

STMA Bulletin

Stress Tolerant Maize for Africa

January-April 2020

STMA Bulletin is a quarterly publication of the Stress Tolerant Maize for Africa (STMA) project. This initiative funded by the Bill & Melinda Gates Foundation and the United States Agency for International Development (USAID) is led by the International Maize and Wheat Improvement Center (CIMMYT) and the International Institute of Tropical Agriculture (IITA). For more information about STMA visit: <http://stma.cimmyt.org>

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Stress tolerant maize builds the resilience of Africa's smallholder farmers

The just concluded 4-year Stress Tolerant Maize for Africa (STMA) project has been a highly successful and impactful cause in reinforcing the resilience, improving the food security and livelihoods of millions of smallholder farmers and their families across sub-Saharan Africa (SSA).

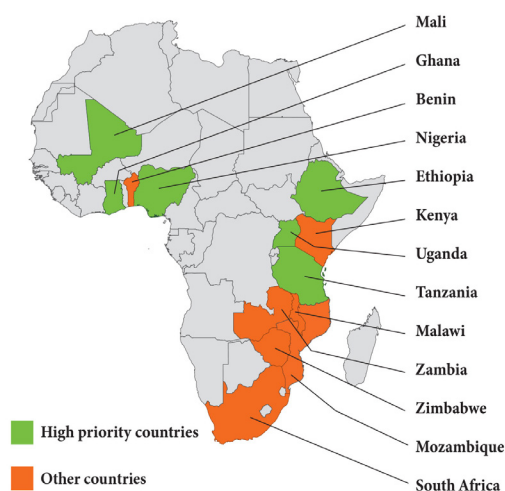
Over 200 million households in SSA rely on maize for food security and their well-being, yet maize yields in this region are dismally low compared to other parts of the world. Smallholder farmers face drought and other climate stresses, emerging pests and diseases, low soil fertility. The slow adoption of new stress tolerant varieties means farmers are unable to reach their yield potential.

Funded by the Bill & Melinda Gates Foundation and the United States Agency for International Development (USAID), the STMA project sought to cost-effectively develop multiple stress tolerant maize seed varieties that are suitable for and can help smallholder farmers cope with the vagaries of weather and farming stresses.

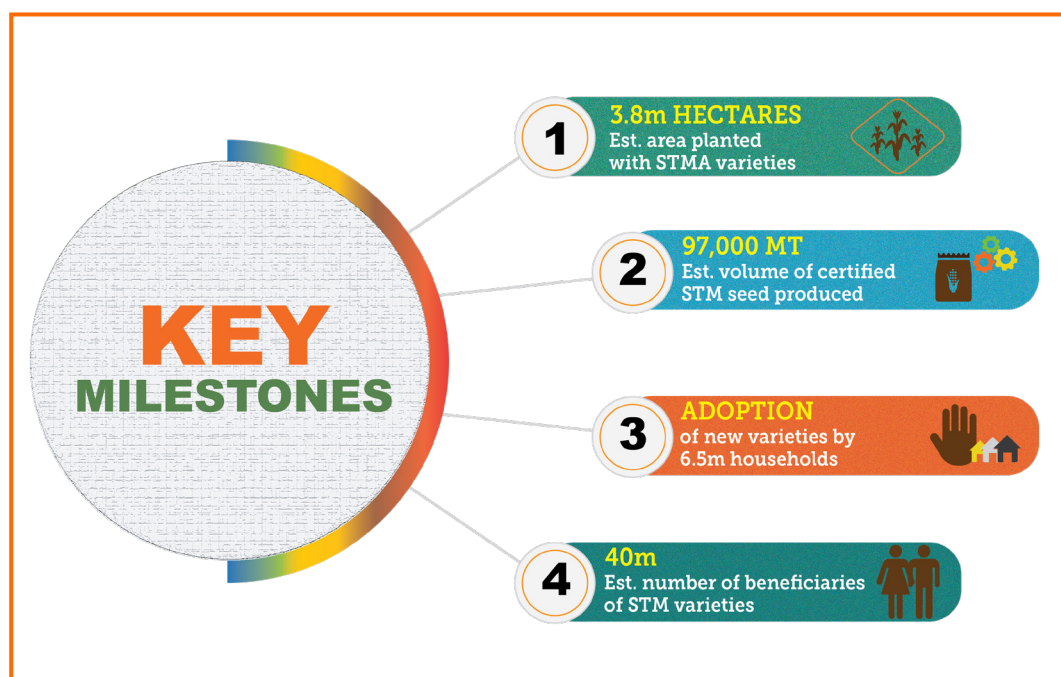
By 2020, project envisioned reaching 5.4 million households with adequate improved maize seed varieties covering at best 2.2 million hectares in eastern (Ethiopia, Kenya, Tanzania, Uganda), southern (Malawi,

Mozambique, South Africa, Zambia, Zimbabwe) and western Africa (Benin, Ghana, Mali, Nigeria). These efforts have been accomplished in close partnerships with local seed companies and national agricultural research organizations across the 13 target countries. Worth noting is that the project exceeded its objectives.

STMA project target countries



Some key milestones of the STMA project



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In the best possible taste

The pursuit for higher and more stable yields, alongside better stress tolerance, has dominated maize breeding in Africa for a long time. Such attributes have been, and still are, essential in safeguarding the food security and livelihoods of smallholder farmers. However, other essential traits have not been the main priority of [breeding strategies](#): how a variety tastes when cooked, its smell, its texture or its appearance.

They are now gradually coming into the mainstream of maize breeding. Researchers are exploring the sensory characteristics consumers prefer and identifying the varieties under development which have the desired qualities. Breeders may then choose to incorporate specific traits that [farmers or consumers value](#) in future breeding work. This research is also helping to accelerate varietal turnover in the last mile, as farmers have additional reasons to adopt newer varieties.

In the last five years, the International Maize and Wheat Improvement Center (CIMMYT) has been conducting participatory variety evaluations across East Africa. First, researchers invited farmers and purchasers of improved seed in specific agro-ecologies to visit



demonstration plots and share their preferences for plant traits they would like to grow in their own farms.

In 2019 and 2020, researchers also started to facilitate evaluations of the sensory aspects of varieties. Fresh samples of green maize, from early- to late-maturing maize varieties, were boiled and roasted. Then, people assessed their taste and other qualities. The first evaluations of this kind were conducted in Kenya and Uganda in August and September 2019, and another exercise in Kenya's Machakos County took place in January 2020.

Similar evaluations have looked at the sensory qualities of maize flour. In March 2020, up to 300 farmers in Kenya's Kakamega County participated in an evaluation of ugali, or maize flour porridge. Participants assessed a wider



Participants taste ugali at a sensory varietal evaluation in Kakamega. Images below: Members of the community participating in cooking, tasting and feeling the texture of various maize varieties. Photo: Joshua Masinde/CIMMYT.

range of factors, including the aroma, appearance, taste, texture on the hand, texture in the mouth and overall impression. After tasting each variety, they indicated how likely they would be to buy it.

Tastes differ

"Farmers not only consume maize in various forms but also sell the maize either at green or dry grain markets. What we initially found is green maize consumers



prefer varieties that are sweet when roasted. We also noted that seed companies were including the sensory characteristics in the maize varieties' product profiles," explained Bernard Munyua, Research Associate with the Socioeconomics program at CIMMYT. "As breeders and socioeconomists engage more and more with farmers, consumers or end-users, it is apparent that varietal profiles for both plant and sensory aspects have become more significant than ever before, and have a role to play in the successful turnover of new varieties."

For researchers, this is very useful information, to help determine if it is viable to bring a certain variety to market. The varieties shared in these evaluations include those that have passed through CIMMYT's breeding pipeline and are allocated to partners for potential release

after national performance trials, as well as CIMMYT varieties marketed by various seed companies. Popular commercial varieties regions were also included in the evaluations, for comparison.

A total of 819 people participated in the evaluation exercises in Kenya and Uganda, 54% of them female.

"Currently, there is increasing demand by breeders, donors, and other agricultural scientists to understand the modalities of trait preferences of crops by women and



men farmers," said Rahma Adam, Gender and Development Specialist at CIMMYT.

That's the way I like it

For Gentrix Ligare, from Kakamega County, maize has always been a staple food in her family. They eat ugali almost daily. The one-acre farm that she and her husband own was one of the sites used to plant the varieties ahead of the evaluation exercise. Just like her husband, Fred Ligare, she prefers ugali that is soft but absorbs more water during preparation.

"I also prefer ugali that is neither very sticky nor very sweet. Such ugali would be appropriate to eat with any type of vegetable or sauce," she said.

Fernandes Ambani prefers ugali that emits a distinct aroma while being cooked and

should neither be very sweet nor plain tasting. For him, ugali should not be too soft or too hard. While it should not be very sticky, it should also not have dark spots in it. “When I like the taste, smell, texture and appearance of a particular variety when cooked, I would definitely purchase it if I found it on the market,” he said.

While the task of incorporating all the desired or multiple traits in the breeding pipeline could prove complex and costly, giving consumers what they like is one of the essential steps in enhancing a variety’s commercial success in the market, argues Ludovicus Okitoi, Director of Kenya

Agricultural and Livestock Organization’s (KALRO) Kakamega Center.

“Despite continuously breeding and releasing varieties every year, some farmers still buy some older varieties, possibly because they have a preference for a particular taste in some of the varieties they keep buying,” Okitoi said. “It is a good thing that socioeconomists and breeders are talking more and more with the farmers.”

Advancements in breeding techniques may help accelerate the integration of multiple traits, which could eventually contribute to quicker varietal turnover.

“Previously, we did not conduct this type of varietal evaluations at the consumer level. A breeder would, for instance, just breed on-station and conduct national performance trials at specific sites. The relevant authorities would then grant their approval and a variety would be released. Things are different now, as you have to go back to the farmer as an essential part of incorporating end-user feedback in a variety’s breeding process,” explained Hugo de Groote, Agricultural Economist at CIMMYT.

[Read the original article here.](#)

Maize project supports partners in COVID-19 response

May and June are the most critical months for planting maize and other cereals in this region. The COVID-19 lockdown is forcing many African governments to develop guidelines that keep agricultural value chains alive while adhering to public health guidelines.

The Stress Tolerant Maize for Africa (STMA) project, which is jointly implemented by the International Maize and Wheat Improvement Center (CIMMYT) and IITA, has developed and deployed multiple stress tolerant and productive maize varieties to help farmers adapt to climate change. CIMMYT and IITA are working in collaboration with diverse national and private sector partners in eight countries in Eastern and Southern Africa and four countries in West Africa.



Stress tolerant maize varieties thrive in harsh conditions. Photo: Courtesy/IITA.

maize varieties will enable partners to reach farmers on time to plant and produce maize during the COVID-19 lockdown in different locations, addressing food shortages that affect poor people the most in both rural and urban areas in these countries.

According to IITA Maize Breeder, Abebe Menkir, the ability of smallholder farmers to increase food production is critical during this pandemic and beyond. He added that the production and availability of an additional 19 MT of breeder seed and 1441 MT of foundation seed of stress-resilient maize varieties with partners in the four STMA project participating countries would contribute to the further multiplication of foundation and certified seed for planting in 2021.

“Such strengthened adaptive capacity of our partners will contribute to building the resilience of farming communities even when the impact of COVID-19 lingers beyond 2020,” he concluded.

[Read the original article here.](#)

Seeing is believing

At demonstration farms, Kenyan farmers discover the stress-tolerant maize varieties they were looking for.

Nancy Wawira strolls through a small plot of maize at Kithimu, in Kenya’s Embu County. She is charmed by the attributes of a maize variety that can yield 2,700kg per acre or more. The variety can endure drought-like conditions, matures in less than 120 days and has potential for double-cobbing.

Wawira is visiting a demonstration farm to witness the performance of several high yielding, early to medium maturing, drought-tolerant maize varieties.

By coming to this demonstration farm, Wawira hoped to identify a newer maize variety she could plant on her quarter-acre of land to get higher yield. The plot she stood on was the exact replica of what she was looking for. “Occasions such as this field day are very important for me and I always endeavor to attend them, as there is always something new to see or



Woman roasting corn supplied by smallholder farmer
Photo: Courtesy/IITA.

In West Africa alone, the national partners and seed companies in Benin, Ghana, Mali, and Nigeria produced 49,293 metric tons (MT) of certified seed of stress-resilient maize varieties in 2019 under STMA with a continual supply of breeder seed from IITA. The available certified seed of resilient

learn,” she says.

On her farm, she has been planting one of the old but popular commercial varieties suitable for this mid-altitude ecology. She normally harvests 4 bags of maize, of 90kg each, every season. However, if there is not enough rain or if there are pests or diseases, which is often the case, she harvests just 2 bags or less. This is hardly enough to meet her family’s food requirements for the year.

Switching to the maize variety she was interested in, and applying recommended farming practices, she could harvest 6 bags per season or more.

“Today, I have learnt how to improve my farming,” says Wawira. “Even when I access the variety that is high yielding, drought-tolerant and can mature in about three and a half months, as I witnessed on one of the plots, I still need to pay attention to proper crop husbandry related to spacing, timing of the planting, seed, fertilizer and pesticide application besides weed control,” she says.

Made to order

Wawira was one of the more than 400 farmers from nearby Manyatta sub-county visiting the demonstration farm on February 7, 2020. They were able to see varieties and learn about their traits, invited by the [Seed Trade Association of Kenya](#) (STAK) with the support of the International Maize and Wheat Improvement Center (CIMMYT).



Farmers listening attentively to a seed company’s representative. Photo: CIMMYT/Joshua Masinde.

The demonstration is a continuation of the work started under the [Drought Tolerant Maize for Africa Seed Scaling](#) (DTMASS) project and later under the Stress Tolerant Maize for Africa (STMA) project.

Officials from Embu County, led by its minister in charge of agriculture Jamleck Muturi, were present during the farmers’ visit. Ten seed firms, some of which use CIMMYT’s germplasm for seed propagation and marketing, participated as well.

“Several of our member seed companies are showcasing the varieties developed through CIMMYT’s breeding pipeline,” said Duncan Ochieng’, the chief executive officer of STAK. “The maize varieties showcased on these demo farms were designed to be drought-tolerant, high yielding and range from early to medium maturing. These varieties are juxta-posed with other commercial varieties suitable for this region.”

During visits to demonstration farms, farmers give feedback on [their variety preferences](#). Seed companies can then align their breeding, germplasm-access requests, seed production or marketing plans with farmers’ expectations.

Vital traits

Farming stresses such as pests, diseases, heat and drought have made targeted breeding a critical necessity. Young farmers are increasingly choosing varieties

that can mature faster, typically in less than three months. They also favor varieties that offer higher yield than the popular commercial varieties, many of which have been on the market for at least a decade. Other sought-after traits are good performance in low or erratic rains, tolerance to maize lethal necrosis, reduced lodging, and efficiency in nitrogen use.

Jackline Wanja, 25, relies on her one-acre farm for survival. “On average, I harvest about 25 bags per acre. On the demo farm, I got to know of a variety than can yield at least 30 bags per acre. I also learnt that the variety is not only drought-resilient but can also mature in about three and a half months. This is the variety that I plan to plant my farm next season,” Wanja said.

For John Njiru, 52, a higher-yielding variety with a lot of foliage, which remains green even after the maize cob has dried, is what he came looking for. For this farmer with 12 acres of land, the green maize foliage is a significant source of income when sold to livestock keepers. Njiru feeds his own livestock with it, making substantial savings on animal feed expenditure. “If this variety is as high yielding as I have been made to understand and can offer me at least 30 bags per acre, I would be a happy farmer. My farming would be very profitable,” he says.

[Read the original article here.](#)



Nancy Wawira at one of the plots with some of the varieties she liked. Photo: CIMMYT/Joshua Masinde.



John Njiru in one of the plots with one of the varieties he liked most. Photo: CIMMYT/Joshua Masinde.

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