

# Types of GMOs

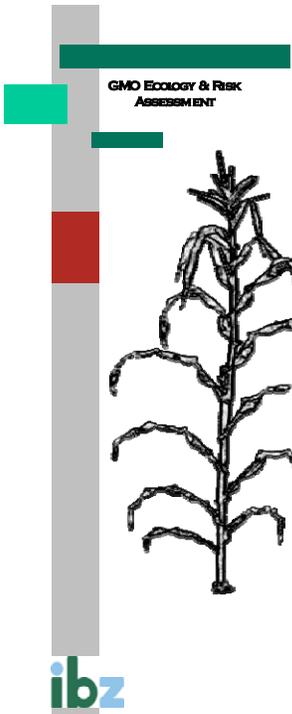
## 1. GM plants

### 1.1 Plants as pesticides

e.g. Bt crops

Here, scientists take genes that produce a toxin from a bacterium (*Bacillus thuringiensis*) and force these into the DNA of plant cells.

Each cell of the plant then produces the toxin, e.g. in the mealie (maize), the leaves, stems, flowers, pollen, mealies and roots will all produce the toxin.



**What are Bt-crop plants?**

Genes encoding for **Bt toxin** isolated from *Bacillus thuringiensis* and engineered into cotton and maize

Constitutive Bt expression

- all plant parts
- most plant fluids, except perhaps phloem/xylem
- season long

Goal: to kill certain target pests, such as *Helicoverpa armigera*

**BUT: can they also kill others?**

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## 1.2 Plants that are herbicide resistant

e.g. Roundup Ready (RR) crops

Here, genes are inserted into the plant, e.g. maize or cotton which make them resistant to herbicide, e.g. Monsanto's Roundup herbicide. This allows farmers to spray their GM crop fields with herbicide, killing the weed but not killing the crop.

## 1.3 Plants that are used for industrial application

e.g. plants that are genetically engineered to produce more starch or more sugar, trees that are genetically modified to produce wood that is more suitable for paper production.

## 1.4 Plants as pharmaceuticals

e.g. plants that are engineered to act as "factories" for the production of vaccines, antibodies, therapeutic proteins. They are not commercially available - much concern about these contaminating the food supply.

## 1.5 Plants that are sterile

These plants have been genetically engineered so they are unable to reproduce - also called "suicide seeds" or "Terminator technology". Much resistance to this and the commercialization of this has been stalled.

**Note:** Most GM plants either are insect resistant (1.1) or herbicide tolerant (1.2)

## 2. GM animals

e.g. cows that are genetically engineered to produce pharmaceuticals in milk, goats that are genetically engineered to produce spider silk in milk, pigs that are genetically engineered as a source of human organ transplants (several human genes have to be added to the pig to send "human signals" that would stop the human immune system rejecting the organ).

Many ethical and scientific concerns - the work is at a research level.



## GMOs IN SOUTH AFRICA

- 1) Commercial plantings are limited to GM maize, GM cotton, GM soya - first commercial GM maize and cotton crops approved in 1997.

Maize:	30 - 40% are GM (mostly yellow maize)
Soya beans:	50% are GM
Cotton:	77% are GM

- 2) Field trials  
Examples: GM maize, GM cotton, GM soya, GM potato, GM sugar
- 3) Clinical trials  
Examples: GM HIV vaccine
- 4) Imports  
Thousands of tons of GM maize, cotton and soya are imported for food and animal feed.
- 5) Research  
Research is being undertaken in many research institutes all over the country, including the Agricultural Research Institute, the Sugar Research Institute and many different institutes at the universities. The research includes work on GM sorghum, GM millet, GM lupin, GM tobacco, GM grapes, GM potato, GM cassava, GM *Eucalyptus*, GM sugar cane, GM foot and mouth disease, GM Rift valley fever virus, GM maize (drought resistant, production of vaccines), GM HIV and GM mice.

## GMO PERMIT APPLICATIONS REFUSED IN SOUTH AFRICA

Key applications that have been refused include those made by:

- Bayer for the import of herbicide tolerant GM rice
- Agricultural Research Council for field trials of GM cassava, genetically modified to produce amylase-free starch so that it is better suited for industrial processing (production of starches and biofuels/agrofuels)
- Syngenta for the import of GM maize, genetically modified for ethanol production (biofuels/agrofuels)

## *Holistic approach to GMOs*

- 1. Ethics**  
Can one “own” life?  
Should one be “mixing” species that would never naturally reproduce?
- 2. Economic Justice**  
Is it right that giant multinationals should have control over our seed supply?
- 3. Social impacts**  
What are the impacts on small-scale farmers, on organic farmers, on food security?
- 4. Health impacts**  
What are the health impacts of GE foods? Has research been done and if so have the right questions been asked?
- 5. Environmental impacts**  
What are the impacts on biodiversity, on pesticide use and the soil? Are “super weeds” created? How does one de-contaminate farmers’ varieties? What is the impact of new organisms that can reproduce?
- 6. Civil society**  
Are people properly informed about GMOs? Do we know if it is safe? What about an informed choice? What about participation in decision making?

### **KEY QUESTION**

Are the above 6 points taken into account when GMOs are approved in South Africa?

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