

# WORKSHOP ADDRESSING CULTURAL AND RELIGIOUS ISSUES

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## **Role of GMOs in Food and Health Security**

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# **1. Role of GMOs in Food and Health Security**

- The scientific field of biotechnology was launched in the early 1970s. By that time, scientists had learned to
  - a) Isolate specific genes of interest
  - b) Clone foreign genes into host cells
  - c) Demonstrate that the gene had entered the host cell
  - d) Show that a specific protein had been encoded by the cloned gene

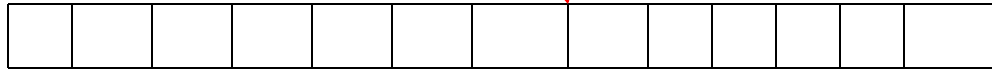
## **2. Formation of Recombinant DNA in GMOs**

- a) Inside the host cell, the foreign gene becomes incorporated into the host DNA
- b) The process is called genetic engineering
- c) The host plant or animal becomes a genetically modified organism (GMO)

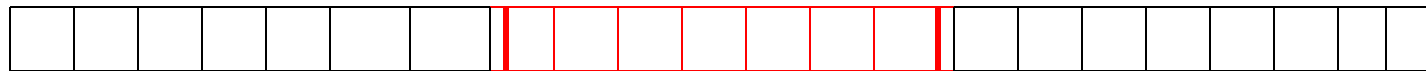
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foreign gene of interest



host DNA in a cell to receive foreign gene



host DNA

foreign gene

host DNA

This is recombinant DNA.

### **3. Basis for choosing the gene to clone**

- A gene that makes a plant to resist herbicides/weed killers
- A gene that makes a plant to be pest or insect resistant

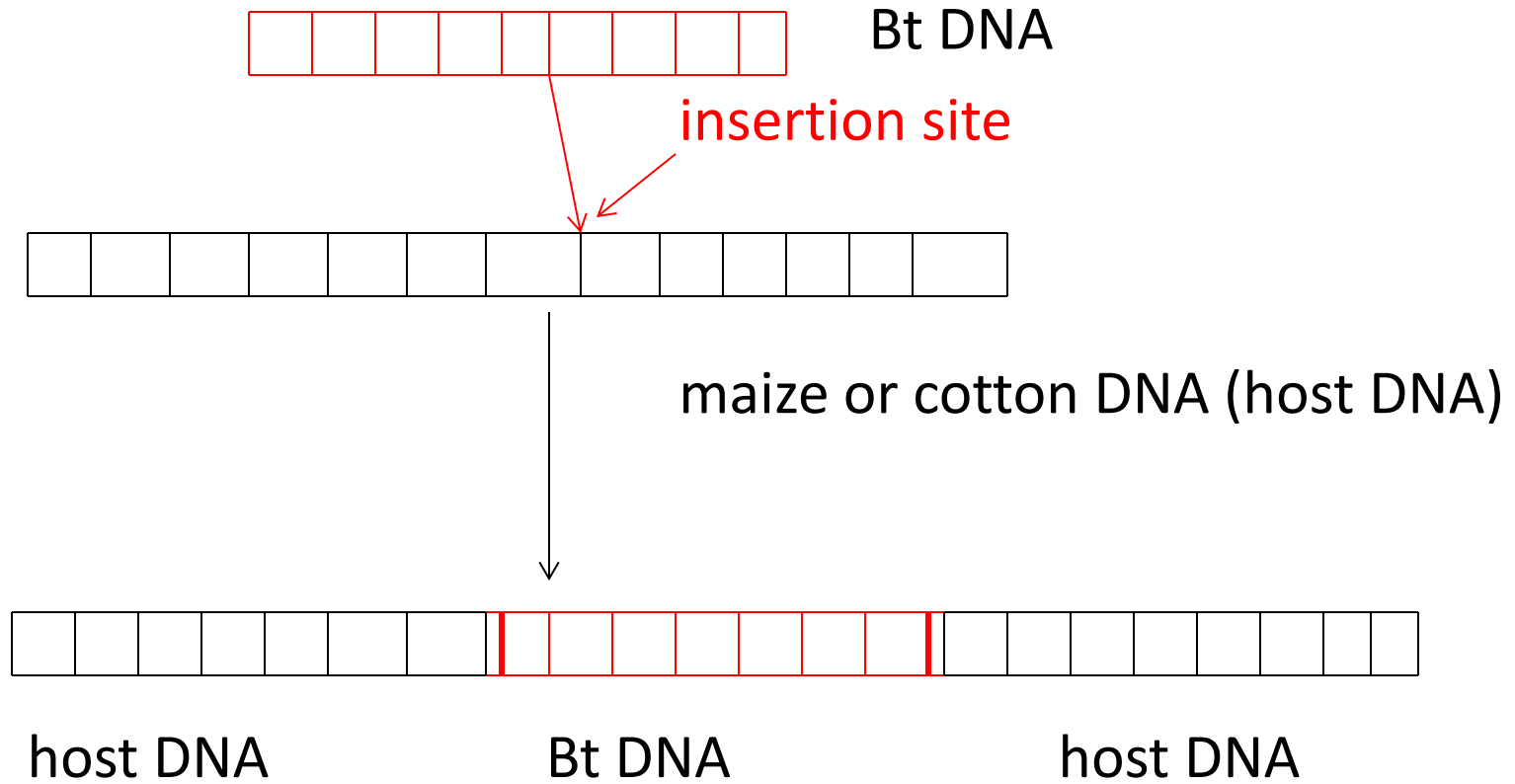
# Benefits of GM Technology

- Reduced use of some insecticides
- Higher yields by control of Bt maize bollworm
- Savings on time, labour, costs
- Development of medical vaccines

## 4. Development of Bt Cotton and Bt Maize

- a) Bt refers to the bacterium Bacillus thuringiensis (Bt)
- b) The DNA of this Bt has genes that produce insecticides that kill infecting insects
- c) Grow normal cotton or maize in a medium that contains the bacterium Bt
- d) The plants will ingest the Bt and its DNA
- e) The DNA of Bt will be incorporated into the DNA of the cotton or maize plant (Bt maize, Bt cotton)

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This will make the plants from these seeds to be pest resistant.



## **5. Properties of Bt Cotton and Bt Maize as GMO Products**

- a) Maize borer is a pest that enters a growing maize plant, as its host plant
- b) When inside the maize stem, it lays eggs
- c) The eggs hatch to produce larvae, which are like little worms
- d) The borer larvae feed on their Bt maize host
- e) This feeding makes such larvae die in 24-48 hours in Bt maize
- f) A similar process happens when pests infect Bt cotton plants

## **6. Pest Resistant Bt Cotton and Bt Maize**

- a) The GMOs give high yields per hectare as no pests interfere with their growth
- b) Bt cotton and Bt maize farmers do not spend money on pesticides
- c) These farmers obtain high yields and enjoy a huge economic benefit from these GM crops

## 7. African Countries Entering the Growing of Biotechnology Crops (GM Crops)

COUNTRY	CROPS	TRAITS	STAGE
Burkina Faso	Cowpea	Insect resistance	Marketing and field trials
Egypt	Maize, cotton, wheat, potato	Viral and insect resistance	Marketing and field trials
Nigeria	Cassava, cowpea, sorghum	Insect resistance	Marketing and field trials
Kenya	Cotton, cassava, sweet potato, sorghum		Marketing and field trials
Uganda	Maize, banana, cassava, cotton	Viral and insect resistance	Marketing and field trials
Malawi	Cotton	Bt	Marketing and field trials
South Africa	Cotton, maize, cassava, potato	Insect and herbicide tolerance and inhibition	Marketing and field trials

## 8. **Guidelines for Biosafety Research in Biotechnology**

- a) The Biotechnology focus on gene transfer to organisms does develop new forms of living organisms called GMOs
  
- b) It is not known how safe it is to work with them or eat them

## 9. Biosafety Regulations

- Zimbabwe has established the National Biotechnology Authority (NBA) which has developed biosafety regulations for the protection of:
  - a) Scientists conducting biotechnology research
  - b) The general public approaching the site of work
  - c) The environment in which this work is being done

## **10. Biosafety Measures in Other Countries**

- The USA has a Federal Drug Administration (FDA) which requires companies to prove the safety of the new products as follows:
  - a) Show evidence that the new product really works in the manner being claimed
  - b) Give evidence on the safety of the new product to human health
  - c) Give evidence that the new product has no harmful effect on the environment

## **11. Strong Measures Taken on New USA Products**

- a) The research and development process will lead to a new product
- b) Confirmation of the biosafety of human health upon exposure to the new product is a must
- c) It takes 5-6 years for these requirements to be satisfied in the USA
- d) Production and commercialisation will then be authorised

## **12. Authorisation of Bt Maize Production**

- a) Very serious measures were taken before the production and marketing of Bt maize was authorised in the USA
- b) Of the 23 years that I spent in the USA, 14 years were spent in research
- c) I fully understand the measures taken by the US Government before they allow a new food item to be sold on the market. That is why I easily eat GMOs.



## **13. Zimbabwe Not Permitting Bt Maize Production**

- a) The national policy in Zimbabwe is not to allow the production and marketing of GMOs
- b) GMOs include Bt maize and all other biotechnology crops
- c) There is a false claim that eating GMOs is a risk to human health

## **14. No evidence of harm to human health by eating GM foods**

- a) The USA has been eating Bt maize for more than 15 years with no episode of harm to human health
  
- b) The South Africans have been eating Bt maize and other GMOs for many years with no report of harm to human health

## 15. Production and Use of GM Crops in Europe

COUNTRY	GM CROP
Portugal	Bt maize
Spain	Bt maize
Germany	Bt potato
Sweden	Bt potato
Czech Republic	Bt maize, Bt potato
Poland	Bt maize
Slovakia	Bt maize
Romania	Bt maize

16. The UK has not gone into producing and using GM crops

- UK scientists have recommended the use of GMO crops
- Because the UK blocks GMO consumption, Zimbabwe has decided to also block it

- a) GM crops are now grown on 50% of the global crop areas
- b) GM maize now takes 32% of the total global land used for maize
- c) GM maize, cotton and soyabeans are the globally dominant biotechnology crops

## 17. The Growing of Bt Cotton in India

- a) India started growing Bt cotton in 2002 on 50,000 ha
- b) Today, they grow Bt cotton on 12 million ha of land
- c) They make the following uses of Bt cotton
  - Cotton fabric for making clothing
  - Cotton meal for animal feed
  - Edible cotton oil for human consumption

## **18. Highlights of Indian Bt Cotton**

- a) Cotton yields were 300 kg/ha in 2002
- b) Bt cotton yields were 500 kg/ha in 2010
- c) Bt cotton now a very profitable crop in India
- d) India now produces 21% of the world total cotton

## **19. Value of Indian Bt Cotton for Indian Farmers**

- a) India has 7 million farmers growing mainly Bt cotton on 1.5 ha/farmer
- b) In 2010, Bt cotton earned \$2.5 billion for these farmers
- c) This works out to \$350,000 per farmer from his 1.5 ha
- d) Clear evidence for poverty alleviation



## 20. Message for Zimbabwe:

- a) Grow Bt cotton, Bt maize and soyabeans
- b) Bt cotton will provide revenue for poverty alleviation
- c) Bt maize and GM soyabeans give high yields for marketing and food security

## **21. Results:**

- a) Abundant food to feed the nation
- b) Stronger input into food industry and markets
- c) Poverty alleviation

## 22. GMO derived drugs/vaccines

- A vaccine is injected into a patient to cure a disease
  - a) GMO insulin hormone is used against diabetes
  - b) Human GMO growth hormone is used to ensure that babies grow normally
  - c) GMO maize vaccine is used against hepatitis B virus (HBV)
    - HBV kills 800,000 people globally each year by infecting the liver

Ndatenda

Ngiyabonga

Thank you