

technological intervention aimed at augmenting the existing efforts. It is targeted at one of the most critical production constraints impacting on maize productivity in Tanzania – drought. The partners will develop new African drought-tolerant maize varieties, incorporating the best technology available internationally. The long-term goal is to make drought tolerant maize available royalty-free to smallholder farmers in Sub-Saharan Africa – most of whom are women – so they can feed their families and increase their incomes.

Risk of crop failure from drought is one of the primary reasons why smallholder farmers in Africa do not adopt improved farming practices. A more reliable harvest could give farmers the confidence to adopt new technologies. With the expansion of maize production in the areas susceptible to drought, it is expected that farmers will get higher, stable, and reliable yields. The new varieties are expected to increase yields by 25 percent over current varieties. Strong and consistent policy support is critical to the success of WEMA project in Tanzania. Policy makers within the relevant government institutions and agencies should create an enabling environment and make science-based decisions that will facilitate the approval and commencement of confined field trials and other biosafety regulatory steps that will eventually lead to commercialisation of WEMA maize varieties. The WEMA intervention is only part of what is needed to help smallholder farmers boost their yields and incomes. Farmers also require good soil health, training and extension services, effective pest and disease management practices, and access to markets to sell their surplus.

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AFRICAN AGRICULTURAL TECHNOLOGY FOUNDATION
FONDATION AFRICAINE POUR LES TECHNOLOGIES AGRICOLES

P.O. Box 30709–00100, Nairobi, Kenya
Tel: 254-(0)20-422 3700, Fax: 254-(0)20-422 3701
Email: aatf@aatf-africa.org
www.aatf-africa.org

Policy Brief

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Mitigating the impact of drought in Tanzania: the WEMA intervention

About AATF

The African Agricultural Technology Foundation (AATF) is a not-for-profit organisation that facilitates and promotes public-private partnerships for the access and delivery of appropriate proprietary agricultural technologies for use by resource-poor smallholder farmers in Sub-Saharan Africa (www.aatf-africa.org).

About WEMA

The Water Efficient Maize for Africa (WEMA) project is a public-private partnership coordinated by AATF to develop drought-tolerant African maize using conventional breeding, marker-assisted breeding, and biotechnology and make it available royalty free to small holder farmers in Sub-Saharan Africa.

Introduction

Maize is a staple food for more than 300 million people in Sub-Saharan Africa where it is grown predominantly by smallholder farmers under rain-fed conditions. The arable land under irrigation is approximately 5 percent. In recent years, rainfall patterns have become erratic and unpredictable as climate change takes its toll on agriculture. This makes Sub-Saharan Africa the most vulnerable region to drought-related production constraints. On the other hand, high population growth rate demands for an increase in maize productivity in marginal and drought-prone areas. The need for drought tolerant maize cannot be gainsaid under the prevailing conditions.

Tanzania is one of the five countries participating in the Water Efficient Maize for Africa (WEMA) project. Others include Kenya, Uganda, Mozambique and South Africa. This policy brief highlights challenges facing the maize sub-sector in Tanzania. WEMA is strategically designed to mitigate production constraints associated with drought. It is a public-private partnership project formed in 2008 and coordinated by the African Agricultural Technology Foundation (AATF). The partnership is funded by the Bill and Melinda Gates and Howard G. Buffett Foundations. The goal of the project is development and deployment of royalty-free drought-tolerant maize varieties using a combination of conventional breeding, marker-assisted breeding and biotechnology techniques and applications.

The importance of maize in Tanzania

Tanzania's economy is heavily dependent on agriculture, which accounts for about one third of the Gross Domestic Product (GDP), provides 85 percent of exports, and employs about 80 percent of the population. Maize is the major and most preferred staple food and cash crop in Tanzania (RATES, 2003). The popularity of maize is evidenced by the fact that it is grown in all the agro-ecological zones in the country. Over two million hectares of maize are planted per year with average yields of between 1.2–1.6 tonnes per hectare. Maize accounts for 31 percent of the total food production and constitutes more than 75 percent of the cereal consumption in the country. About 85 percent of Tanzania's population depends on it as an income-generating commodity (Sassi 2004; Amani 2004: 5; and Isinika, Ashimogo and

Mlangwa, 2003). It is estimated that the annual per capita consumption of maize in Tanzania is over 115Kg; national consumption is projected to be three to four million tonnes per year.

The Government of Tanzania has demonstrated commitment to enhance maize productivity for several decades. Research has been going on under the National Maize Research Programme (NMRP) which started in 1974 to coordinate key aspects of maize research including varietal development and maize management research (Katinila, 1998). The government also takes cognisance of the fundamental contribution that maize can make in meeting the goals and expectations of Vision 2025, the current economic and social development blue print for Tanzania. The Vision portends the intention of the government to transform the agricultural sector from a rural based economy to commercial oriented sector in order to boost agricultural productivity, enhance food security and self-sufficiency. Tanzania also recently launched a new agriculture policy – *Kilimo Kwanza* (agriculture first). It is the country's initiative aimed at transforming Tanzania's agricultural productivity by ensuring access to inputs. The initiative makes provision for the enactment of the National Cereals and Produce Bill. The Bill stipulates policy reforms aimed at improving agriculture and helping cereal producers remain competitive in the global market. Maize is one of the country's priority cereal crops.

Challenges facing maize production

Production of maize in Tanzania is dominated by smallholder farmers. Despite the importance of maize as the main staple crop, average yields in farmers' fields are relatively low averaging 1.2 metric tonnes per hectare compared to the estimated potential yields of 4–5 metric tonnes per hectare. While farmers are keen on increasing maize productivity, their efforts are hampered by a wide range of constraints. They include:

- Inadequate use of inputs such as fertiliser, improved maize seed and crop protection chemicals. The inputs are either not available or too expensive for the farmers to afford.
- Inadequate access to information and extension services. Many farmers continue to grow

unsuitable varieties because they have no access to information about improved maize technologies due to the low levels of interaction with extension officers and other agents.

- Drought is a major threat to maize production in many parts of Tanzania. Maize production can be a risky and unreliable business because of erratic rainfall and the high susceptibility of maize to drought. The performance of local drought-tolerant cultivars is poor. Maize losses can go as high as 50 percent due to drought related stress.

Erratic rainfall is making maize farmers in Tanzania vulnerable to low yields which translate to food insecurity. Tanzania has suffered the effects of a prolonged drought in the recent years. For instance, in 2006 drought severely compromised the food security of a large part of the country's rural population. An assessment conducted by the Food Security Information Team (FSIT) and coordinated by the Office of the Prime Minister and the Ministry of Agriculture, Food Security and Cooperatives, identified some 3.7 million people (nearly 11 percent of the mainland population) as food insecure. The assessment revealed that nearly 85 percent of all districts in the country were affected. Over 565,000 people were identified as requiring emergency food aid, since they lacked resources to purchase staple food, despite subsidised prices.

In 2008 the 'vuli' rains (short rains) which normally come from September to December in the northern region failed. This affected areas like Kagera, Mwanza, northern Kigoma, Shinyanga, Arusha, Tanga and part of the coastal areas which were faced with food shortages. Moreover, the 'masika' rains (long rains) in these areas came late, resulting in late planting. Household stocks diminished causing a state of food insecurity and lack of income. An increase in the prices of staple foods including maize exacerbates the situation. This often compels the government to take policy measures aimed at a meliorating the magnitude of the problem. Some of the government interventions related to this have been imposing export bans on maize and duty waivers on maize imports.

Modern biotechnology provides a major opportunity to address perpetual maize shortages that are now

being aggravated by new climate change threats. Harnessing biotechnology to develop maize seed varieties with traits of drought tolerance is therefore a key mitigation and adaptation strategy.

The WEMA intervention

Smallholder maize farmers in Tanzania face multiple challenges, which in the short to medium term can be mitigated by raising productivity. Increased productivity is crucial for alleviating poverty and enhancing the livelihoods of smallholder maize farmers who make up the majority of the rural poor in Tanzania (R&AWG, 2005).

The WEMA partnership was formed in response to a growing call by African farmers, leaders, and scientists to address the effects of drought in a way that is cost effective for African small holder farmers.

President Jakaya Kikwete Asks World to Help Fight Drought

Addressing the general debate at the 64th session of the United Nations General Assembly, Tanzanian President Jakaya Mrisho Kikwete said 'unprecedented drought' had been gripping Tanzania and neighbouring countries for more than five years, causing severe damage to agricultural production and acute food shortages. He urged the world community to help fight drought in eastern Africa.

'The effects of the drought are threatening to reach catastrophic proportions if the shortage of rain will persist for the next few years,' Kikwete said. 'It is important for the United Nations to be aware of this growing danger and look into ways of assisting us.'

'We should not wait until graphic pictures of emaciated and dying children dominate the TV screens and newspapers for us to act,' he warned.

AATF works with the internationally funded non-profit International Maize and Wheat Improvement Center (CIMMYT), the private agricultural company Monsanto, and the National Agricultural Research Systems (NARS) in eastern and southern Africa in this effort. Each partner brings its unique expertise to the project. AATF contributes its expertise in leadership, public-private partnership management, technology stewardship and project management. CIMMYT provides high-yielding maize varieties

that are adapted to African conditions and expertise in conventional breeding and testing for drought tolerance. Monsanto provides proprietary germplasm, advanced breeding tools and expertise, and drought-tolerance transgenes developed in collaboration with BASF. The national agricultural research systems, farmers' groups, and seed companies participating in the project contribute their local germplasm, land, expertise in field testing, seed multiplication and distribution.

The varieties developed through the project will be distributed to African seed companies through AATF as part of their seed business without royalty and made available to smallholder farmers.

The project involves public and private institutions and in the process of implementing the project their capacity and experience in maize breeding, biotechnology, and biosafety is expanded. The benefits and safety of the maize varieties that will be developed will be assessed by national biosafety authorities according to regulatory requirements in the partner countries.

The first conventional hybrids developed through marker-assisted breeding could be available after six or seven years of research and development. For the drought-tolerant varieties developed through transgenic means, it is projected that farmers could have access to the seeds between 2015 and 2017. Development of transgenic varieties will take slightly longer because of the technology development pathway and the biosafety regulatory requirements that have to be addressed prior to commercial release. The maize products to be developed could increase yields by 25 percent compared to current varieties. This increase would translate into about two million additional tonnes of food during drought years.

Conclusions

Maize is of fundamental importance in Tanzania both as a staple food and cash crop. It plays a central role in the economic and social circles of the Tanzanian economy. The importance attached to maize is also evidenced by consistent efforts by the government at various levels to enhance its productivity. The WEMA project therefore is a