continent of Africa, collectively grew 78.2 million hectares (46% of global) and together represent ~40% of the global population of 7 billion, which could reach 10.1 billion by 2100. Remarkably, Africa alone could escalate from 1 billion today (~15% of global) to a possible high of 3.6 billion (~35% of global) by the end of this century in 2100 – global food security, exacerbated by high and unaffordable food prices, is a formidable challenge to which biotech crops can contribute but are not a panacea.

Brazil, the engine of biotech crop growth

Brazil ranks second only to the USA in biotech crop hectarage in the world, with 36.6 million hectares, and emerging as a global leader in biotech crops. For the fourth consecutive year, Brazil was the engine of growth globally in 2012, increasing its hectarage of biotech crops more than any other country in the world – a record 6.3 million hectare increase, equivalent to an impressive year-over-year increase of 21%. Brazil grows 21% of the global hectarage of 170 million hectares and is consolidating its position by consistently closing the gap with the US. A fast track approval system allows Brazil to approve events in a timely manner. Brazil has already approved the first stacked soybean with insect resistance and herbicide tolerance for commercialization in 2013. Notably, EMBRAPA, a public sector institution, with an annual budget of ~US$1 billion, gained approval to commercialize a home-grown biotech virus resistant bean, (rice and beans are the staples of Latin America) developed entirely with its own resources, thus demonstrating its impressive technical capacity to **develop**, **deliver and deploy** a new state-of-the art biotech crop.

USA maintains leadership role and Canada grows record canola hectarage

The US continued to be the lead producer of biotech crops globally with 69.5 million hectares, with an average adoption rate of ~90% across all biotech crops. Canada grew a record 8.4 million hectares of biotech canola at a record adoption rate of 97.5%.

India and China continue to grow more Bt cotton

India cultivated a record 10.8 million hectares of Bt cotton with an adoption rate of 93%, whilst 7.2 million small resource poor farmers in China grew 4.0 million hectares of Bt cotton with an adoption rate of 80%, cultivating on average, 0.5 hectare per farmer. India enhanced farm income from Bt cotton by US$12.6 billion in the period 2002 to 2011 and US$3.2 billion in 2011 alone.

Progress in Africa

Africa continued to make progress with South Africa increasing its biotech area by a record 0.6 million hectares to reach 2.9 million hectares; Sudan joined South Africa, Burkina Faso and Egypt, to bring the total number of African biotech countries to four. In South Africa the hectarage occupied by biotech crops in 2012 continued to increase for the 15th consecutive season, driven mainly by increased hectarage under maize and soybeans. The estimated total biotech crop area in 2012 was 2.9 million hectares, compared with 2.3 million hectares in 2011/2012, an impressive 26% annual increase in area.

Five EU countries planted a record 129,071 hectares of biotech Bt maize, up 13% from 2011. Spain was by far the largest adopter planting 90% of the total Bt maize hectarage in the EU.

Five EU countries (Spain, Portugal, Czechia, Slovakia and Romania) planted a record 129,071 hectares of biotech Bt maize, a substantial 13% increase over 2011, with Spain growing 90%, equivalent to 116,307 hectares of the total Bt maize hectarage in the EU. Spain had a record adoption rate of 30%. The planned approval in 2014, subject to clearance of a new biotech potato named “Fortuna” resistant to late blight, (the most important disease of potatoes), is potentially an important product, that can meet EU policy and environmental needs to make potato production more sustainable by reducing heavy fungicide applications and decreasing production losses estimated at up to US$1.5 billion annually in the EU alone, and US$7.5 billon worldwide.

Biotech crops contribution to Food Security, Sustainability and Climate Change

From 1996 to 2011, biotech crops contributed to Food Security, Sustainability and Climate Change by: increasing crop production valued at US$98.2 billion; providing a better environment, by saving 473 million kg a.i. of pesticides; in 2011 alone reducing CO_2 emissions by 23.1 billion kg, equivalent to taking 10.2 million cars off the road; conserving biodiversity by saving 108.7 million hectares of land; and helped alleviate poverty by helping >15.0 million small farmers, and their families totalling >50 million people, who are some of the poorest people in the world. Biotech crops are essential but are not a panacea and adherence to good farming practices such as rotations and resistance management, are a must for biotech crops as they are for conventional crops.

Contribution of biotech crops to Sustainability

Biotech crops are contributing to sustainability in the following five ways:

- **Contributing to food, feed and fiber security and self sufficiency, including more affordable food, by increasing productivity and economic benefits sustainably at the farmer level**

  Economic gains at the farm level of ~US$98.2 billion were generated globally by biotech crops during the sixteen year period 1996 to 2011, of which 51% were due to reduced production costs (less ploughing, fewer pesticide sprays and less labor) and 49% due to substantial yield gains of 328 million tons. The corresponding figures for 2011 alone was 78% of the total gain due to increased yield (equivalent to 50.2 million tons), and 22% due to lower cost of production (Brookes and Barfoot, 2013, Forthcoming).

- **Conserving biodiversity, biotech crops are a land saving technology**

  Biotech crops are a land-saving technology, capable of higher productivity on the current 1.5 billion hectares of arable land, and thereby can help preclude deforestation and protect biodiversity in forests and in other in-situ biodiversity sanctuaries. Approximately 13 million hectares of biodiversity – rich tropical forests, are lost in developing countries annually. If the 328 million tons of additional food, feed and fiber produced by biotech crops during the period 1996 to 2011 had not been produced by biotech crops, an additional 108.7 million hectares (Brookes and Barfoot, 2013, Forthcoming) of conventional crops would have been required to produce the same tonnage. Some of the additional 108.7 million hectares would probably have required fragile marginal lands, not suitable for crop production, to be ploughed, and for tropical forest, rich in biodiversity, to be felled to make way for slash and burn agriculture in developing countries, thereby destroying biodiversity.

- **Contributing to the alleviation of poverty and hunger**

  To-date, biotech cotton in developing countries such as China, India, Pakistan, Myanmar, Bolivia, Burkina Faso and South Africa have already made a significant contribution to the income of >15 million small resource-poor farmers in 2012; this can be enhanced significantly in the remaining 3 years of the second decade of commercialization, 2013 to 2015 principally with biotech cotton and maize.

- **Reducing agriculture's environmental footprint**

  Conventional agriculture has impacted significantly on the environment, and biotechnology can be used to reduce the environmental footprint of agriculture. Progress to-date includes: a significant reduction in pesticides; saving on fossil fuels; decreasing CO_2 emissions through no/less ploughing; and conserving soil and moisture by optimizing the practice of no till through application of herbicide tolerance. The accumulative reduction in pesticides for the period 1996 to 2011 was estimated at 473 million kilograms (kgs) of active ingredient (a.i.), a saving of 8.9% in pesticides, which is equivalent to an 18.3% 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. The corresponding data for 2011 alone was a reduction of 37 million kgs a.i. (equivalent to a saving of 8.5% in pesticides) and a reduction of 22.8% in EIQ (Brookes and Barfoot, 2013, Forthcoming).

  Increasing efficiency of water usage will have a major impact on conservation and availability of water globally. Seventy percent of fresh water is currently used by agriculture globally, and this is obviously not sustainable in the future as the population increases by almost 30% to over 9 billion by 2050. The first biotech maize hybrids with a degree of drought tolerance are expected to be commercialized by 2013 in the USA, and the first tropical drought tolerant biotech maize is expected by ~2017 for sub-Saharan Africa. Drought tolerance is expected to have a major impact on more sustainable cropping systems worldwide, particularly in developing countries, where drought is more prevalent and severe than industrial countries.

- **Helping mitigate climate change and reducing greenhouse gases**

  The important and urgent concerns about the environment have implications for biotech crops, which contribute to a reduction of greenhouse gases and help mitigate climate change in two principal ways. First, permanent savings in carbon dioxide (CO_2) emissions through reduced use of fossil-based fuels, associated with fewer insecticide and herbicide sprays; in 2011, this was an estimated saving of 1.9 billion kg of CO_2, equivalent to reducing the number of cars on the roads by 0.8 million. Secondly, additional savings from conservation tillage (need for less or no ploughing facilitated by herbicide tolerant biotech crops) for biotech food, feed and fiber crops, led to an additional soil carbon sequestration equivalent in 2011 to 21.1 billion kg of CO_2, or removing 9.4 million cars off the road. Thus in 2011, the combined permanent and additional savings through sequestration was equivalent to a saving of 23 billion kg of CO_2 or removing 10.2 million cars from the road (Brookes and Barfoot, 2013, Forthcoming).

  Droughts, floods, and temperature changes are predicted to become more prevalent and more severe as we face the new challenges associated with climate change, and hence, there will be a need for faster crop improvement programs to develop varieties and hybrids that are well adapted to more rapid changes in climatic conditions. Several biotech crop tools, including tissue culture, diagnostics, genomics, molecular marker-assisted selection (MAS) and biotech crops can be used collectively for 'speeding the breeding' and help mitigate the effects of climate change. Biotech crops are already contributing to reducing CO_2 emissions by precluding the need for ploughing a significant portion of cropped land, conserving soil, and particularly moisture, and reducing pesticide spraying as well as sequestering CO_2.

In summary, collectively the above five thrusts have already demonstrated the capacity of biotech crops to contribute to sustainability in a significant manner and for mitigating the formidable challenges associated with climate change and global warming; and the potential for the future is enormous. Biotech crops can increase productivity and income significantly, and hence, can serve as an engine of rural economic growth that can contribute to the alleviation of poverty for the world's small and resource-poor farmers.

Regulation of biotech crops

The lack of appropriate, science-based and cost/time-effective regulatory systems continues to be the major constraint to adoption. Responsible, rigorous but not onerous, regulation is needed for small and poor developing countries. It is noteworthy, that on 6 November 2012, in California, USA, voters defeated Proposition 37, the proposed state petition on "Mandatory Labeling of Genetically Engineered Food Initiative" – the final result was No 53.7% and Yes 46.3%.

Status of approved events for biotech crops

While 28 countries planted commercialized biotech crops in 2012, an additional 31 countries totalling 59 have granted regulatory approvals for biotech crops for import, food and feed use and for release into the environment since 1996. A total of 2,497 regulatory approvals involving 25 GM crops and 319 GM events have been issued by competent authorities in 59 countries, of which 1,129 are for food use (direct use or processing), 813 are for feed use (direct use or processing) and 555 are for planting or release into the environment. Of the 59 countries with regulatory approvals, USA has the most number of events approved (196), followed by Japan (182), Canada (131), Mexico (122), Australia (92), South Korea (86), New Zealand (81), European Union (67 including approvals that have expired or under renewal process), Philippines (64), Taiwan (52) and South Africa (49). Maize has the most number of approved events (121 events in 23 countries), followed by cotton (48 events in 19 countries), potato (31 events in 10 countries), canola (30 events in 12 countries) and soybean (22 events in 24 countries). The event that has received the most number of regulatory approvals is the herbicide tolerant maize event NK603 (50 approvals in 22 countries + EU-27), followed by the herbicide tolerant soybean event GTS-40-3-2 (48 approvals in 24 countries + EU-27), insect resistant maize event MON810 (47 approvals in 22 countries + EU-27), insect resistant maize event Bt11 (43 approvals in 20 countries + EU-27), insect resistant cotton event MON531 (36 approvals in 17 countries + EU-27) and insect resistant cotton event MON1445 (31 approvals in 14 countries + EU-27).

Global value of biotech seed alone was ~US$15 billion in 2012

Global value of biotech seed alone was ~US$15 billion in 2012. A 2011 study estimated that the cost of discovery, development and authorization of a new biotech crop/trait is ~US$135 million. In 2012, the global market value of biotech crops, estimated by Cropnosis, was US$14.84 billion, (up from US$13.35 billion in 2011); this represents 23% of the US$64.62 billion global crop protection market in 2012, and 35% of the ~US$34 billion commercial seed market. The estimated global farm-gate revenues of the harvested commercial "end product" (the biotech grain and other harvested products) is more than ten times greater than the value of the biotech seed alone.

Future Prospects

Future prospects up to the MDG year of 2015 and beyond look encouraging. Several new developing countries are expected to plant biotech crops before 2015 led by Asia, and there is cautious optimism that Africa will be well-represented: the first biotech based drought tolerant maize planned for release in North America in 2013 and in Africa by ~2017; the first stacked soybean tolerant to herbicide and insect resistant will be planted in Brazil in 2013; subject to regulatory approval, Golden Rice could be released in the Philippines in 2013/2014; drought tolerant sugarcane is a possible candidate in Indonesia, and biotech maize in China with a potential of ~30 million hectares and for the future biotech rice which has an enormous potential to benefit up to 1 billion poor people in rice households in Asia alone. Biotech crops, whilst not a panacea, have the potential to make a substantial contribution to the 2015 MDG goal of cutting poverty in half, by optimizing crop productivity, which can be expedited by public-private sector partnerships, such as the WEMA project, supported in poor developing countries by the new generation of philanthropic foundations, such as the Gates and Buffet foundations. Observers are cautiously optimistic about the future with more modest annual gains predicted because of the already high rate of adoption in all the principal crops in mature markets in both developing and industrial countries.

Drought in the USA in 2012

The worst drought in 50 years impacted on crop production in the USA in 2012. The drought was estimated to have affected 26 of the 52 states, and covered at least 55% of the land area of the USA, which is almost 1 billion hectares. In comparison, the more severe Dust Bowl drought of 1934 covered almost 80% of the US land area. By the end of July 2012, drought and extreme heat had affected more than 1,000 counties in 29 states and they were designated natural disaster counties by USDA. As of July 2012, compared with the average year, 38% of the US maize crop had already been rated as poor and similarly 30% of soybean was rated poor. Given that the maize crop is the most important in the US valued at US$76.5 billion in 2011, losses for 2012 are expected to be substantial. The drought in Texas alone in 2011 was estimated to have cost US$7.6 billion and final losses for the drought of 2012 are likely to be much higher. Since US maize and US soybean exports represent 53% and 43% of global maize and soybean exports, respectively, the impact of the 2012 drought on international prices are likely to be significant. There is some comfort in the fact that global rice and wheat supplies were relatively plentiful in 2012 and the hope is that they will preclude a broad escalation of commodity prices as was the case in mid-2008. Maize is more vulnerable than soybean to price escalation because the shortfall in maize production could be exacerbated by the demand for maize for biofuel production in the US.

Some preliminary advance estimates in July 2012 suggested that losses in the US soybean and maize area affected by drought could be as high as 30%, but reliable estimates will not be available until later. Some of the most recent estimates indicate that compared with 2011 yields the average for 2012 will be 21% less for maize and 12% less for soybeans. Preliminary estimates by USDA suggested that the 2012 drought would result in increases in food prices of 3 to 4% in 2013, with beef prices increasing by 4 to 5%.

First biotech drought tolerant maize to be deployed in the US in 2013

Drought tolerance conferred through biotech crops is viewed as the most important trait that will be commercialized in the second decade of commercialization, 2006 to 2015, and beyond, because it is, by far, the single most important constraint to increased productivity for crops worldwide. The first and most advanced drought tolerant biotech/transgenic maize, will be launched commercially by Monsanto in the USA in 2013. Notably, the same technology, has been donated by the technology developers, Monsanto and BASF, to a Private/Public sector partnership (WEMA) which hopes to release the first biotech drought tolerant maize as early as 2017 in sub-Saharan Africa where the need for drought tolerance is greatest.

Global review of drought tolerance

Given the pivotal importance of drought tolerance, ISAAA invited Dr. Greg O. Edmeades, former leader of the maize drought program at the International Maize and Wheat Improvement Center (CIMMYT), to contribute a timely global overview on the status of drought tolerance in maize, in both conventional and biotech approaches, in the private and public sector, and to discuss future prospects in the near, mid and long term. The contribution by Dr. Edmeades, ***"Progress in Achieving and Delivering Drought Tolerance in Maize -- An Update"***, supported by key references, is included as a chapter in the full version of Brief 44, as well as an introductory chapter on drought to highlight the enormous global importance of the drought tolerance trait, which virtually no crop or farmer in the world can afford to be without.

ISAAA
International Service
for the Acquisition
of Agri-biotech
Applications

ISAAA *SEAsia*Center
c/o IRRI, DAPO Box 7777
Metro Manila, Philippines

Tel.: +63 2 580 5600 ext. 2234/2845 · Telefax: +63 49 5367216
URL: http://www.isaaa.org

For details on obtaining a copy of ISAAA Brief No. 44 - 2012, *email* publications@isaaa.org