WHAT IS BIOTECHNOLOGY?

http://www.accessexcellence.org/RC/AB/BC/

Coined in 1919 by Karl Ereky, an Hungarian engineer

Defined as:
All the lines of work by which products are produced from raw materials with the aid of living organisms

Biotechnology is a technology based on biology, especially when used in agriculture, food science, and medicine.

http://en.wikipedia.org/wiki/Biotechnology

1. “Any technological application that uses biological systems, living organisms, or derivatives thereof, to make or modify products or processes for specific use" (Convention on Biological Diversity).
2. “ Interpreted in a narrow sense, ... a range of different molecular technologies such as gene manipulation and gene transfer, DNA typing and cloning of plants and animals" (FAO's statement on biotechnology)

http://www.fao.org/biotech/find-formalpha-n.asp

HOW MUCH DO YOU KNOW ABOUT GENETICS, PLANT BREEDING, AND BIOTECHNOLOGY?

WHO WON

A NOBEL PRIZE FOR DISCOVERING

THE STRUCTURE OF DNA?

2003 WAS AN ANNIVERSARY FOR THIS DISCOVERY. WHICH ANNIVERSARY WAS IT?

WHO IS CONSIDERED TO BE THE FATHER OF GENETICS?

WHAT WAS MENDEL'S OCCUPATION?

IN THOUSANDS OF YEARS AGO, WHICH NUMBER BEST APPROXIMATES THE TIME OF DOMESTICATION OF PLANTS AND ANIMALS?

FROM WHAT PART OF THE WORLD DID THE FOLLOWING CROPS ORIGINATE?

SOYBEAN
CORN
WHEAT
POTATO
PEANUT

WHAT DOES ‘GMO’ STAND FOR?

IN 20% INCREMENTS, WHAT PERCENTAGE OF SOYBEAN GROWN IN THE U.S. IS TRANSGENIC?

WHICH TWO OF THE FOLLOWING COUNTRIES GROW THE MAJORITY OF TRANSGENIC CROPS?

U.S.

CHINA

AUSTRALIA

ARGENTINA

CANADA

GENOME REFERS TO THE COMPLETE GENETIC MATERIAL CONTAINED IN AN INDIVIDUAL.

WHICH OF THE FOLLOWING ORGANISMS HAS THE SMALLEST GENOME?

HUMAN

RICE

CHICKEN

WHEAT

WHICH OF THE FOLLOWING ORGANISMS HAS THE LARGEST GENOME?

HUMAN

RICE

CHICKEN

WHEAT

WHICH OF THE FOLLOWING GENOMES HAVE BEEN SEQUENCED?

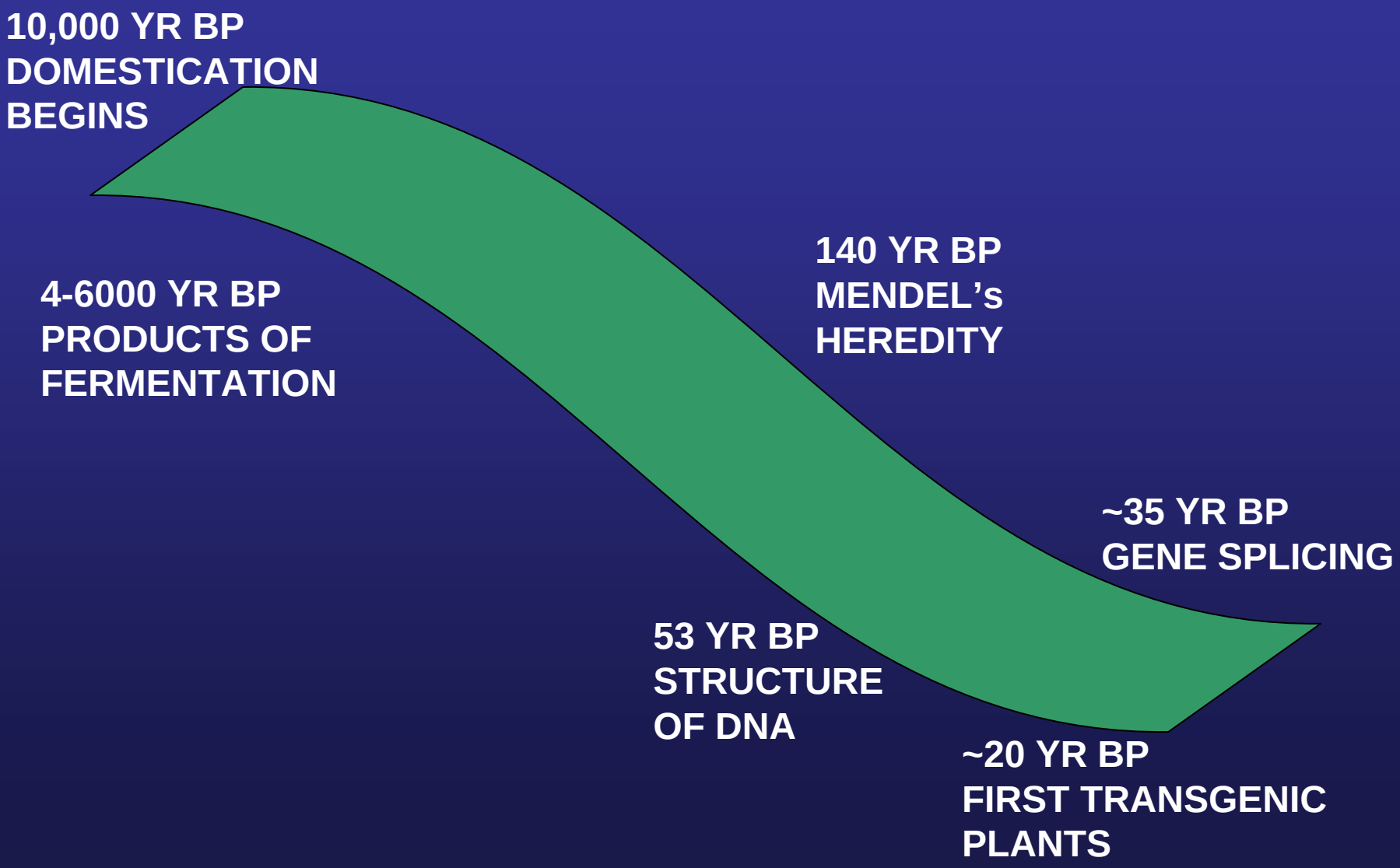
HUMAN

RICE

CHICKEN

WHEAT

BIOTECHNOLOGY TIMELINE



http://www.accessexcellence.org/RC/AB/BC/index.html#Anchor-44867

GENETICALLY MODIFIED ORGANISMS

- DNA - the molecule of genetics (makes up our GENES)

http://www.sumanasinc.com/webcontent/anisamples/molecularbiology/DNA_structure.html
http://molvis.sdsc.edu/dna/index.htm

MANIPULATING DNA

RESTRICTION ENZYMES

http://www.phschool.com/science/biology_place/labbench/lab6/enzwork.html

VIRTUAL RESTRICTION DIGESTION

http://tools.neb.com/NEBcutter2/index.php

http://www.restrictionmapper.org/

GEL ELECTROPHORESIS

http://www.vivo.colostate.edu/hbooks/genetics/biotech/gels/virgel.html

GENETIC ENGINEERING

CUTTING & PASTING

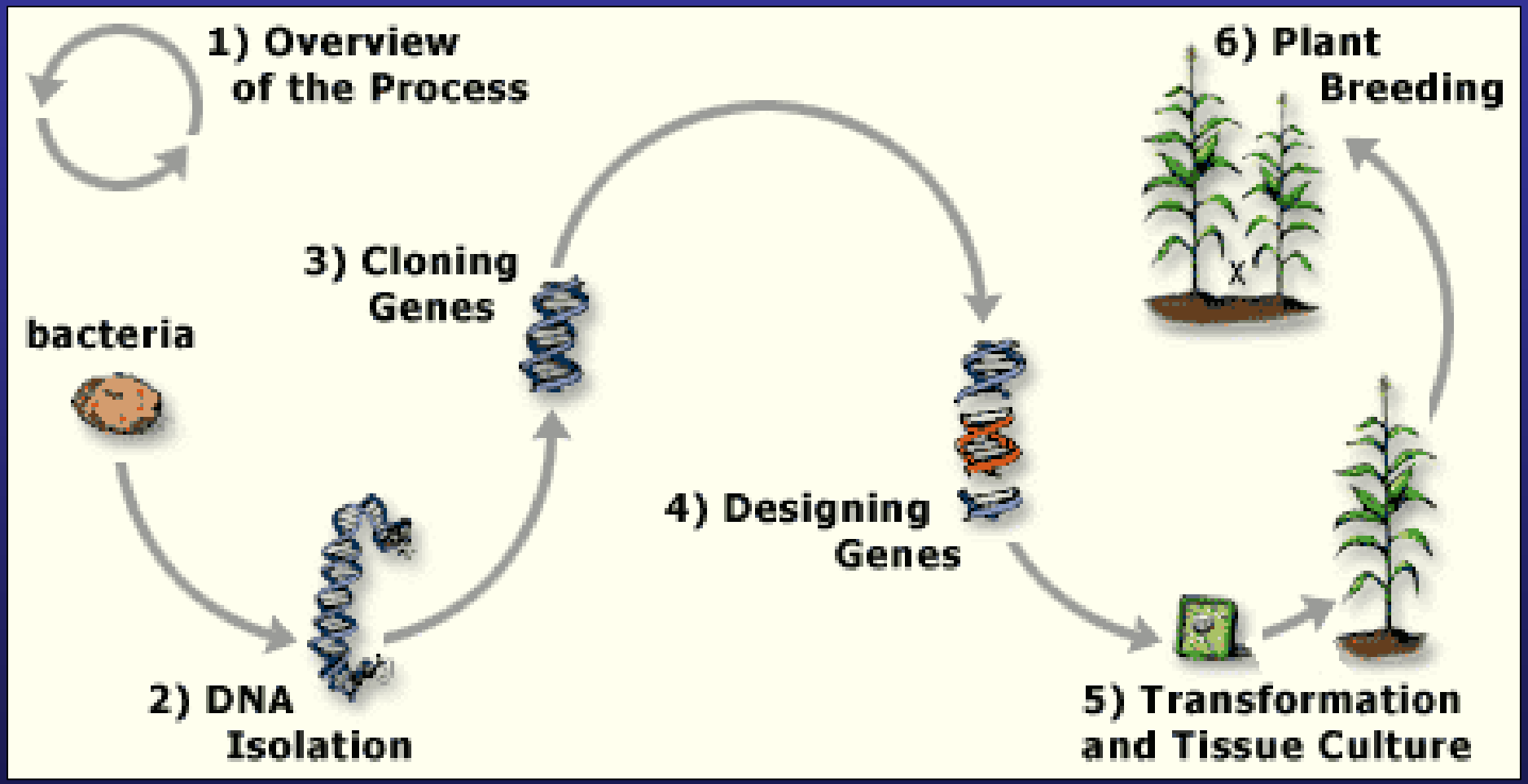
http://www.dnai.org/b/index.html

CLONING PLASMIDS INTO BACTERIA

http://www.accessexcellence.org/RC/VL/GG/plasmid.html

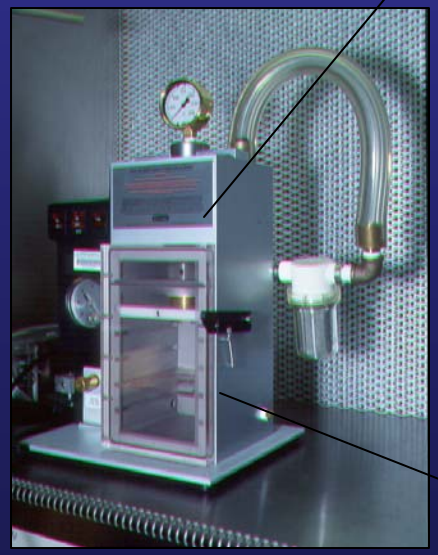
GENETIC ENGINEERING OF PLANTS

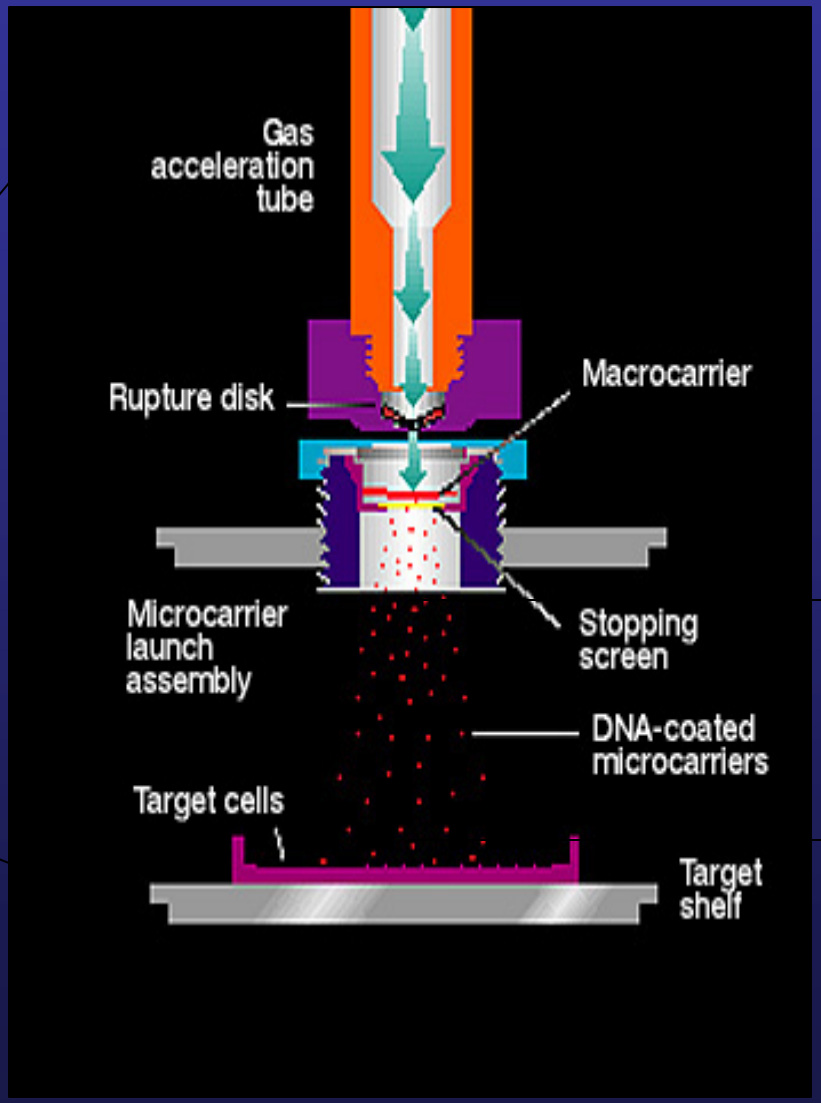
http://www.colostate.edu/programs/lifesciences/TransgenicCrops/animation.html

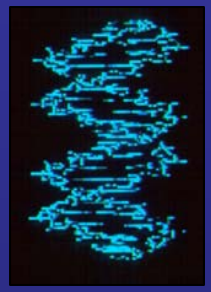


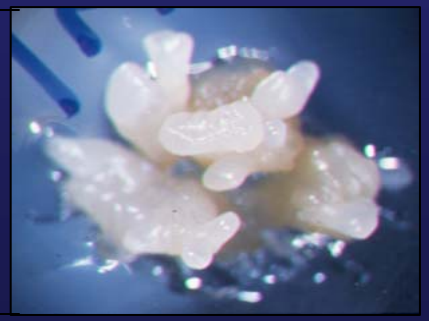
http://www.colostate.edu/programs/lifesciences/TransgenicCrops/animation.html

Direct DNA Transformation
Microprojectile Bombardment Using the 'Gene Gun'

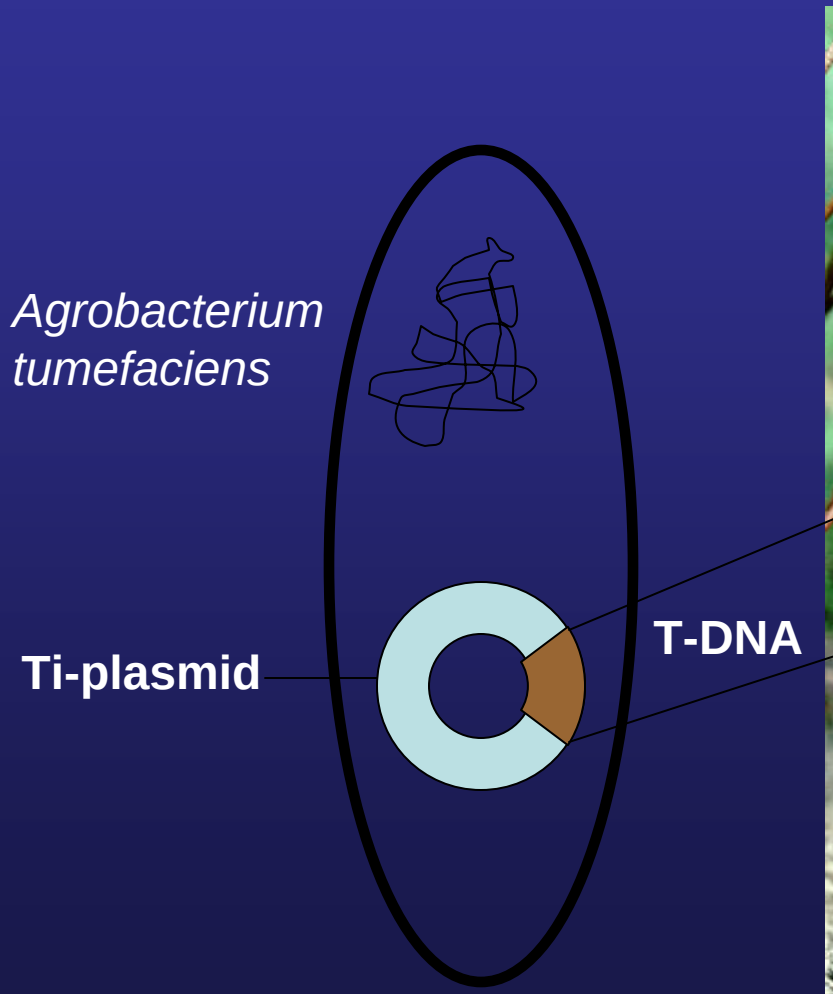


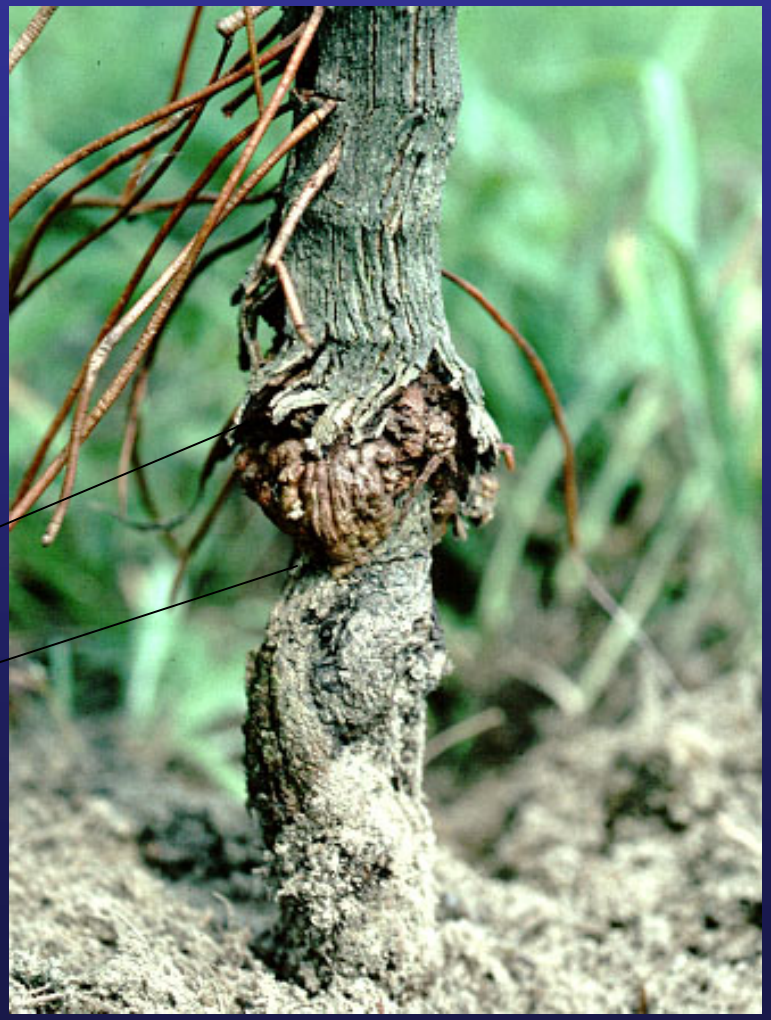






Crown Gall Disease -
A Natural Case of Plant Genetic Engineering





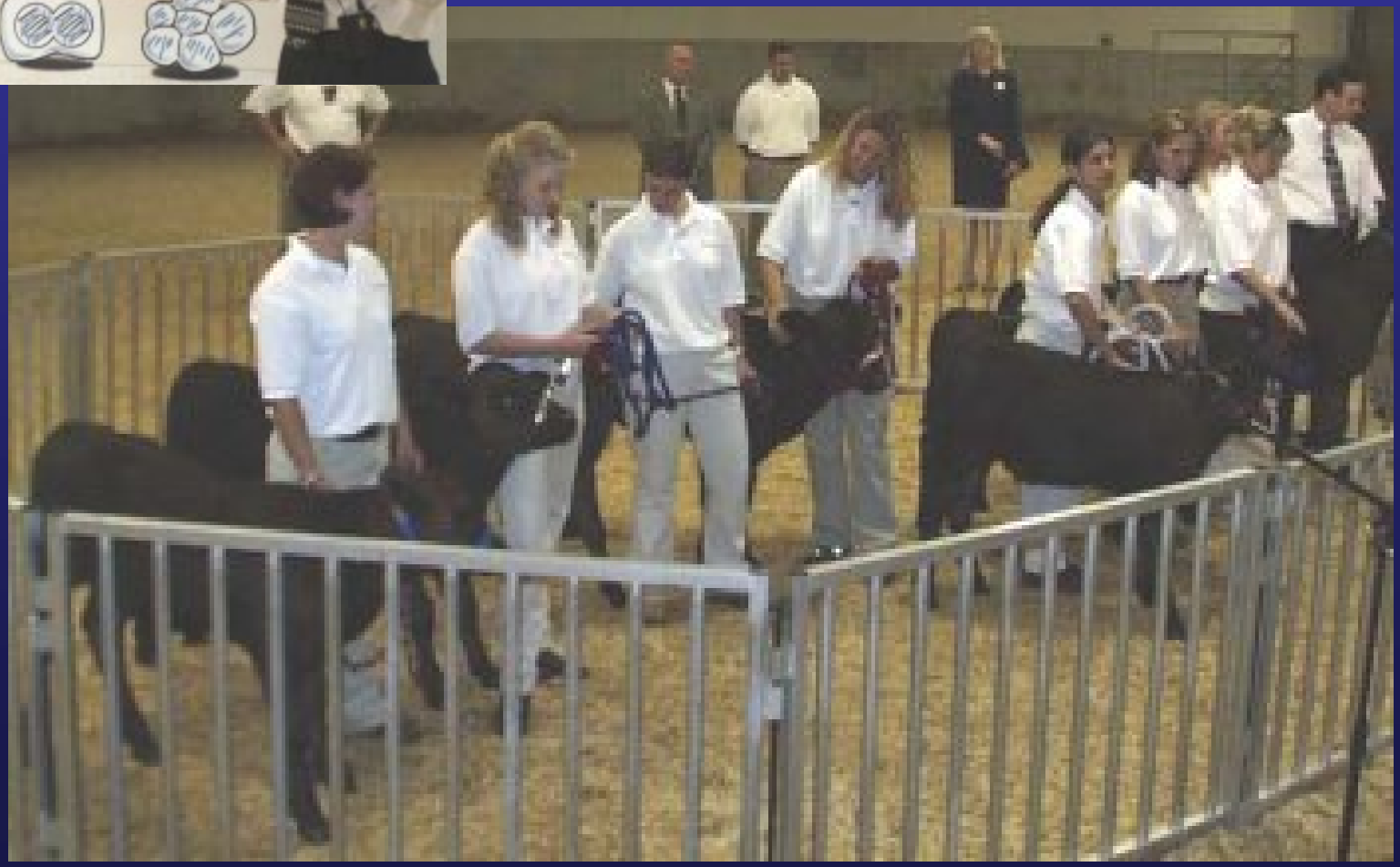
EARLIEST PRODUCTS OF BIOTECHNOLOGY WHAT ISSUES DID THEY RAISE?

- Human insulin
- "CHY-MAX" brand chymosin
- rBST/BGH
- FlavrSavr tomato
- Bt Crops

http://www.accessexcellence.org/RC/AB/IE/wholesome.html

http://www.colostate.edu/programs/lifesciences/TransgenicCrops/

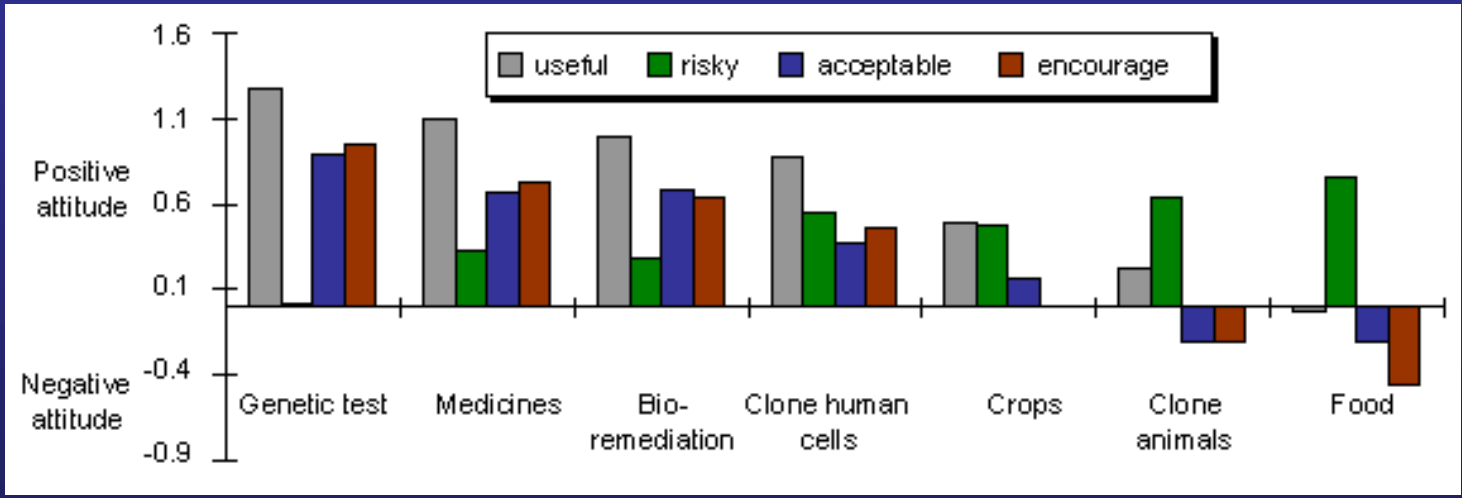
Animal Biotechnology Cloning



Transgenic Salmon
AQUA Bounty Farms

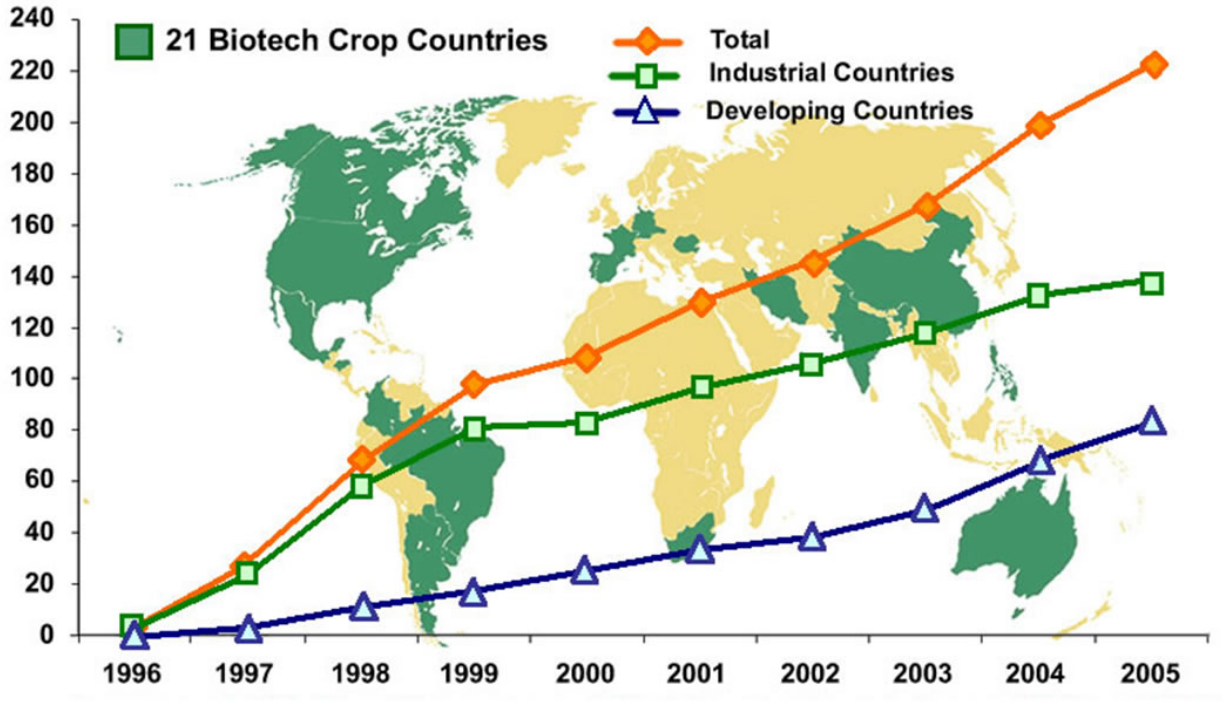
Enviropig

Figure 1. European attitudes to seven applications of biotechnology.



http://www.agbioforum.org/v3n23/v3n23a04-gaskell.htm#F1

Global Area of Biotech Crops
Million Acres (1996 to 2005)

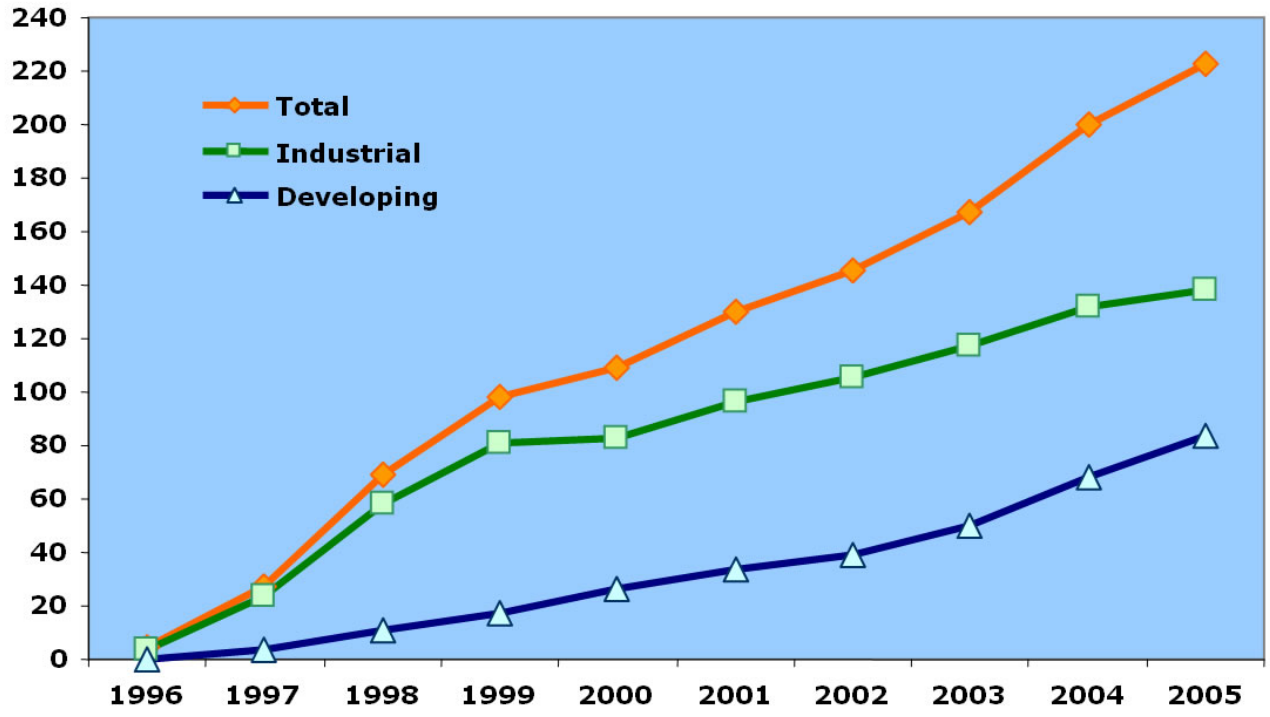


Increase of 11%, 22 million acres or 9.0 million hectares between 2004 and 2005.

Source: Clive James, 2005

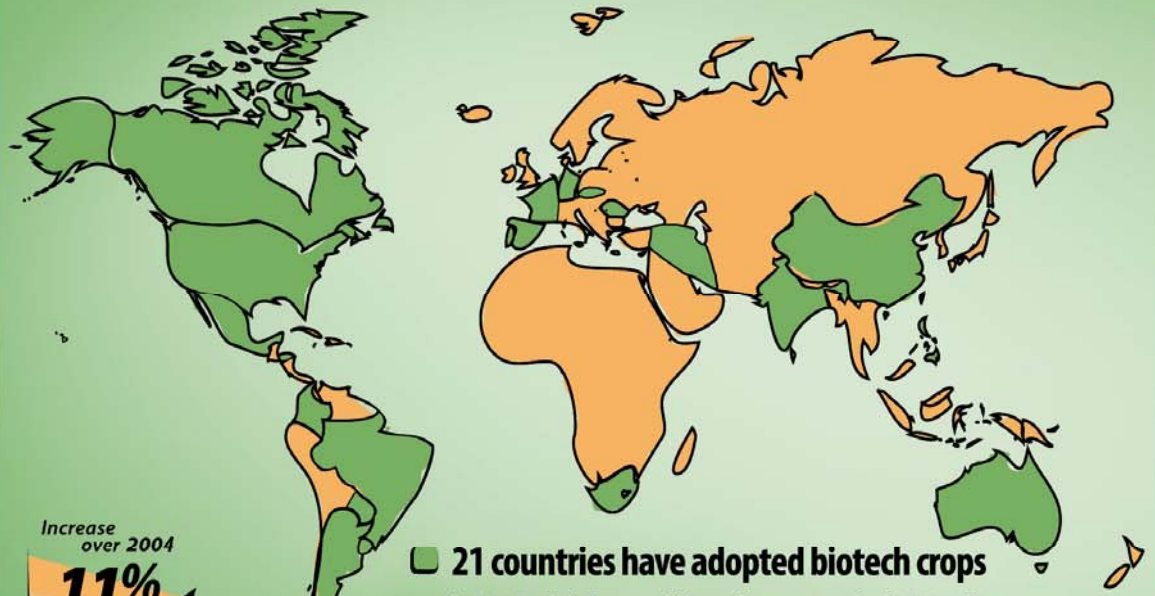
http://www.isaaa.org/

Global Area (Million Acres) of Biotech Crops, 1996 to 2005: Industrial and Developing Countries



Source: Clive James, 2005

Global Status of Biotech Crops in 2005



Increase over 2004

11%

21 countries have adopted biotech crops

In 2005, global area of biotech crops reached 222 million acres, representing an increase of 11% from 2004, equivalent to 22 million acres

Source: Clive James, 2005 ISAAA Briefs 34

BIOTECH MEGA-COUNTRIES

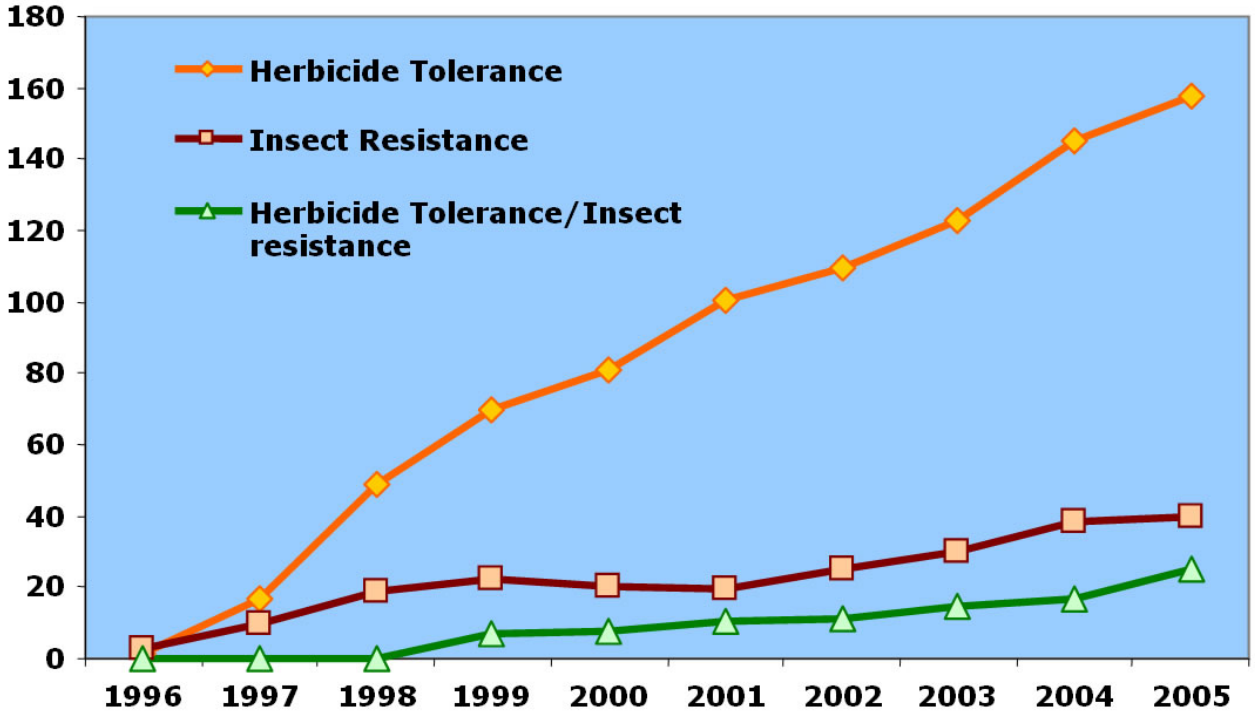
125,000 acres or more

USA:	123 million
Argentina:	42 million
Brazil:	23 million
Canada	14 million
China:	8 million
Paraguay:	4.4 million
India:	3.2 million
South Africa	1.2 million
Uruguay:	.74 million
Australia:	.74 million
Mexico:	.25 million
Romania:	.25 million
Philippines:	.25 million
Spain:	.25 million

125,000 acres or less

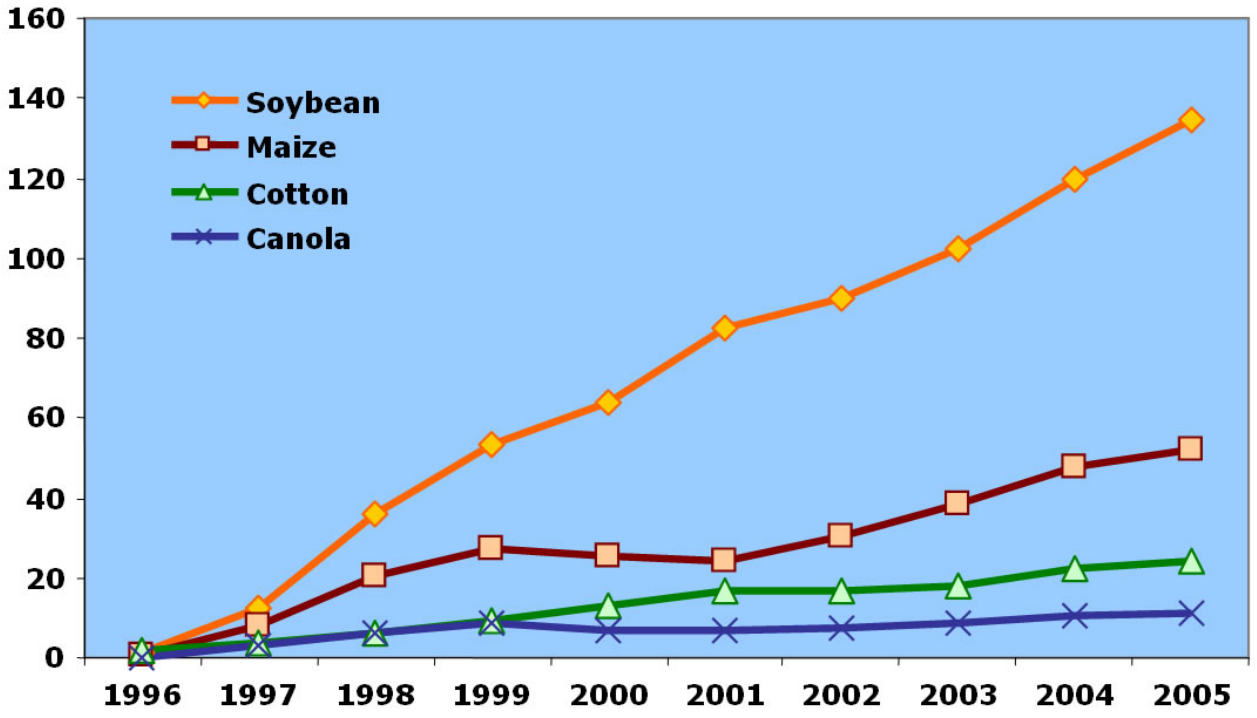
Columbia Iran Honduras Portugal
Germany France Czech Republic

Global Area (Million Acres) of Biotech Crops, 1996 to 2005: by Trait



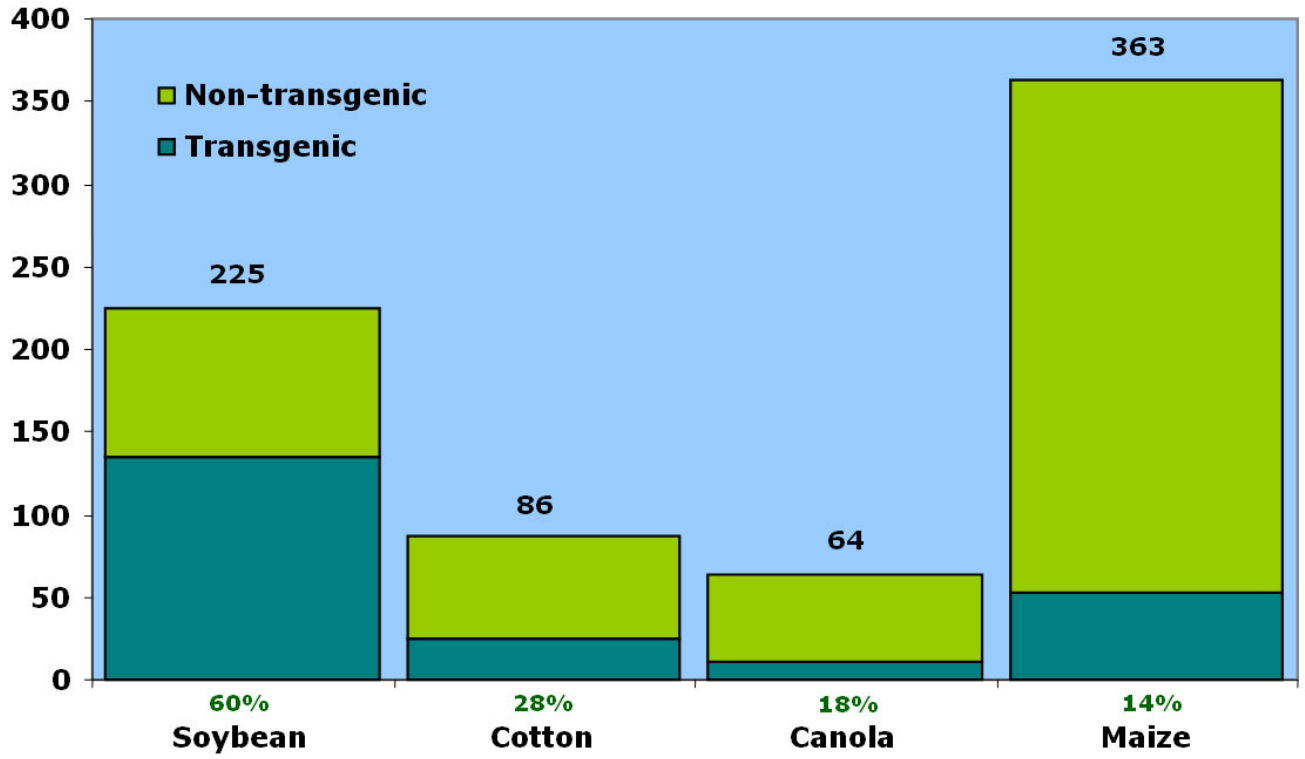
Source: Clive James, 2005

Global Area (Million Acres) of Biotech Crops, 1996 to 2005: by Crop



Source: Clive James, 2005

Global Adoption Rates (%) for Principal Biotech Crops (Million Acres)



Source: Clive James, 2005

Global Status of Approved Genetically Modified Plants

http://www.agbios.com/dbase.php?action=Synopsis

http://www.nbiap.vt.edu/

Regulatory Oversight in the US

http://www.agbios.com/cstudies.php?book=REG&ev=CAN-USA&chapter=USA&lang=EN

Risks and Concerns

http://www.colostate.edu/programs/lifesciences/TransgenicCrops/risks.html#humanhealth