

Productivity and Stress Management



QUICK FIGURES



25%

Agriculture's contribution to Africa's GDP. The sector also makes up more than half of all jobs on the continent.



80%

of farms in Sub-Saharan Africa are smallholdings.



US\$1 trillion

The expected size of Africa's agriculture sector by 2030.

PROGRAMME OVERVIEW

Agriculture remains the single greatest contributor to gross domestic product and employment across Africa. The sector makes up an estimated 25 percent of the continent's GDP, and more than half of its jobs. Around 80 percent of farms in Sub-Saharan Africa are smallholdings, employing around 175 million people, and women make up between 60-80 percent of the workforce. The potential for growth is enormous. The World Bank estimates that the sector could more than triple in size to US\$1 trillion by 2030.

Despite the significance of agriculture for African economies and societies, the sector has suffered from perennial under-performance in productivity. Farmers, particularly smallholders, have far less access to high-technology inputs than their peers in Asia or the Americas.

This represents an enormous opportunity, as even relatively small improvements in productivity represent a significant uplift to the lives of farmers. According to the World Bank, growth in the agriculture sector is two to three times more effective at reducing poverty than an equivalent amount of growth in any other sector.

However, African agriculture also faces new and emergent challenges, in particular climate change, which threatens the ability of the continent to achieve food security, eradicate poverty and achieve sustainable development. Less predictable weather patterns, the increased incidence

of droughts and floods, and the emergence of new pests, such as fall armyworm, are already creating problems for African farmers. This calls for the urgent adoption of advanced agricultural techniques, including conventional and biotechnological approaches for the genetic improvement of crops and inputs so that the gains that African countries have made in agricultural growth can be sustained and accelerated.

Our contribution

AATF believes that agricultural technology will play a central role in Africa's ongoing development. Agriculture can be a catalyst for the transformation of the economies of Sub-Saharan Africa, but it must be made resilient to current and emerging challenges. That means that farmers must have access to technologies that allow them to increase their output in a sustainable, resilient manner.

We work with farmers, scientists, policymakers and other stakeholders to create mechanisms through which technologies can be transferred to and utilised by smallholders. We identify appropriate technologies and products that have the potential to increase their productivity, address their current challenges and reduce their vulnerabilities. We then work across the value chain to ensure that these technologies are adapted into tangible products. We engage with governments to help to create an enabling policy environment, with companies that can bring these solutions to market in an affordable and economically sustainable way, and with public and private stakeholders in the development space who can ensure that farmers can gain and maintain access to these products.

Current projects and special initiatives

Drought tolerant and insect resistant maize

The impact of climate change on Africa's staple crops could be enormous. If nothing is done, the yield of rain-fed maize crops could decline by 25 percent by 2050. AATF's Water Efficient Maize for Africa (WEMA) project is developing transgenic maize hybrids that are well adapted to moderate drought conditions and are resistant to the stem borer insect.

The product has undergone a highly successful commercialisation, with 38 seed companies licensing WEMA for testing or sale. Nearly 4,000 tonnes of seed have been sold to farmers for cultivation in less than five years, meaning that an estimated 2.4 million people have benefited from WEMA products to date.

NEWEST Rice Project

Rice has become a priority crop of strategic importance for food security in most African countries where the consumption continues to rise at a rate of 6-12%, which is higher than the rate of increase of production (3.4%) leading to rice deficit of over 12 million metric tons (MT) per year. Insufficient rice production (mostly caused by low yield) affects the wellbeing of over 20 million smallholder farmers.

Biotic and abiotic constraints are the main factors responsible for the low productivity. Most of these stresses are associated with soil nutrient depletion and imbalances (salinity,

nutrient deficiencies and toxicities) and water availability (drought and excess water) under rainfed condition which is prevalent in Africa. Over 80% of agricultural lands in Africa are nitrogen (N) deficient, also more than 70% of the 8 M ha of land under rice cultivation is rainfed therefore highly prone to drought.

In addition, salinity in the rice production system of Africa is seriously aggravated using large amounts of irrigation water in lowland rice, poor farmer cultivation practices involving the use of brackish groundwater.

AATF is working with partners to mitigate the effect of these soil nutrient imbalances by developing rice varieties that are Nitrogen-use Efficient, Water-use Efficient and Salt Tolerant (NEWEST Rice). The NEWEST Rice outperformed appropriate control lines by an average of 25 percent under limited nitrogen applications, and an average of 40 percent more than controls under combined limited nitrogen and drought conditions in the field.

Pod Borer Resistant Cowpea

Cowpea is one of the most important legume food crops in Sub-Saharan Africa where it constitutes the major protein source for low-income people both in rural and urban centers.

Maruca vitrata, a podborer is considered as one of the most destructive insect

pests of cowpea causing up to 80% direct yield losses. The Pod borer resistant cowpea Project, coordinated by AATF, and implemented in Burkina Faso, Ghana and Nigeria, has developed cowpea lines that are highly resistant to **M. vitrata**, using modern gene technology.

The Bt-Cry 1Ab transgene gives a nearly 100% control of Maruca. In addition, AATF has a second gene (Bt-Cry2Ab) to boost durability and stability of resistance for farmer long-term benefits. PBR-Cowpea raised grain yields by 15-20 percent under moderate infestation of Maruca, and by more than 100 percent under severe infestation and normal farmer agronomic practices.

Hybrid rice: breeding by design

African rice crops have historically been uncompetitive with imports from the global market, as low productivity increases their production costs. Local farmers are often unable to meet domestic demand. In Kenya, for example, only 200,000 tonnes of rice is produced per year, against a demand of 450,000 tonnes.

AATF is working with partners who are developing new rice hybrids that can dramatically increase the yields of African rice crops, from 3 tonnes per hectare to up to 10 tonnes per hectare, thus improving the livelihoods of farmers and reducing Sub-Saharan Africa's dependence on imports.