The role of GMOs in Food Security: An African Context

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Grand Food Security Challenges in Africa

- Increasing world population 2050 = demand for food
- Urban growth = food security needs increase.
- Challenge to grow enough food sustainably to feed the growing population.
- Farmers are on the front line of this battle – They are expected to produce more food while fighting against climate change.
- Changes in rainfall are a particular problem on the African continent.
- Agricultural production in Africa is hampered by a number of abiotic and biotic factors.

Source UN 2015

Grand Challenge : Drought

Grand Challenge : Stalk Borer & FAW in Maize

Grand Challenge: The Striga weed invasion

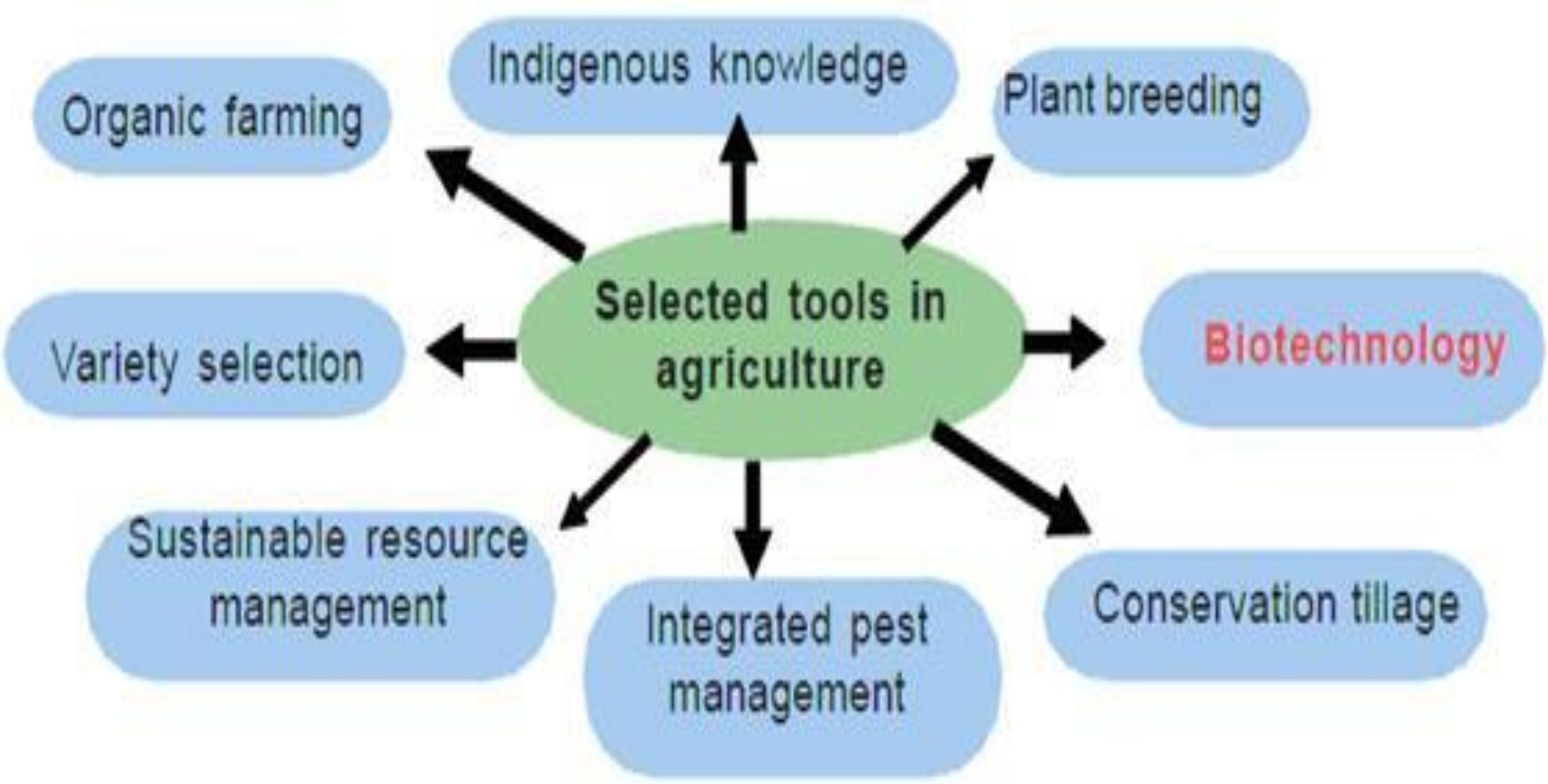
Witchweed: The African Farmer's Enemy

Grand Challenge: Maize Lethal Necrosis Disease

Maize streak disease (MSV): A major threat to smallholder farmers in Sub-Saharan Africa causing up to US$480 million losses annually.

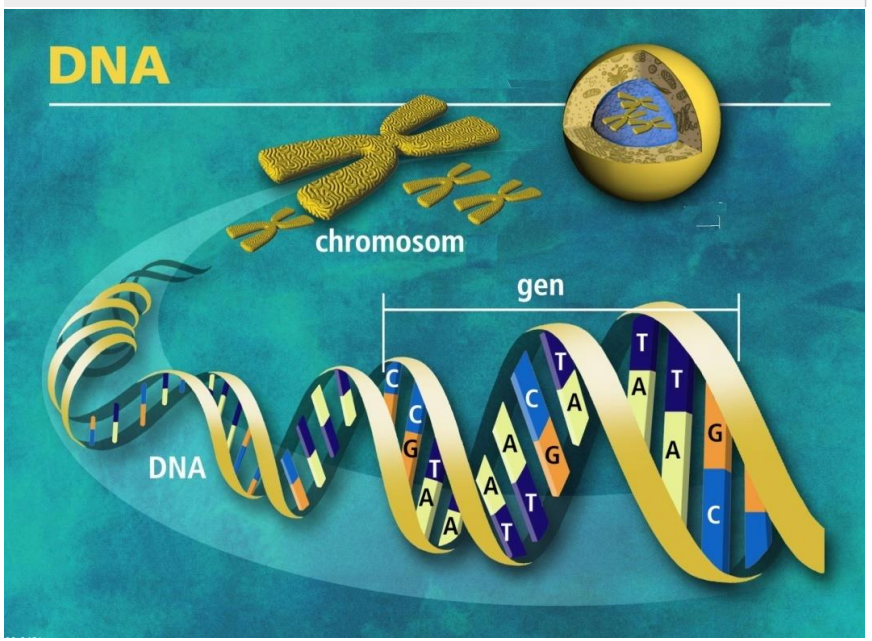
Photo Charles Karavina

Multifaceted approach to food security challenges

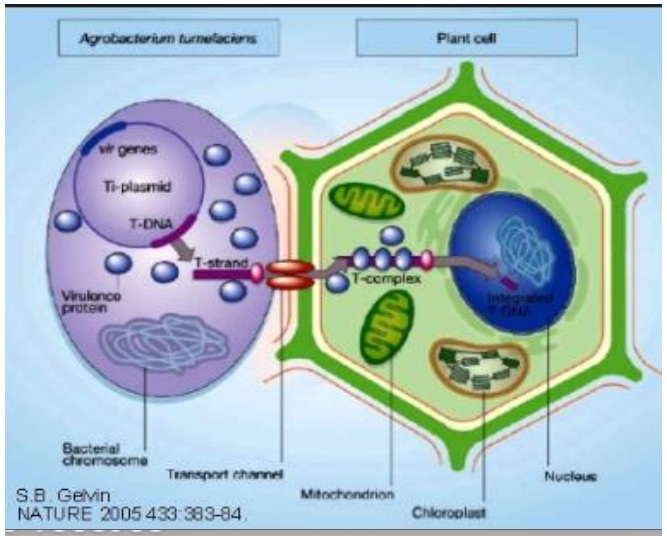


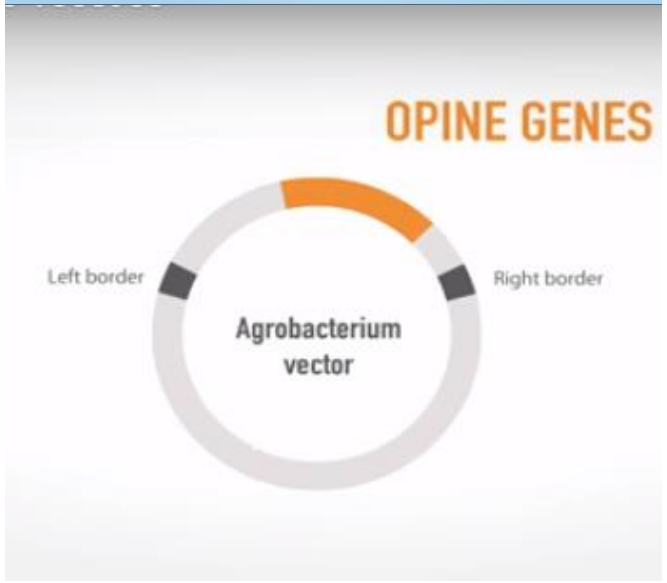
What is DNA

- All living organism is made up of cells.
- Inside each cell there is genetic material called DNA “Barcode” which carries a the blueprint of the organism
- The DNA is a double helix molecule that holds the genetic instructions and transfers characteristics from one generation to the next.
- DNA is made from four chemical building blocks (ATCG)



A Natural GMO





What is a GMO

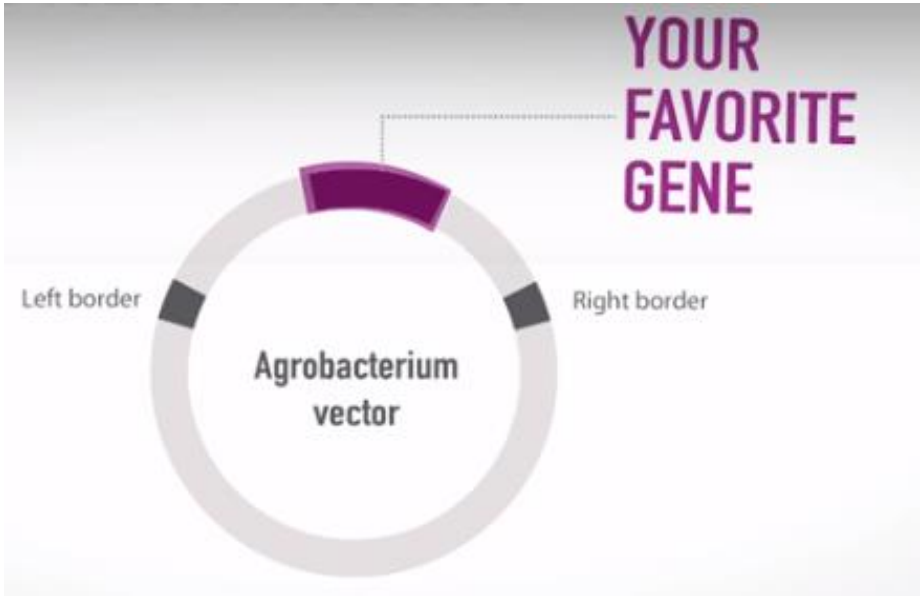
- Process of copying a gene for a desired trait (insect resistance) from one plant or organism and using it in another plant.
- Methods of creating Biotech Crop are evolving, but one of the common ways is:

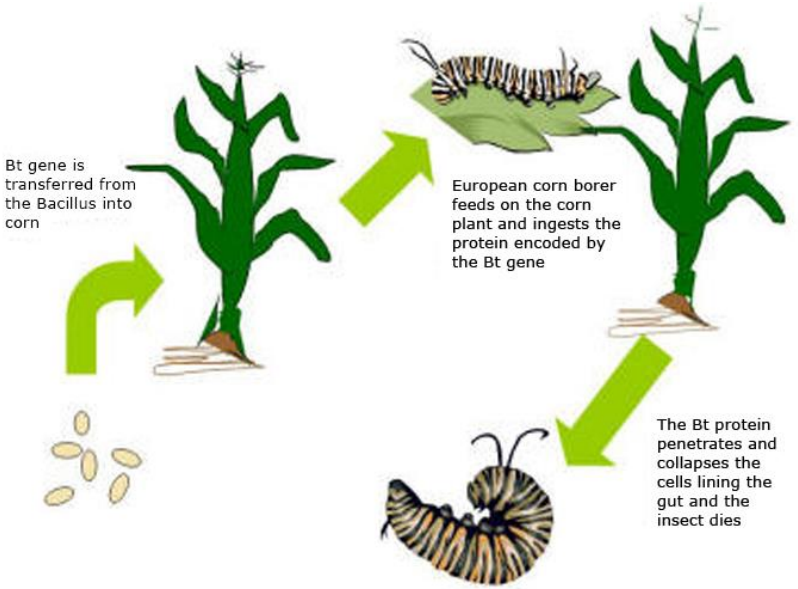
1. **Identification of a genetic material: that will make a plant less susceptible to insects pest.**

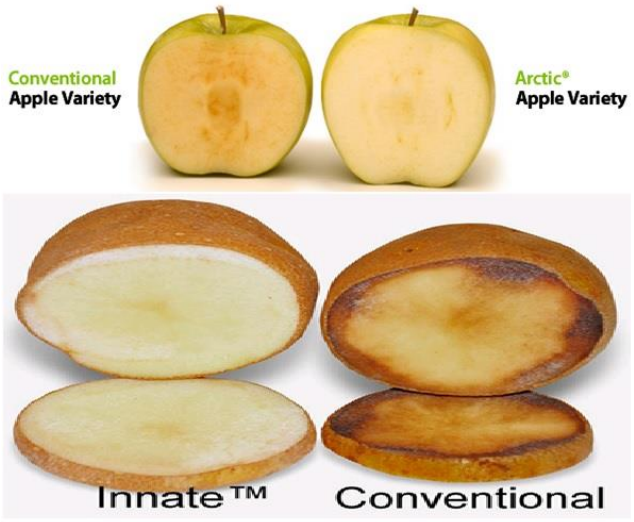
2. **Transferring the genetic material: using agrobacterium.**

3. **Planting:** The seed is then tested for safety, reliability and effectiveness. Once it receives approval by the regulators, farmers hare able to plant and reap the benefits the new technology

How Do You Make a GMO Plant?







Global Status of Commercialized GM/Biotech Crops: 2017

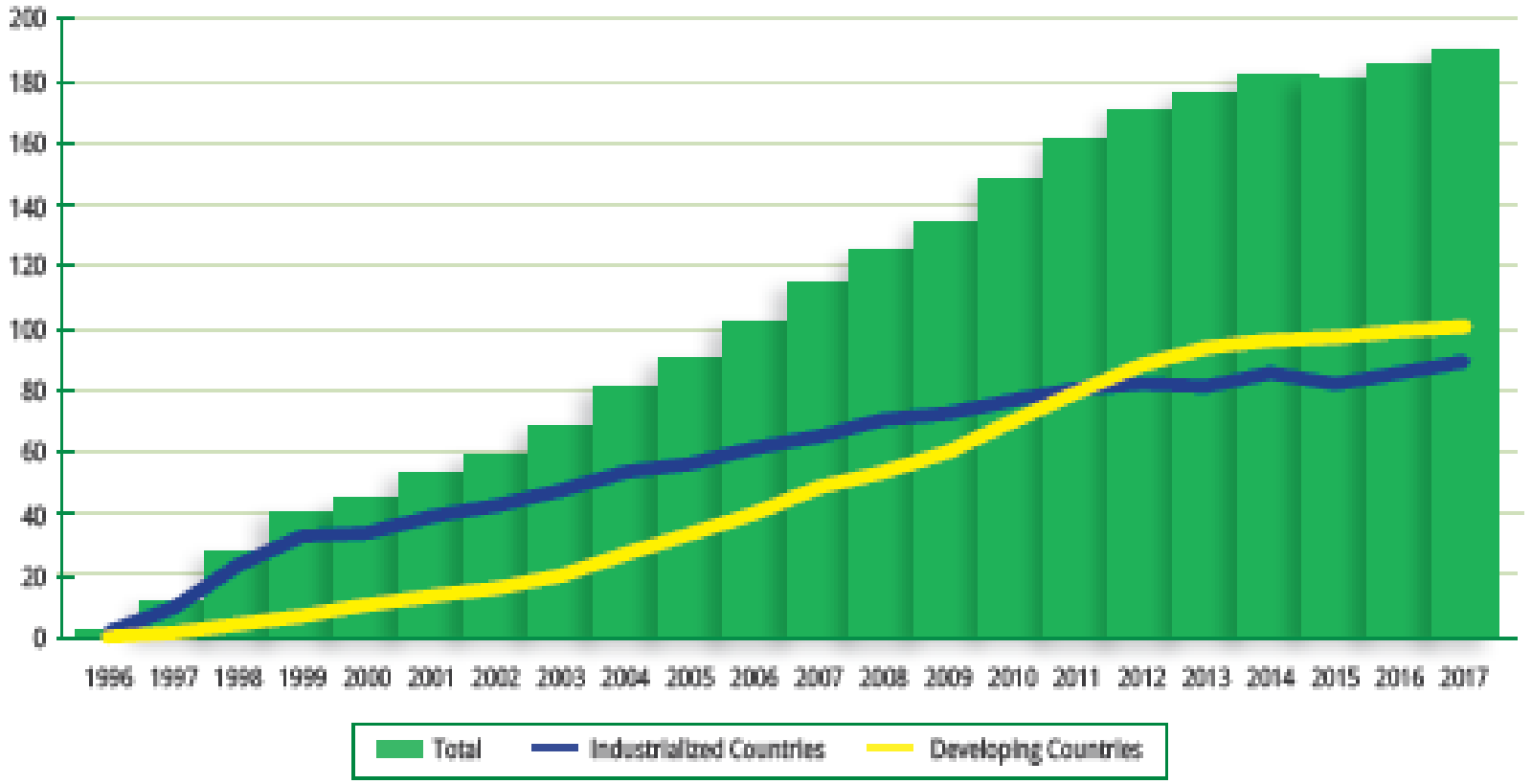


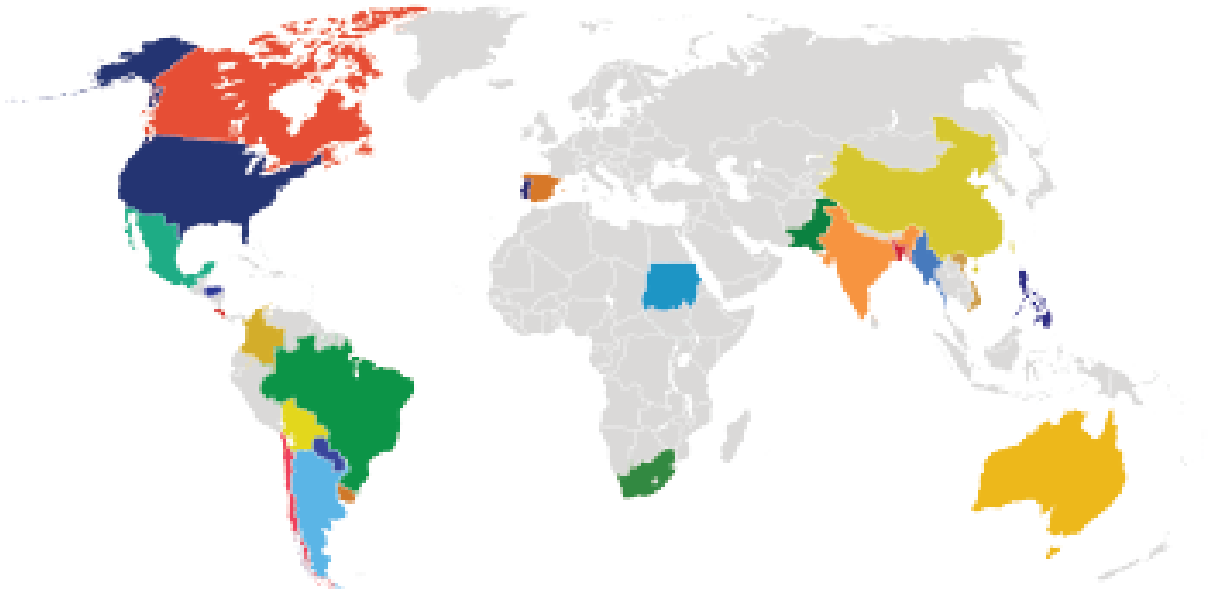
Figure 1. Global Area of Biotech Crops, 1996 to 2017: Industrialized and Developing Countries (Million Hectares)

Source: ISAAA, 2017

Impact of Biotech Crops to sustainable Global Agriculture

1) Biotech crops contribute to food, feed, fibre security & self sufficiency
   - Affordable food - increasing productivity & economic benefits sustainably @farm level
2) Biotech crops help save the land
   - Make every hectare of cultivated land more productive
3) Biotech crops contribute to alleviation of poverty and hunger
   - Increase the income of small resource poor farmers
4) Biotech crops help reduce the agriculture ‘s environmental footprint
   - Reduction of pesticide, saving on fuel , conservation agriculture practices
5) Biotech crops are helping mitigate climate change.
   - Drought tolerant crops

Biotech Crop Countries



24 countries which have adopted biotech crops

3%
Increase from 2016

In 2017, global area of biotech crops was 189.8 million hectares, representing an increase of 3% from 2016, equivalent to 4.7 million hectares.

Source: ISAAA, 2017

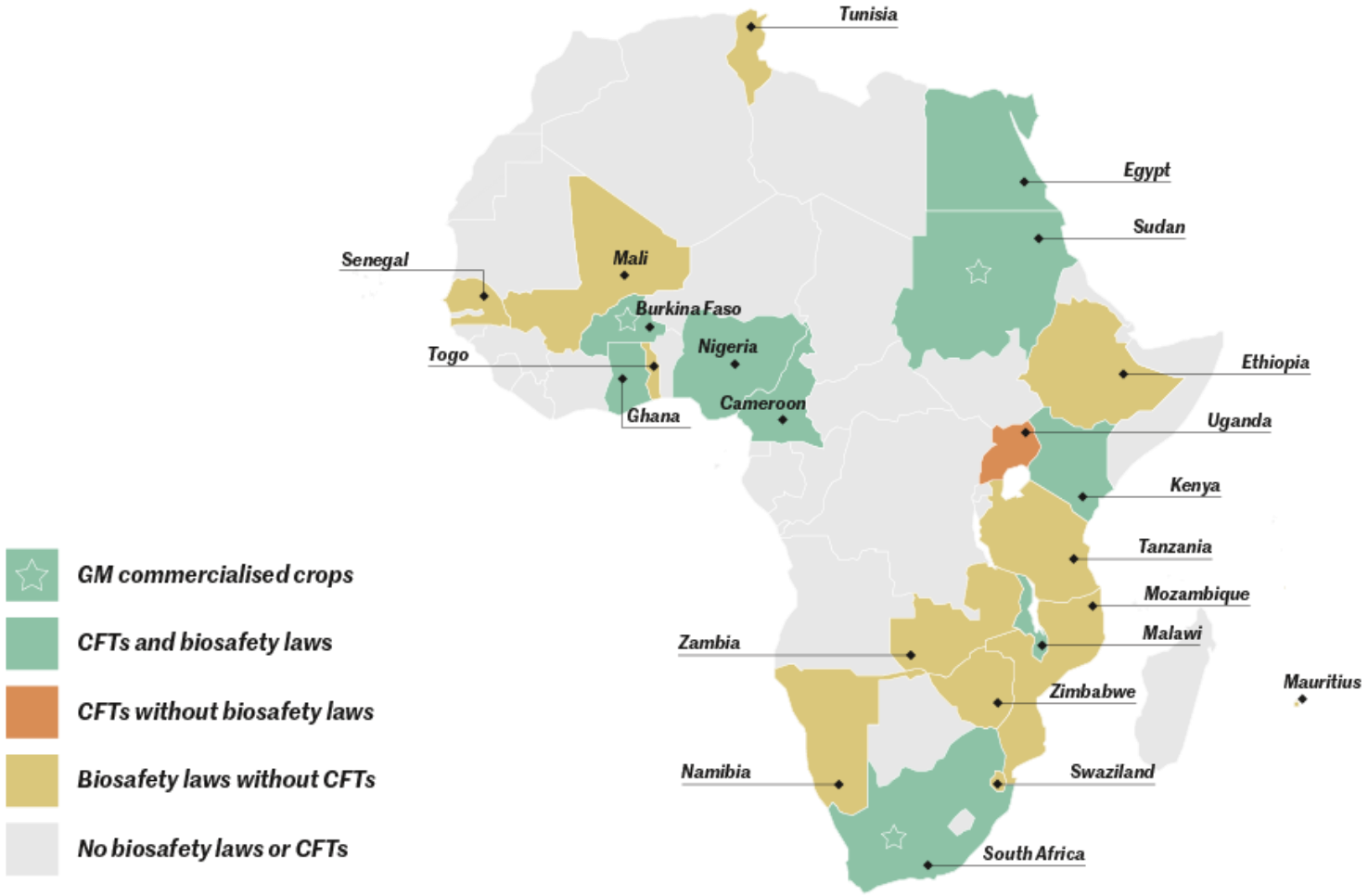
50,000 hectares, or more	
1. USA	75.0 million
2. *Brazil**	50.2 million
3. *Argentina**	23.6 million
4. Canada	13.1 million
5. *India**	11.4 million
6. *Paraguay**	3.0 million
7. *Pakistan**	3.0 million
8. *China**	2.8 million
9. *South Africa**	2.7 million
10. *Bolivia**	1.3 million
11. *Uruguay**	1.1 million
12. Australia	0.9 million
13. *Philippines**	0.6 million
14. *Myanmar**	0.3 million
15. *Sudan**	0.2 million
16. Spain	0.1 million
17. *Mexico**	0.1 million
18. *Colombia**	0.1 million

Less than 50,000 hectares

*Vietnam** Portugal
*Honduras** *Bangladesh**
*Chile** *Costa Rica**

* *Developing countries*

Status of Biosafety in Africa



NB: Ethiopia, Nigeria and Swaziland commercialized - Burkina Faso & Egypt did not plant GM

Major Objections to GMOs

1. **The nature of the natural**
   - At the heart of many objections is the notion that GMOs are unnatural
2. **Whether natural or not, GMOs generate many objections on the question of safety**.
   - New threats, new risk not presented by other plant breeding methods.
   - Threats to human health (food allergies, etc)
3. **Risk to the environment**
   - Biological pollution" or "genetic contamination" caused by gene flow among plants, which is irreversible with unknown risk.
   - GMOs create superweeds and superbugs to the detriment of both agriculture and the environment.
   - “Damage to non-target insects. e.g. Bt crop kill susceptible insects, whether they damage the crop or not.
   - Herbicide-tolerant crops increase the use of herbicides, mainly glyphosate, increasing many risks to both people and the environment.

THE GMO PERMIT APPLICATION PROCESS

PERMIT ISSUED FOR:

– Contained use –
– Field trials –
– Commercial commodities –
– General release –

DEPARTMENT OF AGRICULTURE, FORESTRY AND FISHERIES

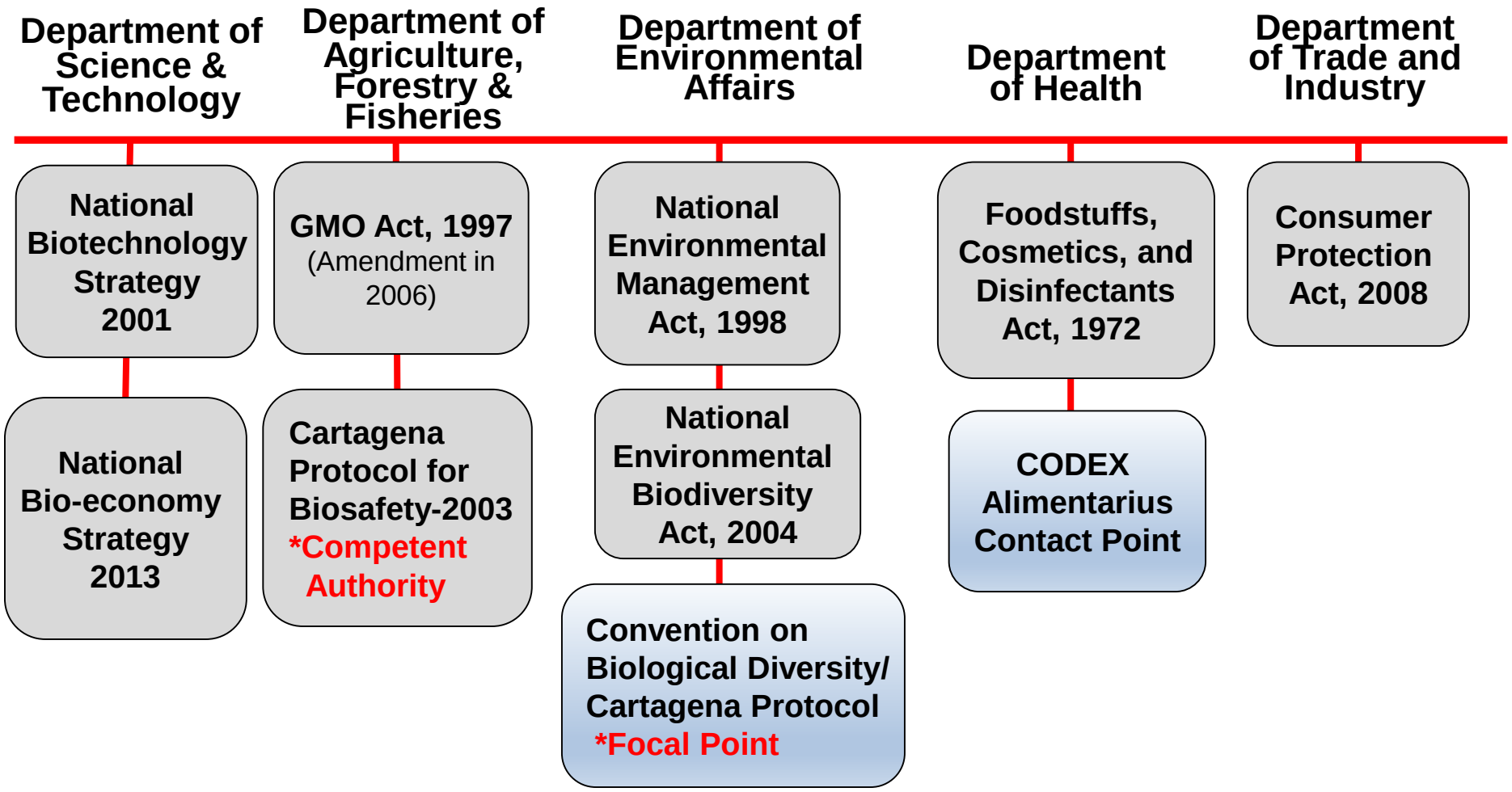
Applications sent to GMO Registrar

SCIENTIFIC EVALUATION BY THE ADVISORY COMMITTEE

THE EXECUTIVE COUNCIL

The Executive Council, consisting of several government departments, makes final decision, taking public input into consideration.

RSA Regulatory framework for GMOs



Africa Biotech Crops Status

Source ISAAA 2017

Adoption of Biotech Crops in Africa

Barriers & challenges to the adoption of Biotech in Africa

- Many countries have yet to put into place their biosafety and other legal frameworks.
- Mis-information and the politicisation of food security and biotech by anti-GMO agenda groups.
- Regulatory approval in many countries can be a cumbersome and time-consuming - process that becomes cost prohibitive for businesses and public sector enterprises.
- Objections arise because there are differences in the ability of states to take advantage of biotech without dependence on other countries or multinational firms.
- Global trade issues- influence whether a biotech crop makes it into the hands of their intended beneficiaries.

How Biotech crops could potentially end poverty and Hunger in Africa

- Extreme poverty and hunger can be decreased by increasing crop productivity (Better seed, innovation, Education & Resources)
- Technological advancement in farming can increase food productivity in Africa.
- Biotech crops have proven/demonstrated potential to address the poverty challenge.
- Biotech crops increase crop yields, **lower costs for food production**, **reduce the need for pesticides**, e**nhance nutrient composition and food quality**, **resist pests and disease** and increase food security.

South Africa Experience

- Robust, science-based regulatory framework for Biotech crops.
- Biotech crops modified to be either insect resistant or herbicide tolerant or to contain both of these traits.
- Farmers are required to sign special grower agreements: refuge compliance.
- GM Regulation: planting refugia is mandatory

Taking SA maize to Vietnam

The Mercury 1 Aug 2018 +1 more Network Reporter

EMERGING black farmers at Matatiele, Eastern Cape are producing maize that is being supplied to Vietnam and other countries.

The commercial farming opportunities are as a result of the efforts of the Department of Rural Development and the Grain Farmer Development Association (GFADA).

The department said it was pleased that the farms were able to produce for commercial markets.

Grain Farmer Development Association chairman, Neo Masithela, Eastern Cape Rural Development and Agrarian Reform District Director for Alfred Nzo, Bukiwe Madyibhi and Matatiele farmer, Tebogo Mongoato show off maize from the Eastern Cape to be exported...

"We are happy that they are now selling their maize to local markets and export markets, and are getting good profits for their hard work. Sending this maize to foreign markets confirms that the Agriculture Economic Transformation Strategy we are implementing is the correct strategy and our method of investing our own money and partnering with commodity groups is the right approach."

As part of the implementation of the Agriculture Economic Transformation Strategy, the department signed a service-level agreement with the GFADA tasking it to support

LOCAL COMMUNITY BUY OLD GINNERY

Makhathini cotton comeback

THE MERCURY - TUESDAY 18 AUGUST 2015

Nokuthula Ntuli

THE rural Makhathini Flats, near Jozini, are on track to again become the cotton capital of KwaZulu-Natal after the government helped local people buy the ginnery.

The Makhathini ginnery closed down in 2007 when it was placed under liquidation by the Land Bank. This crippled the 3 000 local farmers who were supplying it with cotton.

"Some were able to send their cotton to a ginnery in Limpopo but others simply stopped farming cotton and let their land lie unproductive," said Charles Kekane, the ginnery's operations manager.

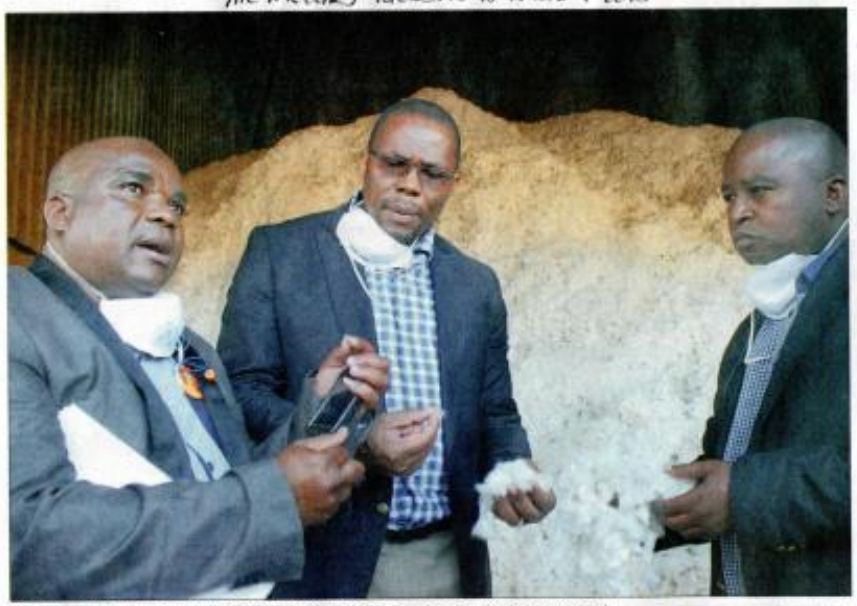
The Department of Agriculture and Fisheries heard the community's pleas and bought the ginnery in 2010 for R30 million, intending to re-commission it to process locally produced cotton. Millions were also spent on refurbishing the machinery and fencing the property before the ginnery reopened in 2012.

"We are not back to where we were (before 2007) but we are hopeful that the local farmers will pick up their tools again and we will have a profitable ginnery that is of benefit to everyone because this plant belongs to the community," said cotton farmer Phineas Gumede.

On Friday the KZN MEC for Agriculture, Cyril Xaba, and Deputy Minister for Rural Development and Land Reform Mcebisi Skwatsha visited the ginnery to assess its progress.

They also met local farmers to discuss plans to grow the project into a comprehensive agri-processing plant for cotton and other products such as glycerine, margarine and cooking oil.

Currently the cotton seeds are sold to livestock farmers as



Cotton farmer Phineas Gumede, left, shows KZN MEC for Agriculture Cyril Xaba, centre, and Land Reform deputy Minister Mcebisi Skwatsha harvested cotton before the seeds are removed. Top right, Skwatsha tries his hand at harvesting cotton during his visit to the Makhathini ginnery on Friday. Right, Gumede tells Skwatsha and Xaba about the advantages of rotating cotton with nutritional crops such as buttemuts. PICTURES: SANDILE MAKHOBA

machinery. The government is in the process of transferring the ginnery to Ubongwa Farmers' Co-operative which comprises 32 farmer associations with a total of 1 579 farmer members.

"This co-operative will become solely responsible for the successful operation of the ginnery. This will result in farmers being involved in more stages of the value chain of cotton processing," said Skwatsha, with progress being made.

uMkhanyakude Business Chamber chairman Hebron Nxumalo said the ginnery had created employment opportunities for those who did not wish to go to urban areas.

Seventeen people are permanently employed but dozens of seasonal jobs are created for cotton and nutritional crops that are planted when the cotton is not in season.

"Our hope is to see farmers

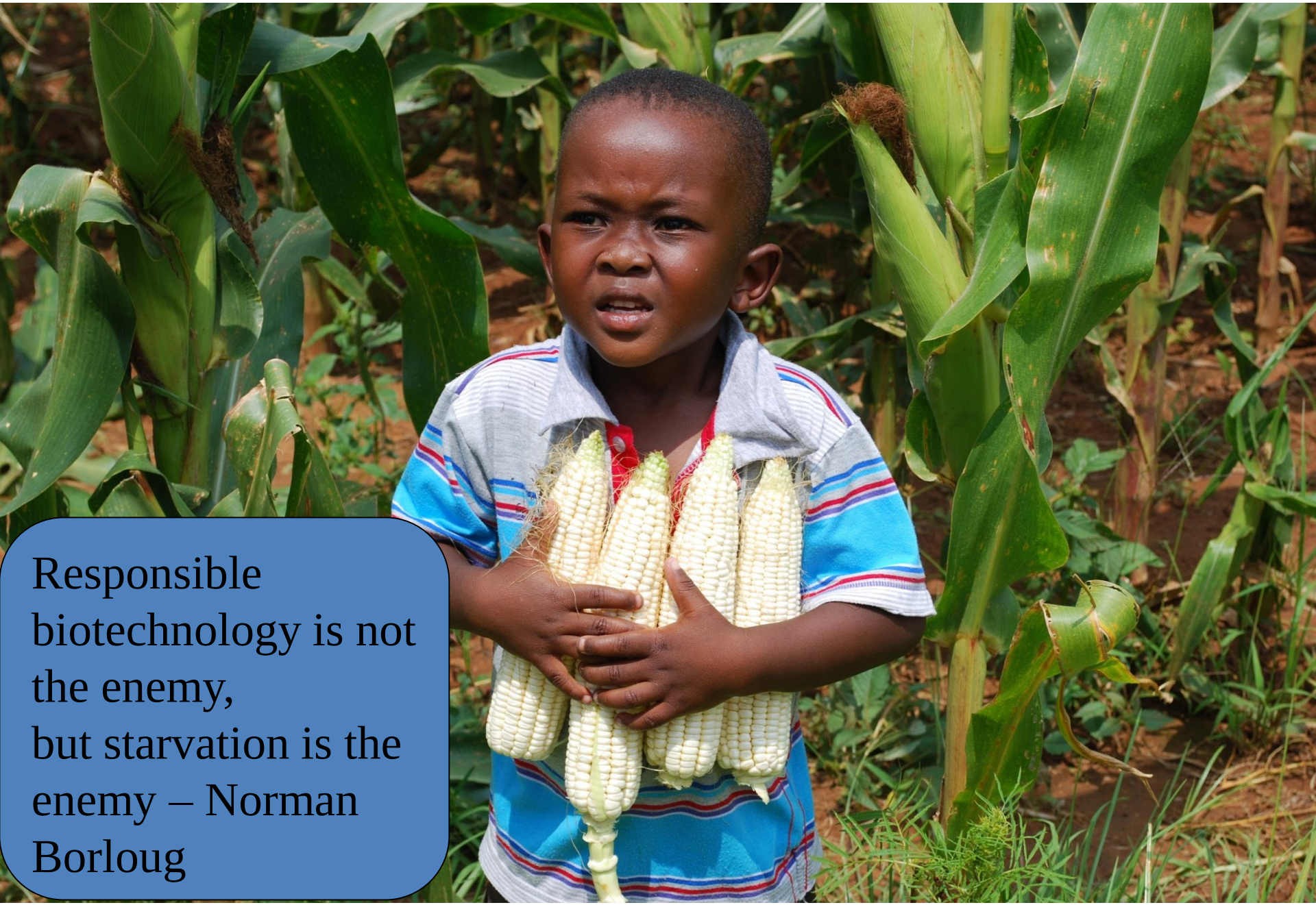
cotton into the ginnery. At the moment we are getting 600 tons so it's not a profitable venture yet, but close to R4m has been paid to farmers since 2012," said Gumede.

One of the 938 female farmers involved, Matozi Sizwelane, said agriculture was the future of the region because of its flat terrain and moist soil.

"We want to see more young people being beneficiaries because now we have only 129

Conclusion

- Together, we need to inspire a climate for change.
- Must be committed to defending evidence-based science.
- An evidence-based approach to decision-making is crucial to ensuring global access to modern agricultural tools.
- Driven by the urgency of resolving pressing social and environmental problems.
- Justice: All farmers should have the right to choose improved seeds that can help improve their livelihoods and health


Responsible biotechnology is not the enemy,
but starvation is the enemy – Norman Borloug