

WEMA Water Efficient Maize *for* Africa



Frequently Asked Questions about *Bt* Maize

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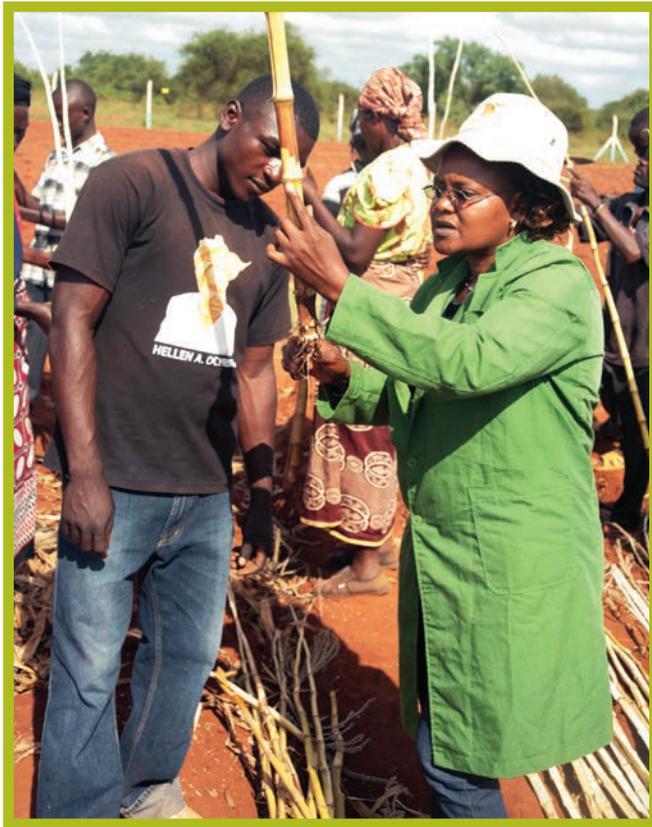
What is *Bt* maize?

Bt maize is maize that has been genetically modified to produce an insecticide – *Bt* protein – that kills certain insect pests. The gene added to the maize comes from the soil bacterium *Bacillus thuringiensis* (*Bt*), which has long been known to possess an insecticide effect.

Why is *Bt* maize needed?

Insect pests are a problem for farmers in Kenya and elsewhere in Africa because farmers have little or no resources to effectively manage them. Stem borer insect pests feed on maize leaves, stems and ears causing substantial yield reduction. In Kenya, stem borers are known to reduce maize production by an average of 13 percent or 400,000 tonnes of maize, equivalent to the normal yearly amount of maize the country imports. This damage is valued at more than USD 80 million. Some of the most astronomical losses occur when drought conditions and insect pressure combine in the field.

Insects impact yield 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 insect pest protection technology being developed by the Water Efficient Maize for Africa (WEMA) project will help to ensure better plant health as they will be able to use the available water and nutrients more efficiently. It will complement and protect yield made possible through the project's ongoing work.



How are insect pests controlled today?

For most smallholder farmers, the only option for controlling insect pests is to spray the plants numerous times with insecticides that are costly and are not easily available. *Bt* maize provides in-plant insect protection against damaging stem borer insect pests, which allows for 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 bacterium, *Bacillus thuringiensis*, *Bt* for short, which produces a protein that is toxic to the digestive systems of a targeted group of insect-pests. There are many different *Bt* proteins, but each one affects only certain insect groups. Through genetic modification (GM), a modified form of the insect-protected gene is inserted into the maize plant, so that 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. 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. Unlike many chemical insecticides, *Bt* protein is harmless to humans and is broken down quickly. This is why *Bt* preparations are frequently used as biological plant protectants in organic farming.

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. WEMA 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.

Aren't there reports of farmers in South Africa having resistance issues with *Bt* maize technology?

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.

How will *Bt* maize benefit farmers?

These new insect-protected maize varieties will provide better seed choices to farmers and help them produce more reliable harvests and better grain quality as a result of stem borer damage control on maize plants. *Bt* maize will also reduce pesticide use, which will bring benefits to both the environment and human health. *Bt* maize will also help Kenyan farmers who have no access to pesticides to control stem borers and protect their grain yield through use of improved seed alone. A more reliable harvest will give farmers additional confidence to invest in their farms and improve their farming practices. This will help farmers harvest enough to feed their families, have a surplus which they can sell to increase their incomes and help strengthen local communities.

Is *Bt* maize variety safe for human consumption?

Bt maize has been safely deployed and used for nearly 20 years in various parts of the world including Europe and has a history of safe cultivation and consumption. *Bt* maize derives its name from soil-dwelling bacteria, *Bacillus thuringiensis*, which has had a safe use as an insecticide for a long period of time. The varieties developed through transgenic approaches including *Bt* maize also undergo extensive health and safety risk assessments. Detailed food, feed and environmental safety assessments confirm the safety of this specific *Bt* insect protection. The new *Bt* maize varieties will need to pass all regulatory requirements and evaluations in Kenya before Kenyan farmers can grow them.

How stem borers cause damage and consequently yield losses in maize

Leaf feeding damage



Ear feeding damage



Stem feeding damage



When will smallholder farmers in Kenya have access to the *Bt* maize varieties?

The goal of the project is to complete development and make the *Bt* maize varieties available royalty-free to smallholder farmers through local seed companies by 2017. However, this timing depends on the regulatory review and approval process.

Are *Bt* maize products already in use?

Yes. *Bt* maize is approved in major maize growing regions of the world. In 2014, a record 181.5 million hectares of biotech crops were grown globally – an increase of 6 million hectares from 2013 and more than 100-fold gain since 1.7 million hectares were planted in 1996. In South Africa, an estimated total of 2.73 million hectares of *Bt* maize was planted in 2014. *Bt* maize has been in the market for nearly 20 years, with more than 25 countries growing it today on 106 million hectares. This same insect-protected maize is approved for planting in Europe and is planted in Spain, Portugal, Czech Republic and Romania.

How much will *Bt* maize cost?

The *Bt* maize seed developed by WEMA will be made available to smallholder farmers in Kenya 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 WEMA *Bt* Maize varieties?

WEMA *Bt* Maize hybrids are owned by the respective institutions that developed them including the national government research organisations e.g. Kenya Agricultural and Livestock Research Organisation (KALRO). The improved maize varieties will be licensed to local seed companies royalty-free through 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.

Can farmers save their seed for replanting?

Farmers can choose to save their seed for replanting. However, as with all hybrid maize seed, yield is reduced with replanting of farm-saved seed. It is good practice to plant new seeds each year to help ensure consistently good harvests.

Which countries in Africa grow GM crops?

In Africa, countries growing GM crops are South Africa, Burkina Faso and Sudan. Encouragingly, an additional seven African countries Cameroon, Egypt, Ghana, Kenya, Malawi, Nigeria, and Uganda have conducted field trials on the following broad range of staple and orphan crops: rice, maize, wheat, sorghum, bananas, cassava, and sweet potato. In 2014, Burkina Faso increased its *Bt* cotton hectareage by more than 50 percent from 313,781 hectares to 474,229; and sold *Bt* cotton worth \$1 billion (USD). Sudan, in its second year of commercialisation, increased its *Bt* cotton hectareage substantially to 90,000 hectares (approximately 46 percent) in 2014.

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.

Are GM crops safe to grow and eat?

Yes. GM crops are identical to their conventional counterparts except for the introduced genetic material that confers the desired beneficial characteristic. All GM crops undergo safety assessment before they can be grown and used. This is called a biosafety review and is coordinated by country governments; and in Kenya, by the National Biosafety Authority (NBA). The safety review covers three areas: details on the changes in the GM crop relative to the conventional varieties; an assessment of the environmental risk of the GM crop in the release environment; and an assessment of the food and feed safety of the GM crop and any products derived from it.

Who will conduct the safety assessment of GM maize?

The National Biosafety Authority (NBA) in Kenya is the competent authority for the regulatory process to authorise commercial release of this GM maize. The NBA has a Review Board with representatives from various public interest groups and relevant regulatory agencies including Ministry of Agriculture, Ministry of Health, Ministry of Science & Technology, and Ministry of Environment as well as other relevant agencies to participate in the review process.