

Gene Revolution in Developing Countries?

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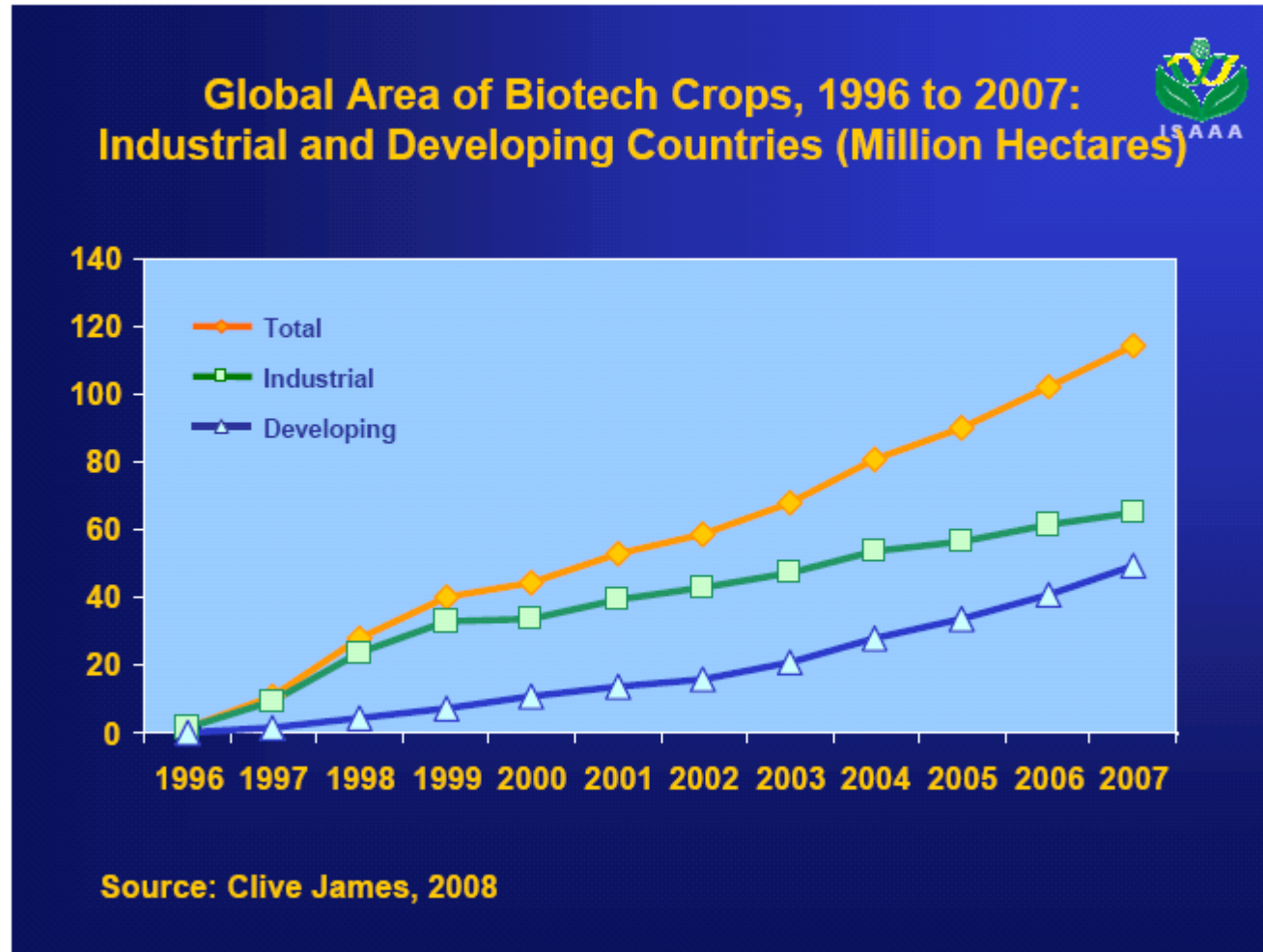
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Biotechnology – a set of research tools

- Transgenic, genetic engineered (GE) or genetic modification (GM), plants –
 - plant varieties produced using recombinant DNA techniques, also known as genetic engineering or genetic modification, which modifies an organism's genetic make-up using transgenesis, in which DNA from one organism or cell (the transgene) is transferred to another without sexual reproduction.
 - Main focus of this presentation and this morning's talks
- Tissue culture –
 - reproducing plants from small sections of plant tissue
 - extensively adopted in bananas, sweet potato, cassava, tobacco
- Conventional breeding enhanced by genomics and molecular markers

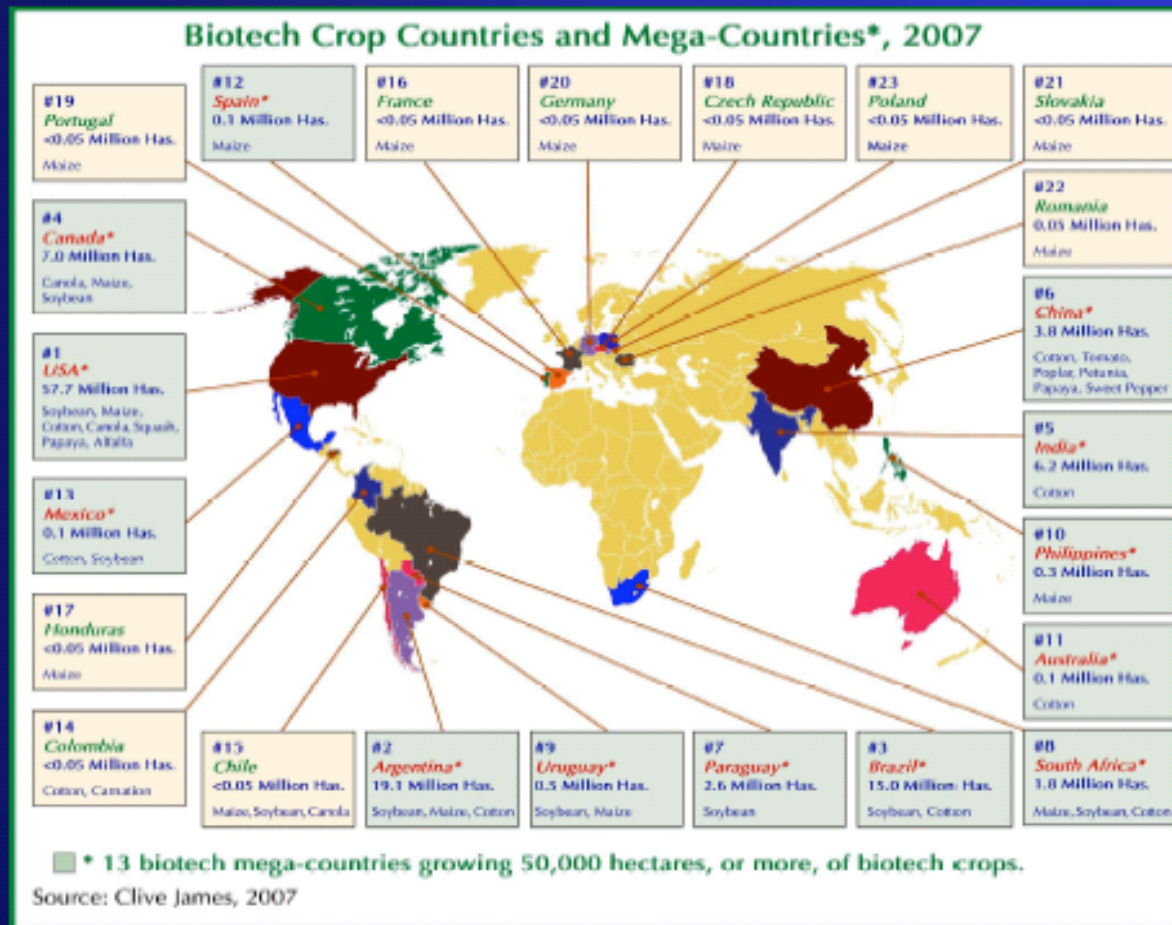
Rapid spread of GM crops – developing countries catching up



23 Countries: North & South America, India, China, South Africa, a Few European Countries



Biotech Crop Countries and Mega-Countries, 2007



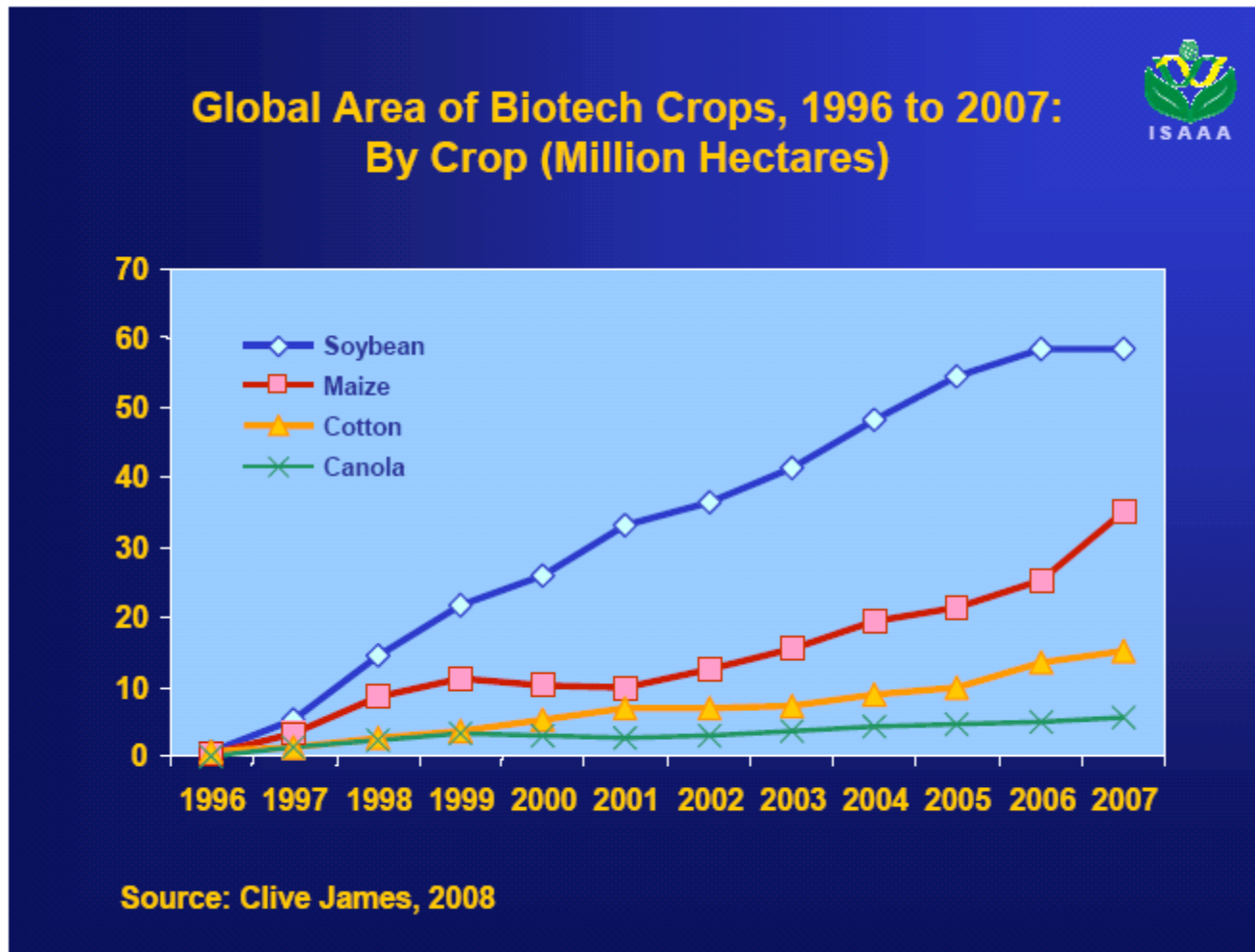
Most countries not growing GM crops

- Africa except South Africa, Burkina Faso and Egypt
- Asia –officially only India, China, and Philippines
- Europe – commercial amounts only in Spain

Food Made from Transgenic Grains or Oilseeds Consumed in Many More Countries

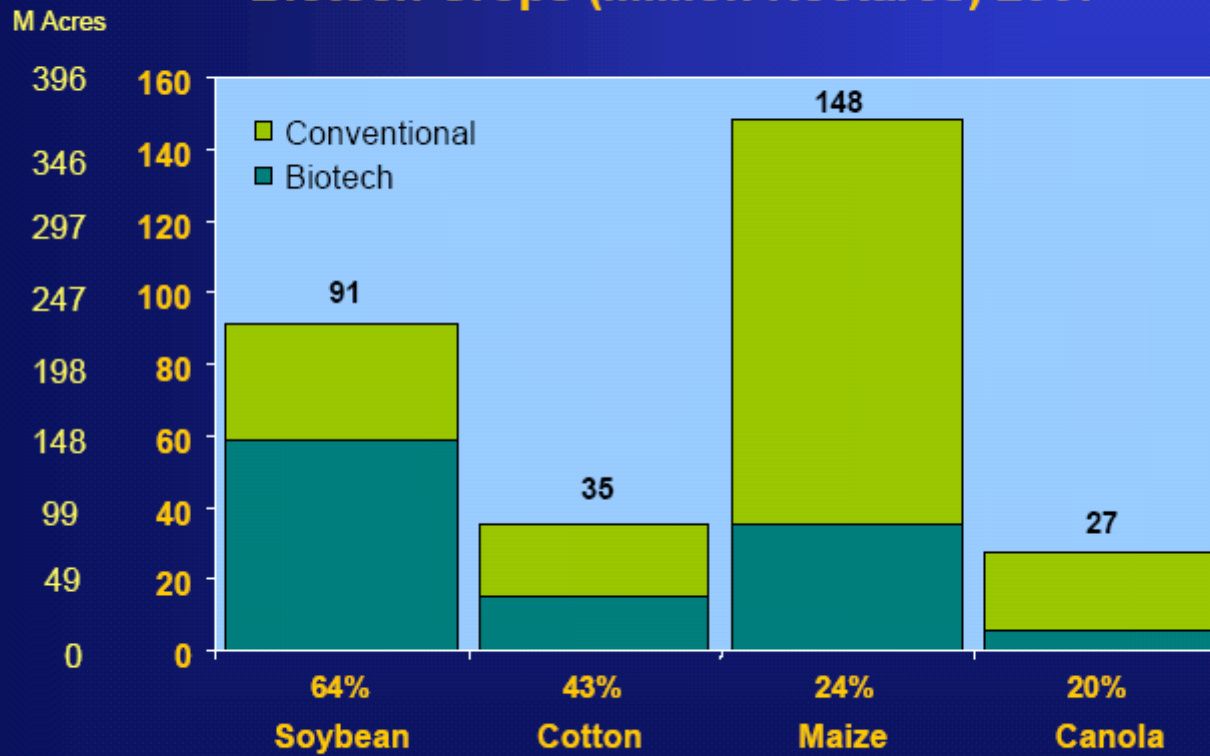
- Much of Africa consume GM maize from South Africa and the Americas
- GM soybeans and soybean oil consumed extensively in non-producing countries
- GM soybeans and maize used extensively in animal feed

Four Major Crops: Soybeans, Maize, Cotton, and Canola





Global Adoption Rates (%) for Principal Biotech Crops (Million Hectares) 2007

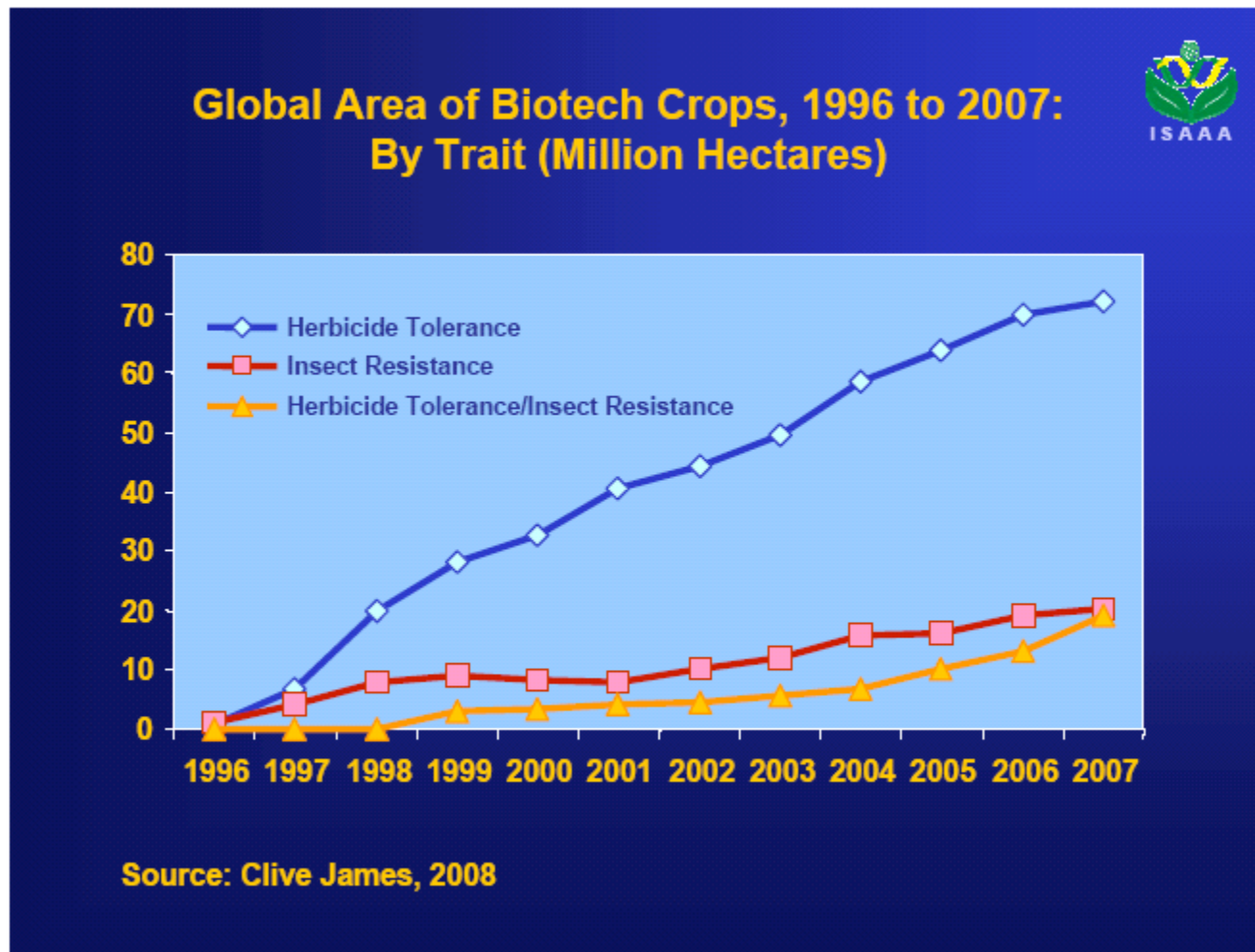


Source: Clive James, 2008

No Transgenic Varieties of Most Major Foodgrains

- White maize in South Africa is only subsistence food grain that is grown extensively
- GM rice has been tested extensively on farmers' fields in China and in experiment stations elsewhere but not approved
- GM wheat tested in experiment stations in US not in LDCs
- No cassava, potatoes, millets, pulses

Dominant traits are Herbicide Tolerance & Insect Resistance



Other traits in the pipeline

- Genes for quality
 - Traits for high quality oils are in use US
 - Golden rice research continues in Asia
- Drought tolerance – in US 2011 or 2012
- Disease resistance
- Intrinsic yields

Summary of Economic Impact in Developing Countries

- Winners
 - Small farmers are increasing their income and reducing variability of yields using Bt crops in India, China, and South Africa
 - India and South Africa – primary benefits is increased yields
 - China – mainly due to reduced pesticide use but small yield increases also.
 - Large commercial farmers gain in South America, South Africa and India
 - Biotech & seed cos gain but less than farmers
 - Their share of benefits is highest in South Africa and lowest in China
 - Consumers of vegetable oil, maize, and cotton
- Losers
 - Insecticide companies losers
 - Farmers who can not adopt lose income

Other impacts

- Health benefits from Bt cotton due to reduced exposure to pesticides in China
- Environmental benefits from reduced pesticides in China and South Africa
- Major changes in the structure of the seed industry in India and China

Gene Revolution in Developing Countries? No yet

- Objective of this morning's presentations is to look at some of the reasons why.