

FAQs on Water Efficient Maize for Africa (WEMA)



TWN
Third World Network

1. What is WEMA?

Water Efficient Maize for Africa (WEMA) is an initiative that aims to develop drought-tolerant and insect-resistant maize, using conventional breeding, marker-assisted breeding, and genetic engineering. It claims that this will produce more reliable harvests under moderate drought conditions and protect maize from insect pests common to maize, such as maize stemborers.

2. Which countries are participating in WEMA?

Five African countries – Kenya, Mozambique, South Africa, Tanzania and Uganda – are participating in WEMA.

The public agricultural research institutions involved are:

- Kenya Agriculture and Livestock Research Organisation (KALRO)
- Mozambican Agrarian Research Institute (IIAM)
- South African Agricultural Research Council (ARC)
- Tanzanian Commission for Science and Technology (COSTECH)
- Ugandan National Agriculture Research Organisation (NARO)

3. Who are the main partners and funders of WEMA?

WEMA is a public-private partnership coordinated by the African Agricultural Technology Foundation (AATF).



The partners are the International Maize and Wheat Improvement Center (CIMMYT), agribusiness giant Monsanto Company, and the national agricultural research systems in Kenya, Mozambique, South Africa, Tanzania and Uganda, where field trials are either currently being conducted or are imminent.

Funding is provided by the Bill & Melinda Gates Foundation, the Howard G. Buffet Foundation and the United States International Agency for Development (USAID).

4. Will genetic engineering deliver drought tolerance?

There is no doubt that the climate change problem for farmers in Africa is very real and farmers need tools to help them to adapt and increase their resilience. However, will WEMA's genetically modified (GM) drought-tolerant maize really help?

Drought is a complex challenge that doesn't lend itself to simple solutions. Genetic engineering's applicability to drought tolerance is limited insofar as it can only manipulate a few genes at a time, while many genes control drought tolerance in plants. Also, other factors, such as soil quality, affect the ability of crops to withstand drought. Moreover, droughts vary in severity and timing. These complications make it unlikely that any single approach or gene used to make a GM crop will be useful in all, or even most, types of drought.

WEMA is heavily reliant on conventional breeding and marker-assisted selection, which have already produced numerous non-GM drought-tolerant maize hybrids. A transgene could be inserted into already drought-tolerant germplasm. It is, therefore, not clear how much 'additional' drought tolerance is conferred by genetic engineering, if at all.

5. What does the data say on the GM drought-tolerant maize?

The gene that is purported to confer drought tolerance was donated by Monsanto to the five WEMA countries. The event name is MON 87460. It is the only GM drought-tolerant maize on the market and has been deregulated in the United States since 2011, under the commercial name DroughtGard.

From the limited data supplied by Monsanto to the US Department of Agriculture, MON 87460 provides approximately only 6% reduction in yield loss in times of moderate drought. This 'yield advantage' will decrease as water deficit stress becomes too severe and it is noted by Monsanto that, "under severe water deficit, yield can be reduced to zero".¹

Figures pertaining to yield are not homogenous and vary according to the source (even among WEMA collaborators). An analysis commissioned by the pro-biotech group, the International Service for the Acquisition of Agri-biotech Applications (ISAAA) mentions that, based on over 2,000 comparisons, Monsanto has indicated that MON 87460 had "about 7%" yield advantage under drought conditions, and that "early hopes of a 15% boost in yields under stress from this transgene have been replaced with a more

1. Monsanto Company (2009) Petition for Determination of Non-Regulated Status for MON 87460.

modest expectation of 10%”.² The ARC, in its trials of MON 87460, claims 8–14% yield advantage under moderate drought stress.³

WEMA includes the development of non-GM drought-tolerant maize. This component builds on an earlier project undertaken by CIMMYT called Drought Tolerant Maize for Africa (DTMA). While many non-GM drought-tolerant maize varieties have been developed, to date, very few are commercially available. Nonetheless, according to a 2014 article in the science journal *Nature*, DTMA has developed 153 new varieties and in field trials “these varieties match or exceed the yields from commercial seeds under good rainfall conditions, and yield up to 30% more under drought conditions”.⁴ While the validity of such claims is difficult to corroborate, it would appear that conventional breeding for drought tolerance is more effective than genetic engineering.

6. Why is WEMA stacking the maize with GM insect resistance (and other) traits?

WEMA maize varieties will have both drought tolerance and insect resistance traits. WEMA justifies the insect resistance component by claiming that the yield ‘advantage’ achieved through drought tolerance needs protection from insects, which are more likely to inflict damage to crops during droughts.

Monsanto donated its Bt insect-resistant event MON 810 to four of the WEMA countries – Kenya, Mozambique, Tanzania and Uganda. This event, however, is being phased out worldwide, due to the development of resistance in major target pests, making it next to useless. One aspect of insect resistance management that might delay the development of resistance is the planting of refugia to non-Bt crops.⁵ However, setting aside a significant portion of land for this is difficult for small-scale farmers, and the lack of compliance with planting refugia has been a major factor in the development of insect resistance.

South Africa, which had grown MON 810 maize since 1998, experienced the development of rapid and widespread resistance in the target pests, and has since phased out the event. Instead of MON 810, Monsanto, through the WEMA Project, donated to South Africa a stacked Bt maize event (MON 89034), which expresses two different insecticidal toxins. It is not clear why the other four WEMA countries have been donated an event that has created problems elsewhere.

In addition, Monsanto has made an application to the South African authorities for approval of the commercial release of MON 87460 x NK 603 x MON 89034, which combines drought tolerance, glyphosate resistance and insect resistance. According to the African Centre for Biodiversity (ACB), “Stacking this [drought tolerance] trait with herbicide tolerant and insecticidal traits is a mechanism to prolong the utility of these traits and the sales of their associated pesticides”.⁶

2. Edmeades GO (2013) *Progress in achieving and delivering drought tolerance in maize – An update*. ISAAA: Ithaca, NY.

3. Mashingaidze K (2015) Cited in: African Centre for Biodiversity (ACB) (2017) *The Water Efficient Maize for Africa (WEMA) Project – Profiteering not philanthropy!* Johannesburg: African Centre for Biodiversity.

4. <http://www.nature.com/news/cross-bred-crops-get-fit-faster-1.15940>

5. refugia – areas of land surrounding Bt crops, where non-Bt crops are planted, to promote the survival of susceptible pests in order to delay resistance development.

6. African Centre for Biodiversity (ACB) (2017) *Objection against the general release of MON 87460 x NK 603 x MON 89034 in South Africa*. Johannesburg: African Centre for Biodiversity.

7. How do WEMA's claims of safety stand up?

WEMA makes general claims of safety for the GM approaches – that they “undergo extensive health and safety risk assessments” and that “these detailed food, feed and environmental safety assessments confirm product safety.”

However, the safety of genetically modified organisms (GMOs) is still in question. Indeed, a broad community of independent scientific researchers and scholars have challenged claims of a consensus over the safety of GMOs.⁷ In a joint statement developed and signed by over 300 independent researchers, they conclude that the scarcity and contradictory nature of the scientific evidence published to date prevents conclusive claims either of safety, or lack of safety, of GMOs. Long-term safety tests of MON 87460 have also not been conducted.

Expert opinion sought by the ACB, in support of its objection to the South African authority's decision on Monsanto's application for the general release of MON 87460, identified several potential hazards capable of causing adverse effects.⁸ Monsanto failed to identify, evaluate and assess these hazards and potential hazards in its application. In addition, Monsanto's failure to properly evaluate identified hazards in the early stages of the risk assessment of MON 87460 meant that a robust risk assessment could not be completed.

8. Are there trade-offs to the WEMA varieties being 'royalty-free'?

The WEMA varieties will be marketed royalty-free by local seed suppliers to smallholder farmers in South Africa and all farmers in sub-Saharan Africa. If the varieties are sold to commercial farmers, the seed will have to be sold at a higher price, as the royalty-free provision will not apply.

For Monsanto, the condition of providing its technology royalty-free may be a small price to pay, as it will obtain access to germplasm held by the other partners. Indeed, CIMMYT germplasm is a public good and its germplasm lines are made available only under strict conditions, one of which is that project collaborators must commit to royalty-free use of the germplasm.

CIMMYT, through the DTMA project, has already identified drought-tolerant maize germplasm for WEMA use. This maize germplasm – a collection of Africa's diversity of maize – may hold valuable traits, not only for the future of our agriculture and food supply, but, from a private sector perspective, traits that may lend themselves to future commercialisation and profits. Monsanto can now access this elite germplasm, as well as those donated by the national gene banks in the five WEMA countries. However, there is no information as to whether appropriate safeguards against biopiracy and benefit-sharing agreements are in place.

7. Hilbeck A et al. (2015) No scientific consensus on GMO safety. *Environmental Sciences Europe* 27:4, <https://doi.org/10.1186/s12302-014-0034-1>

8. African Centre for Biodiversity (ACB) (2017) *Founding affidavit: ACB's submission in the High Court of South Africa*.



Since WEMA is also expected to involve technology that has broad commercial applicability and significant commercial value to larger-scale farmers, there is every intention to preserve the ability to benefit from this, including through the application of patents, plant variety protection and trademarks. According to the WEMA Intellectual Property Policy,⁹ each party owns the intellectual property (IP) on their own materials and on the technology brought into the project (pre-existing IP) but they license this to one another. However, although the original germplasm remains the property of the original contributor, should a breeding programme develop it further, that germplasm will be owned by the party whose breeding programme developed it, regardless of the source of the initial germplasm. Thus Monsanto not only gets access to valuable germplasm, but, should Monsanto develop the germplasm further, it can also own it.

9. Are there alternatives to genetic engineering?

African farmers need real solutions to climate change. While WEMA's conventionally bred drought-tolerant maize might not pose the biosafety concerns that the GM variety does, it is still part of an aim to build a seed industry in Africa that is driven by the private sector, through the adoption of hybrid maize varieties. But time and again, we have seen that real solutions do not lie with corporations or the industrial model of agriculture, but, instead, with farmers, in farmers' fields, and with farmer-managed seed systems. Real solutions lie with farmers' knowledge of, for example, how to create healthy soils that store more water under drought conditions and how to grow a diversity of crops to create the resilience needed to face increased unpredictability in weather patterns.

Agroecology draws on farmers' knowledge and experiences, and there is growing international recognition that a paradigm shift towards diversified agroecological systems is necessary and urgent, particularly in the face of climate change. Agroecology outperforms conventional agriculture on many fronts, whether from an economic, environmental, health, social or cultural perspective. Evidence is particularly strong on the ability of agroecology to deliver strong and stable yields by building environmental and climate resilience. For example, the Rodale Institute in the US provides data from a 30-year comparison, showing that organic corn yields were 31% higher than conventional yields in years of drought; by way of comparison, GM drought-tolerant corn (the same event used in the WEMA project) only outperformed conventional plantings by 6.7% to 13.3%, far less than the organic corn¹⁰ – providing a convincing case for agroecology.

9. <https://www.aatf-africa.org/userfiles/wema-ip-policy.pdf>

10. Rodale Institute (2015) The farming systems trial. <http://rodaleinstitute.org/assets/FSTbookletFINAL.pdf>

