

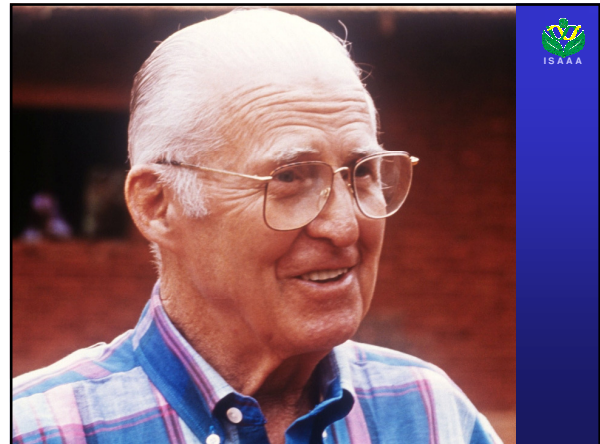
Biotech/GM Crops –1996 to 2009 Adoption, Impact and Future Prospects


by
Dr. Clive James, Founder and Chair, ISAAA

Dedicated to the late Nobel Peace Laureate
Norman Borlaug, first founding Patron of ISAAA

Chile, July 2010

International Service for the Acquisition
of Agri-biotech Applications (ISAAA)
<http://www.isaaa.org>





Norman Borlaug (1914-2009) The ingredients of success

THE QUADRILOGY of the 4 “P”s


- **PRODUCTIVITY** – Entire focus on more kgs per hectare & team approach – Borlaug assumed full responsibility for success or failure for wheat production at the farm/national level NOT the field expt. level.
- **PEOPLE** – Investment in human capital
- **POVERTY** – Alleviation of poverty
- **PEACE** - “Cannot have PEACE on empty stomachs”



European Co-sponsors of the 2009 Report The Mission of ISAAA – Alleviation of Poverty

- The two European philanthropic sponsors support the noble goal of sharing knowledge to aid global society in knowledge-based decisions on biotech crops.
- Ibercaja, a bank in Spain – Spain successfully grows 80% of the Bt maize hectares in the EU.
- Fondazione Bussolera-Branca, Italy
- ISAAA shares knowledge freely on biotech crops whilst respecting the rights of others to make decisions – ISAAA is a pro-choice organization.


Source: Clive James, 2010



The Challenge – Double Crop Production sustainably, on less resources, by 2050

- Hunger & malnutrition exceeds 1 billion for first time.
- NO SINGLE APPROACH will double crop production SUSTAINABLY by 2050.
- Conventional technology ALONE will NOT double crop production by 2050 and GM/BIOTECH CROPS, NOT A PANACEA but essential.
- Successful strategy must have MULTIPLE APPROACHES that address all the principal issues that include:
 - Population stabilization
 - Improved food distribution systems
 - A Technology Component is ESSENTIAL – A crop improvement STRATEGY THAT INTEGRATES the BEST of CONVENTIONAL and the BEST of BIOTECH to optimize productivity and CONTRIBUTE to self-sufficiency and food, feed and fiber security

Source: Clive James, 2010



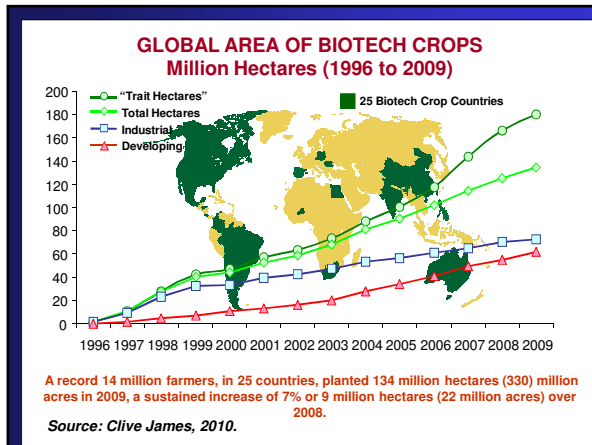
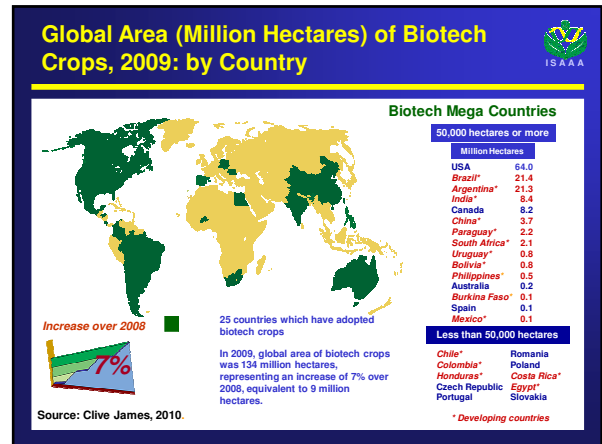
Acceptance Issues related to Biotech Crops

- **Food safety** – food as safe, or safer, than conventional
- **Environmental Impact**
 - **Gene Flow** – conservation of biodiversity – coexistence
 - **Effect on non-target organisms** – Target specific tech
 - **Management of Bt resistance** – durability, a challenge
- **Ownership of the technology**
 - **Role of the Private sector, IPR** – public/private balance
- **Ethical considerations** – the right to food
- Above issues impact on **INTERNATIONAL TRADE**

Source: Clive James, 2010

ISAAA

ADOPTION OF BIOTECH CROPS 1996 - 2009



ISAAA

Developing countries record bigger gains in biotech hectares than industrial countries – will exceed industrial countries by 2015

- From 1996 to 2009, % of global area of biotech crops in developing countries increased consistently with a record 46% in 2009 – expected to exceed 50% by 2015.
- Biotech area in developing countries (16) grew by 7.0 million hectares, or 13% in 2009, compared with 2.0 million hectares or 3% in industrial countries (9).
- The 5 mega biotech countries of Lat Am, Asia & Africa: **Argentina, Brazil, China, India and South Africa**, with a combined population of 2.7 billion (41% of global), grew 57 million hectares of biotech crops in 2009, equivalent to 43% of global total.

Source: Clive James, 2010

ISAAA

The five mega developing countries deploying biotech crops in 2009

- Argentina** – #3 in the world ~ \$1.1 B gain in 2008 for soy/maize/cotton, largest country gain of >\$9 bill 1996/08
- Brazil** – #2 in 2009 – highest absolute growth of 5.6 M has \$0.7 B gain in 2008; \$2.8 B 2003/08 A global leader.
- China** – Biosafety clearance, rice & maize. 7 M farmers grew 3.7 M has of Bt cotton in 2009, \$859 M gain in 2008; \$7.6 B in 1996-2008.
- India** – Bt cotton – 8.4 M has, 87% adoption, 5.6 million farmers gain \$1.8 B in 2008; \$5.1 B gain in 2002-08.
- South Africa** – Lead country in Africa – in 2009, 17% growth, maize: white (food) & yellow (feed), soy, cotton.

Source: Clive James, 2010

ISAAA

2009 HIGHLIGHTS Progress on many fronts

- China grants biosafety certificate to biotech rice & maize
- 134 million hectares, 7% growth or 9 million hectares
- 14 M farmers, up 0.7 M, 90% or 13 M were small farmers
- Dev. countries almost half; Mexico - First GM maize trials
- Stacked traits, 11 countries, 28.7 M hectares (21%)
- Brazil – largest absolute growth of 5.6 million hectares
- Continued Progress in Africa: growth in all 3 countries
- Burkina Faso highest global percent growth of 14-fold
- Costa Rica joined & Japan grew blue rose for first time

Source: Clive James, 2010

IMPACT OF BIOTECH CROPS



- **Productivity and income**
- **Protection of Biodiversity**
- **Environment and Climate change**
- **Socio-economic Benefits**

GLOBAL IMPACT of BIOTECH CROPS



INCREASED PRODUCTIVITY (kg/ha)

- Increased productivity/income & cheaper production costs = more affordable food for consumers
- Accumulated Farm income gains of **\$52 billion from 1996 to 2008**, of which **50%** due to lower production costs, and **50%** due to a production gain of **167 M tons**.

PROTECTION OF BIODIVERSITY

- Goal – Double crop production on same area of 1.5 B hectares of crop land without felling forests & losing biodiversity – 13 M has loss of forest /year in DCs
- **167 M tons would have required an additional 63 M hectares – Biotech crops are a land saving technology and saves biodiversity in forests and sanctuaries**

Source: Compiled by Clive James, 2010

GLOBAL IMPACT of BIOTECH CROPS



ENVIRONMENTAL IMPACT AND CLIMATE CHANGE

- Reduced need for external inputs
- Saving of **356,000 MT pesticides from 1996 to 2008** – 8% saving; In 2008 alone, saving was **34,000 MT** – a saving of **10% pesticides**
- Saved **14 B kg CO₂** in 2008 – contribution to climate change, equivalent to removing **7 million cars** off the road
- Conservation of **SOIL (< erosion) & WATER** by biotech + no/low till on 50 million hectares, mainly in North and Latin America – contribution to **SUSTAINABILITY**

SOCIAL BENEFITS

- Contribution to **poverty alleviation** of 13 million small resource-poor farmers in 2009 in China (7.0 M), India (5.6 M) and balance in Philippines, South Africa and 14 other DCs
- **Welfare benefits** emerging in India where women and children in Bt cotton families get more medical and educational support

Source: Compiled by Clive James, 2010

FUTURE PROSPECTS

2010 – 2015

THE REMAINDER OF THE SECOND DECADE OF BIOTECH/GM CROPS

2015, The Millennium Development Goal Year

Two requirements for continued growth of Biotech/GM crops from 2010 to 2015



- Political will and support from lead institutions
- A new wave of improved Biotech crops

Source: Clive James, 2010

Growing political will & support from lead institutions



- Premier Wen Jiabo, China *"I strongly advocate making great efforts to pursue transgenic engineering. The recent food shortages around the world have strengthened my belief"* (2008).
- Bill and Melinda Gates Foundation *"We include transgenic approaches because we believe they can help address farmers' challenges faster than and more efficiently than conventional breeding alone"* (2009).
- Support from G8 at Hokkaido Japan in 2008 and in La'Quilla Italy in 2009 *"To help farmers in the poorest nations improve production and help the poor help themselves i.e. a new emphasis on food self-sufficiency as well as food security."*
- Leadership of Spain with Bt maize in EU; Royal Society of London, recommends investments in biotech crops

Source: Clive James, 2010

A partial list, of an impressive new wave of biotech crops, 2010 - 2015



- **IMPORTANCE of RICE as a CROP and DROUGHT as a TRAIT**
- Smartstax maize in US and Canada in 2010
- Amflora potato in Germany, Sweden and Czechia in 2010
- New herbicide tolerant Soy (BASF/Embrapa) in Brazil 2011
- Golden Rice 2012/2013 – Philippines, Bangladesh, India
- Bt rice in China ~ 3 years
- Phytase maize in China ~ 3 years
- Drought tolerant maize – 2012, USA & Canada, Africa (2017)
- Soybean with omega-3 ~ in about 3 years
- Golden bean mosaic virus ~ 3 years Embrapa, Brazil (public)
- Nitrogen use efficiency; biotech wheat ~ 2015 or later

Source: Clive James, 2010

Challenges for the Future



- Establish responsible and efficient regulatory systems, that are appropriate for developing countries with limited resources
- Improved Communication with Society about the attributes and potential of biotech crops

Source: Clive James, 2009

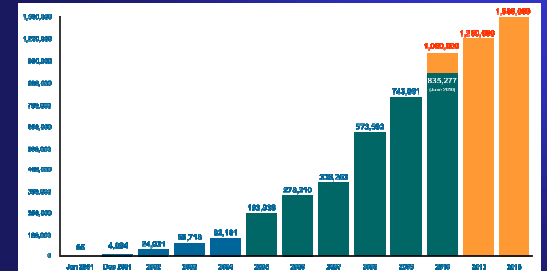
ISAAA's Global Knowledge Center (KC) on Crop Biotech & Network of Biotechnology Information Centers (BICs)



Source: Clive James (2010)

INTERNATIONAL SERVICE FOR THE ACQUISITION OF AGR-BIOTECH APPLICATIONS

ISAAA Crop Biotech Update Recipients As of June 2010



- Includes recipients of Crop Biotech Update translations in Arabic, Bahasa Indonesia, Bangla, Chinese, French, Italian, Japanese, Portuguese, Spanish, Thai and Vietnamese
- Does not include subscribers to other list serves that pick up articles from the Crop Biotech Update; estimated at 30,000
- Projected number of subscribers

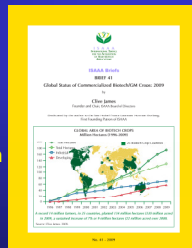
To subscribe, go to <http://isaaa.org/kc/cropbiotechupdate/subscribe/default.asp> or send an email to knowledge.center@isaaa.org with **SUBSCRIBE** as subject!

Knowledge Sharing with Global Society



Impact of ISAAA Annual Global Status Review (as of June 15, 2010)

- No. of media articles = 1,469
- No. of countries reached = 65
- No. of people reached = 2.0 billion
- No. of languages = 26



ISAAA Annual Review Brief 41
The GLOBAL STATUS OF COMMERCIALIZED BIOTECH/GM CROPS 2009
Authored by Clive James

THE EPILOGUE Borlaug's Counsel on Biotech/GM Crops



"Over the past decade, we have been witnessing the success of plant biotechnology. This technology is helping farmers throughout the world produce higher yield, while reducing pesticide use and soil erosion. The benefits and safety of biotechnology has been proven over the past decade in countries with more than half of the world's population."

"What we need is COURAGE by the leaders of those countries where farmers still have no choice but to use older and less effective methods. The Green Revolution and now plant biotechnology are helping meet the growing demand for food production, while preserving our environment for future generations."

Source: The RNA Underworld, Sept. 13, 2009.