TELA
Maize Project

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PROSPERITY THROUGH TECHNOLOGY

# TELA Maize Technology

## FAQs: ALL YOU NEED TO KNOW

## Investors

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## What is the TELA Maize Project?

The TELA Maize Project is a public-private partnership that is working towards initiating commercialization of transgenic drought-tolerant and insect-protected maize varieties to enhance food security in Sub-Saharan Africa. The word "TELA" is derived from the Latin word *TUTELA* which means "Protection." The TELA Maize Project builds on progress made from a decade of excellent breeding work under the Water Efficient Maize for Africa (WEMA) Project. WEMA's purpose was to develop drought-tolerant and insect-protected maize varieties for farmers to produce more reliable harvests under moderate drought conditions and protect maize from insects. The project used both conventional advanced plant breeding and biotechnology in the development of the maize varieties. The TELA Project is a continuation of the transgenic WEMA component. The long-term goal of TELA is to make drought-tolerant maize and insect-protected maize varieties – TELA Maize - available royalty-free to small-scale farmers in Sub-Saharan Africa.

## Why is drought tolerance important for smallholder farmers?

Africa is a drought-prone continent, making farming risky for millions of smallholder farmers who rely on rainfall to water their crops. Maize is the most widely grown staple crop in Africa – more than 300 million people depend on it as their main food source – and it is severely affected by frequent drought. Drought leads to crop failure, hunger, and poverty. Climate change will only worsen the problem. Identifying ways to mitigate drought risk, stabilize yields, and encourage small-scale farmers to adopt best management practices is fundamental to realizing food security and improved livelihoods for the continent.

## Why is insect protection important for smallholder farmers?

Drought is just one of the many challenges facing Sub-Saharan African farmers. Insects present additional challenges as farmers in the developing world have little or no resources to effectively manage them. As WEMA project carried out its research on drought tolerance, it became clear that insects were having significant impact on yield that could negatively impact the benefits possible through drought tolerance. Stem borer insect pests feed on every major part of the maize plant including maize leaves, stems and ears reducing the flow of water and nutrients, causing stem breakage due to physical damage and possible development of toxins through damage to the plant. Some of the most dramatic losses occur when drought conditions and insect pressure combine in the field. Drought negatively impacts overall plant health resulting in a reduction in crop yield. Insects add to the impact by reducing the plant's ability to use already limited water and nutrients. In severe cases, the combination quickly leads to complete crop failure.

The addition of insect pest protection to the WEMA project helped to ensure better plant health so plants are be able to use the water and nutrients they have more efficiently. Insect protection complements and protects yield made possible through research and development.

## Why test MON810 considering reports of resistance in South Africa?

*Bt* maize has been grown successfully in South Africa since 1998. In 2010, there were reports of resistance developing in an isolated area of South Africa with irrigated maize as the only crop in the area. This was unfortunately as a result of farmers not planting sufficient refuge and as a consequence, resistant insects developed. Steps have been taken to ensure farmers plant the necessary refuge and as a result the resistant insect-pest population has been properly managed and hasn't spread widely.

Results from our trials have shown high efficacy of the *Bt* MON810 in fully protecting against stem borer while also giving partial but significant protection against the opportunistic Fall Armyworm (FAW). The TELA Maize Project has recently accessed the more superior *Bt* MON89034 that gives better protection against the FAW, but the products will only be available to farmers after 3-4 years of product development.

## What is *Bt*?

*Bt* is an abbreviation for *Bacillus thuringiensis*, a soil bacterium that is common around the world. These bacteria produce specialized proteins, called *Bt* proteins, that selectively kill certain types of insects without affecting other living organisms. As such, *Bt* have been and are still used as biological control agents for certain insect pests in farming, especially for the organic food industry. Modern biotechnology has produced *Bt* crops, which are modified to produce specific *Bt* proteins in the plant cells to protect against specific pests. These crops do not need conventional pesticide sprays to destroy the pests that are controlled by the specific *Bt* protein. Existing, approved *Bt* crops have significantly improved the cost effectiveness and sustainability of crop production in North and South America, Europe, Africa, the Middle East, Asia and Australia.

## Why generate technologies for stemborers yet the major issue is FAW?

The WEMA project started with protection against stemborer. FAW came only recently and the technology we are evaluating gives protection against both pests. These are independent pests and the arrival of FAW does not decrease the impact of stemborers in Africa.

## How are insects controlled today?

For most smallholder farmers, the only option for controlling pest insects is to spray the plants numerous times with insecticides that are costly and are not easily available. Insect protected maize provides in-plant insect protection against damaging stem borer insect pests, which allows more widespread and consistent control of target pests on the maize plant.

## How does insect protection work?

Insect protection was developed from the naturally occurring soil bacteria, *Bacillus thuringiensis*, or *Bt* for short, which produces a protein that is toxic to the digestive systems of a targeted group of insects. Through genetic modification, a modified form of the insect-protected gene is inserted into the maize plant, so it can produce the protein on its own. This approach enables the plant to defend itself against these insects and reduces the amount of insecticides needed. This protein does not affect non-target

organisms and is safe for humans, livestock, wildlife, and beneficial insects. Extensive studies have demonstrated that the protein is safe to humans, livestock, wildlife, non-target organisms and beneficial insects. These proteins have been used in organic farming for over 50 years to control insect pests.

### Can the insect pests become resistant over time?

A key component of the *Bt* technology management process is an Insect Resistance Management (IRM) plan which relies greatly on farmers' compliance with planting of conventional maize around the *Bt* maize as a refuge for long term benefit as well as a stewardship requirement. The TELA Project has developed an IRM Plan and is in the process of developing specific stewardship plans for *Bt* maize products for longevity of the insect protected maize and benefits to smallholder farmers. Wherever insect-protected crops have been deployed, extensive farmer education and communication programmes are part of the deployment strategy. Farmers and Extension officers will be trained in insect resistance management.

### Are the varieties being tested the ones that will be availed to farmers?

The current varieties are meant to demonstrate that the technology is safe and works in Africa.

The technology will be availed to farmers in locally adapted varieties.

### How can I tell that I have stemborers or FAW?

Both Stemborer and FAW are moths whose caterpillar cause distinct symptoms on the maize plant. Stemborer causes partial damage on the leaves then burrows and settles in the stem of maize plant forming tunnels. FAW damages the leaves by chewing large amounts of leaf tissue resulting in a ragged appearance to the leaves. FAW larvae are usually found deep in the leaf whorl and often deposit yellowish-brown frass in the plant funnel. Beneath the frass, larvae are protected somewhat from insecticide applications. FAW larvae usually move to new growing points affecting the ear and tassel as they develop. Fully formed ears may be partly or totally destroyed.

### Does *Bt* MON810 control FAW?

*Bt* MON810 provides excellent protection against stemborers and partial but significant protection against Fall Armyworm (yield gains of 50–115% in field trials). A second generation *Bt* in the pipeline (MON89) will provide even better protection (as seen in South Africa), and it can be made available to countries that first approve the first-generation technology of *Bt* MON810, which is currently available."

### How will TELA maize varieties benefit farmers?

These new drought-tolerant and insect-protected maize varieties will provide valuable economic, agronomic and environmental benefits to farmers by helping them produce more reliable harvests under moderate drought conditions and better grain quality due to reduced insect damage. This will help farmers harvest enough to feed their families, a surplus which they can sell to increase their incomes, and help strengthen local communities and countries. The addition of insect protection will also reduce pesticide use which will bring benefits to both the environment and human health. A

more reliable harvest will give farmers additional confidence to invest in their farms and improve their farming practices.

### Are these new maize varieties safe?

TELA Maize is safe for both human and animal consumption. The maize gets its insect protection ability from a common soil-dwelling bacterium, *Bacillus thuringiensis*, *Bt* in short. *Bt* products have been safely deployed and used for over 20 years in various parts of the world and have a history of safe cultivation and consumption. In South Africa where it is being planted, the TELA maize has undergone extensive health and safety assessments as per the country's and international scientific standards. The maize has also undergone regulatory review and evaluation in Kenya and has been approved for National Performance Trials. In all the countries, this maize will need to pass all regulatory requirements and evaluations before farmers can grow them. The varieties developed through transgenic approaches also undergo extensive health and safety risk assessments. These detailed food, feed and environmental safety assessments confirm product safety.

## Are insect-protection products already in use?

Yes. Insect protected (*Bt*) maize is approved in major maize growing regions of the world. In 2017, a record 189.8 million hectares of biotech crops were grown globally – an increase of 4 million hectares from 2016 and more than 100-fold gain since 1.7 million hectares were planted in 1996. An estimated 23.3 million hectares of land were planted with crops containing the *Bt* gene. For the first 22 years of commercialization (1996-2016), benefits from insect resistant crops are valued at US$ 97.4 billion, 52.3% of the global value of biotech crops of US$186.1 billion; and for 2016 alone at US$9.73 billion, 53.4% of the global value of biotech crops of US$18.2 billion. In South Africa, an estimated total of 2.73 million hectares of *Bt* maize was planted in 2014 alone. *Bt* maize has been in the market for over 20 years, with more than 30 countries growing it today. This same insect-protected maize is approved for planting in Europe and is planted in Spain, Portugal, Czech Republic and Romania. Insect protected (*Bt*) maize is approved in major maize growing regions of the world.

## Which countries in Africa grow GM crops?

In Africa, countries growing GM crops are South Africa, Burkina Faso and Sudan. Recently, Nigeria and Ethiopia also approved GM products (*Bt* cotton and Podborer Resistant Cowpea) for commercialization. Kenya and Malawi are also in the process of releasing *Bt* cotton for commercialization. Several other African countries are conducting field trials on the following broad range of staple and orphan crops: rice, maize, wheat, sorghum, bananas, cassava, and sweet potato.

## What are Genetically Modified Organisms?

Genetically modified organisms (GMOs) can be defined as organisms in which the genetic material (DNA) has been altered. Genetic modification allows selected individual genes to be transferred from one organism into another. Such methods are used to create GM plants – which are then used to grow GM crops.

### When will small-scale farmers have access to the maize varieties?

Through WEMA, over 100 conventional drought-tolerant maize hybrids commercialized under the brand name DroughtTEGO® or TEGO® in short were released to farmers from October 2013. Farmers growing TEGO® maize in Kenya recorded an average of 37% yield advantage (4.8 tons per hectare compared to yields of 3.5 tons per hectare) above popular commercial hybrids. In addition, five insect-resistant (*Bt*) TELA® maize hybrids were released to farmers in South Africa end of 2016. *Bt* maize has been granted environmental release in Kenya but is awaiting approval to proceed to National Performance Trials for variety certification. Farmers in other countries other than South Africa will access the seed after environmental release approvals from regulatory agencies in those countries and relevant seed variety release processes.

### Why is it taking long to get the GM varieties to the farmers?

Throughout the world, GM varieties are controlled by government biosafety regulations which take time test, review and approve the varieties.

### What is the difference between traited and non-traited hybrids?

Traited has the target gene for the desired technology while the non-traited is the conventional version without the technology.

### Will farmers be able to save WEMA seeds for replanting?

WEMA seeds are hybrids. Farmers will be free to save seed for replanting. However, just as with traditional seed, it is good farm management practice to source and plant the best available seed each season for consistently good harvests. This will protect the crop from failures caused by loss in seed quality which occurs each time the harvested grain is saved as seed and used for planting.

### How much will TELA Maize seed cost?

The TELA maize seed will be made available to smallholder farmers royalty-free through local seed companies. This means that it will be sold at the regular price of maize seed without additional royalty payments.

## Who owns TELA Maize varieties?

The TELA Maize hybrids are owned by the respective institutions that developed them including the national government research organisations. The improved maize varieties will be licensed to local seed companies royalty-free through the African Agricultural Technology Foundation (AATF).

## How will seed companies have access to the *Bt* varieties?

AATF has authority to give sub-licenses to qualified seed companies to combine the traited varieties with theirs to produce their own hybrids for sale. See *http://www.seedcogroup.com/investors/investor-relations/faqs* for more detail

## Who are the TELA Project partners?

The African Agricultural Technology Foundation (AATF) is coordinating the TELA Project that includes national agricultural research systems in Ethiopia, Kenya, Mozambique, South Africa, Tanzania and Uganda; the International Maize and Wheat Improvement Center (CIMMYT) - an internationally funded, non-profit, scientific

research, training, and development organization; and Bayer Crop Science (Bayer), a private agricultural company. The project will involve local institutions, both public and private to support attainment of Project goals.

**The partners are contributing their technology and expertise to the project.**

1. AATF coordinates the partnership, drawing on its unique experience in public-private partnership management, technology stewardship, and project management.

2. National agricultural research systems, government agencies, farmers' groups, and seed companies participating in the project contribute their expertise in breeding, field testing, seed multiplication and distribution.

3. CIMMYT provides high-yielding maize varieties and inbred lines that are adapted to African conditions and expertise in conventional breeding and testing for drought tolerance.

4. Bayer is contributing maize varieties from its global proprietary collection, drought-tolerant and insect protection genes, biosafety regulatory packages, and its expertise in agriculture research and product deployment.

    i. the International Maize and Wheat Improvement Center (CIMMYT), an internationally funded, non-profit, scientific research, training, and development organization; and

    ii. Bayer Crop Science (Bayer), a private agricultural company.

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## Partners


KALRO
Kenya Agricultural & Livestock Research Organization


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