

Global Status of GM Crops, their Contribution to Sustainability, and Future Prospects

by

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**International Service for the Acquisition
of Agri-biotech Applications (ISAAA)**

<http://www.isaaa.org>

ISAAA's Mission Statement



The mission of ISAAA is to :

- Contribute to poverty alleviation by increasing crop productivity and income generation particularly for resource-poor farmers, and to bring about a safer environment and more sustainable agricultural development, through biotechnology transfer.**
- Share knowledge on crop biotechnology so that the global community is more well informed about the attributes and potential of the new technologies**

For more information, visit <http://www.isaaa.org>

The Challenge



- **Population** 1999 - 6 billion 2050 - 9 billion
90% of population in the South by 2050
- **Cultivable Land per capita**
 - 0.45 ha. in 1966
 - 0.25 ha. in 1998
 - 0.15 ha. in 2050
- **Lower growth in grain yields** -World grain yields grew at 2.1 % in 1980s, but at less than 1.0 % per annum in 1990s
- **Malnutrition/Poverty**
 - 840 million people suffer from malnutrition
 - 1.3 billion afflicted by poverty
- **GOAL --- At least double food production sustainably on same land area, (1.5 billion ha) by 2050**

A Global, Food, Feed and Fiber Strategy



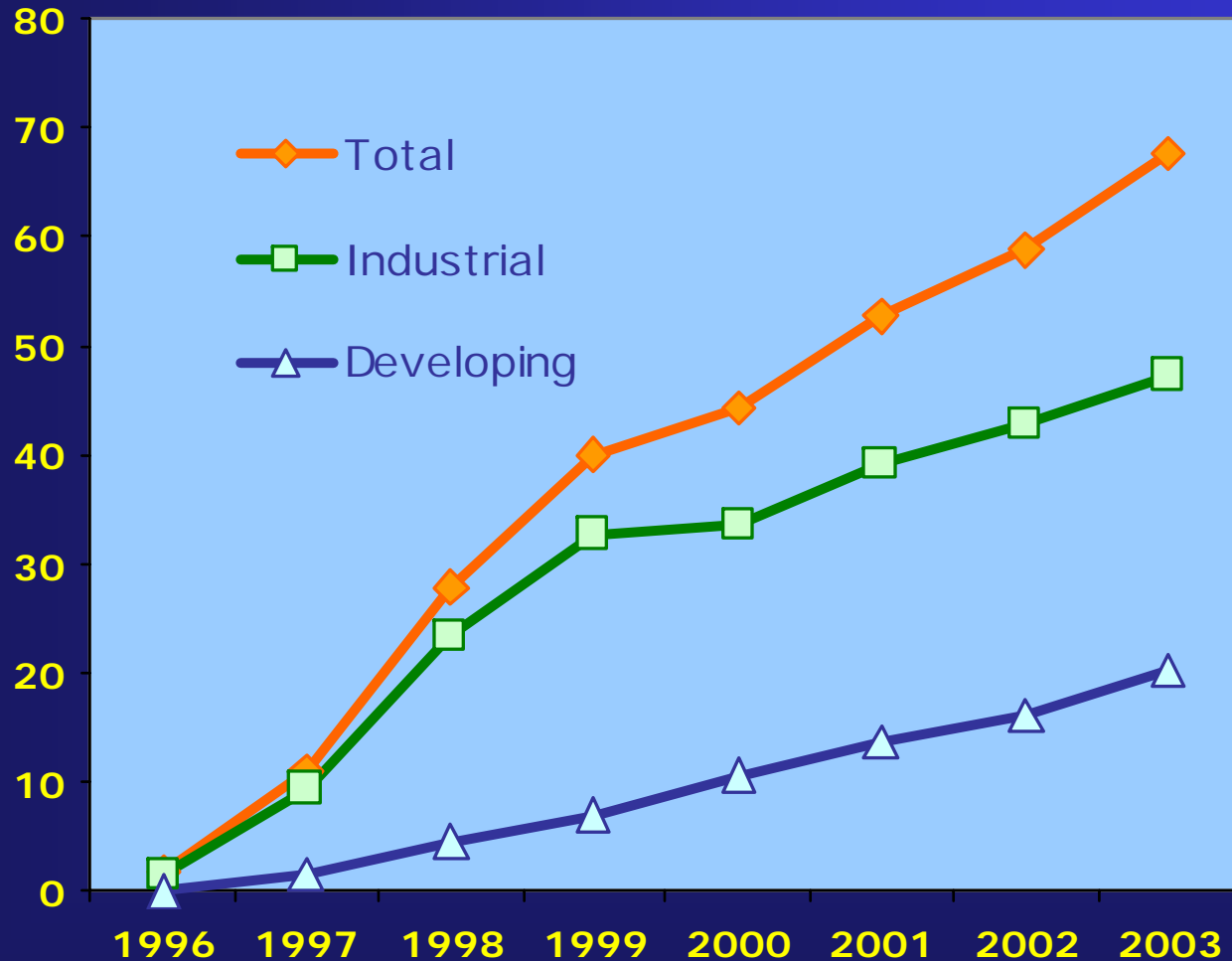
- **NO SINGLE APPROACH** will provide solution to food feed and fiber security
- Conventional crop improvement **ALONE** will not double food production by 2050 -- GM crops **NOT PANACEA** but essential
- Successful strategy must have **MULTIPLE APPROACHES** that address all the principal issues that include:
 - **Population Control**
 - **Improved food distribution systems**
 - **The technology Component - A crop improvement STRATEGY THAT INTEGRATES CONVENTIONAL AND BIOTECH/GM CROP APPROACHES** to optimize productivity and that can **CONTRIBUTE** to food feed and fiber security

Acceptance Issues related to GM Crops



- **Food safety**
- **Environmental Impact**
 - Gene Flow -conservation of biodiversity- coexistence
 - Effect on non-target organisms
 - Durability of Bt resistance
- **Restricted Access and Control of GM technology**
 - Role of the Private sector, IPR
- **Ethical considerations**

Global Area of Transgenic Crops, 1996 to 2003 (million hectares)



Source: Clive James, 2003



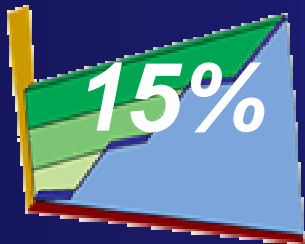
Global Area (million hectares) of Transgenic Crops, 1996 to 2003, by Country and for the Top Ten Countries



Mega countries >50,000 has

USA	42.8 million
Argentina	13.9 million
Canada	4.4 million
Brazil	3.0 million
China	2.8 million
South Africa	0.4 million
Australia	0.10 million
India	0.10 million
Romania	>0.05 million
Uruguay	>0.05 million

Increase over 2002



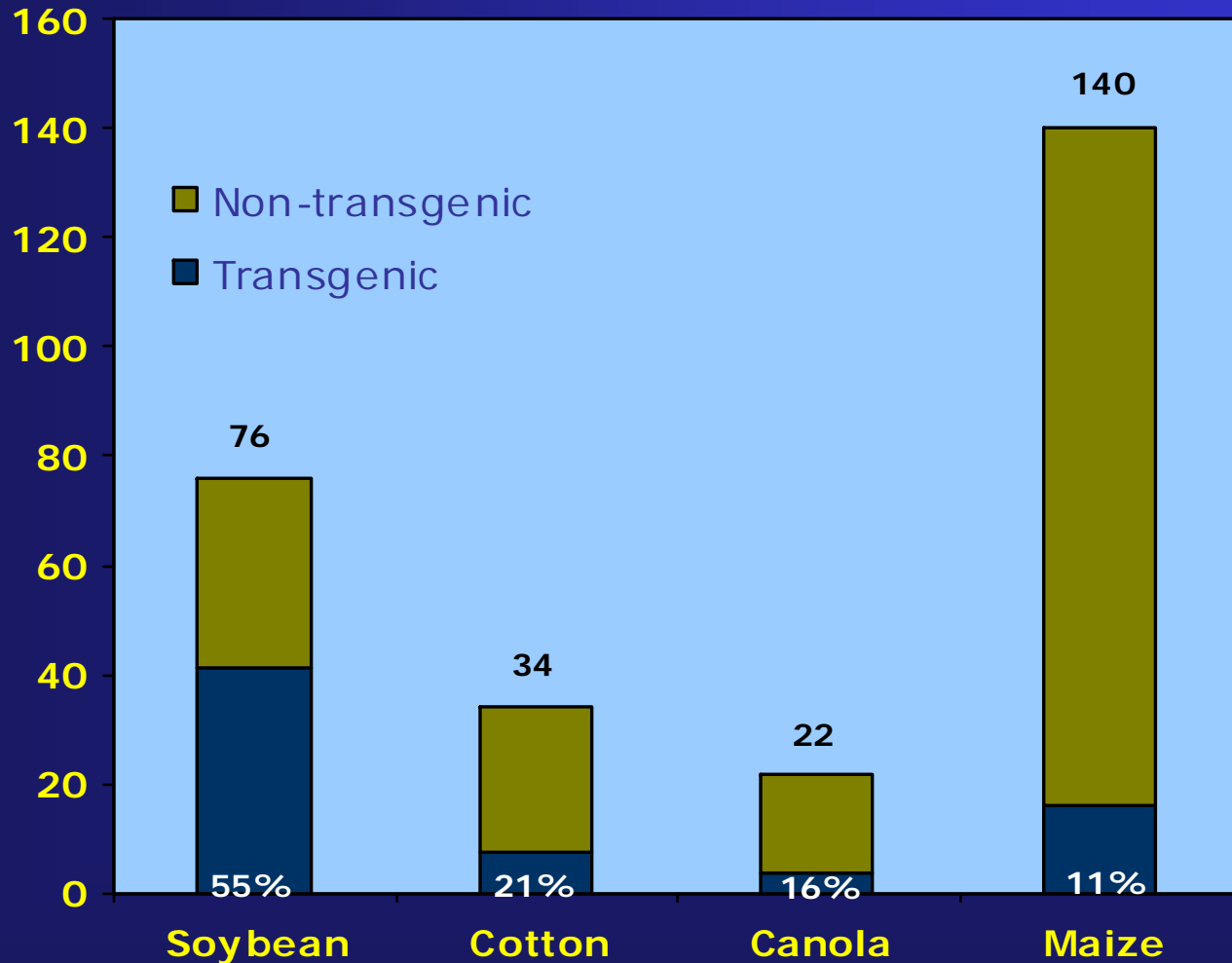
- 18 countries which have adopted biotech crops

In 2003, global biotech crop area was 67.7 mill. has., 15% over 2002 - 3.4 billion lived in GM countries in 2003.

Less than 50,000 hectares

Spain	Bulgaria
Mexico	Honduras
Philippines	Germany
Colombia	Indonesia

Global Adoption Rates (%) for Principal Transgenic Crops (million hectares) 2003



Source: Clive James, 2003

Attributes of Bt Crops



- **Effective control of targeted insect pests**
- **Environment**- 50% less cotton insecticides - Resistance
- **Less exposure to insecticides**, particularly small farmers
- **Higher yields**: related to pest level - up to 40%
- **Health** - Reduced mycotoxins in corn – safer for human and animal consumption
- **Higher Economic Returns** to >6 million farmers - increased crop value of >\$1 billion in 2003, >90% were resource-poor farmers in developing countries

Attributes of Herbicide-tolerant Crops



- **Simple and flexible** weed management
- Improved weed control and **lower production costs**
- Compatibility with no-till, improved soil, moisture/nutrient conservation- erosion control – **this translates to sustainability**
- **Less external inputs** - less fuel (31.2 m lt) in Canada on canola and herbicides on soy (13.0 m. kg.) in US 2001
- **Higher Economic Returns** - estimated increased crop value of \$1.5 bill in 2003; \$300m in developing countries

Summary – Five Major Pot. Benefits of an Integrated Conventional and Biotech Crop Improvement Strategy



- **IMPROVED PRODUCTIVITY AND INCOME** - Restore higher annual genetic gains to increase crop productivity, enhance quality and nutrition; increased crop value of \$2.5 to 3.0 billion in 2003
- **PROTECT BIODIVERSITY** - Double crop production on same area of land - save the forests/biodiversity, 13m ha loss/year
- **ENVIRONMENTAL IMPACT** - Reduce need for external inputs - pesticides - potential to save 50% or 30,000mt in cotton alone - the future - fertilizers - conservation of soil & water- sustainability
- **YIELD STABILITY** - Increase stability of yield through better control of abiotic and biotic stresses - drought - the major cause of past famines - CIMMYT tests DREB1A gene in wheat
- **SOCIAL BENEFITS** - Alleviation of poverty, improved environment & health- a time saving technology for Thandiwe Myeni in S Africa

The Future

**The Challenges of Ensuring Food, Feed
and Fiber Security in developing
countries**

The Potential Contribution of GM Crops

Meeting Global Maize Demand in 2020



	Maize Demand Million MT			
	1997	2020	Increase	%
Industrial	290	343	53	18
Developing	295	508	213	72
Asia	172	309	137	80
Latin America	75	118	43	57
Sub Saharan Africa	29	52	23	80
Others	19	29	10	53
Global	585	851	266	45
Challenge	To produce an additional 266 million MT, with 80% (213m MT) required by dev countries by 2020.			
Source: IFPRI 2003. Cereal Projections.				

Potential for Bt Maize



- **Current 12 million hectares/yr** of Bt maize can be **increased to 40 to 45 million hectares** to provide additional benefits
- **1st generation Bt Maize (cry1Ab) can increase global production of maize by 35 million MT**, with further gains from **2nd generation Bt and novel gene technology** that will be launched in next 3 years
- **Benefits**
 - **Increased productivity – 5 to 40%**
 - **Lower levels of harmful mycotoxin**
 - **50% less insecticides (5,000 MT) on food/feed crop** with environmental implications
- **Developing countries** could be major beneficiary of above benefits, **with 66% of global maize area**, and the challenge of **meeting a demand of an additional 213 million MT of maize by 2020**

Challenges for the Future



- **Continuing Responsible Stewardship - assessment of risk, with & without GM crops**
- **Improved Communication with Society. Knowledge-based decisions re GM crops**
- **Increase in # of GM countries, farmers and area**
- **Ensure that biotech crops in conjunction with conventional technologies can CONTRIBUTE to a more Sustainable Agriculture, Global Food, Feed & Fiber Security, Alleviation of Poverty and a Safer Environment**

ISAAA's Global Knowledge Center (KC) and Network of Biotechnology Information Centers



• 14 Near-term nodes

• *8 future nodes

★ Global Knowledge Center (KC), in the Philippines

CropBiotech Update Subscribers, 2001-04



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