AFRICAN AGRICULTURAL TECHNOLOGY FOUNDATION
FONDATION AFRICAINE POUR LES TECHNOLOGIES AGRICOLES

Addressing Farmers' Constraints Through **Scientific Interventions**

Annual Report 2008

Better tools, better harvests, better lives

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Scientific Interventions

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better tools, better harvests, better lives *mieux s'outiller pour récolter plus et vivre mieux*

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Annual Report 2008. Addressing Farmers' Constraints Through Scientific Interventions

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Message from the Board Chair

Prof Jennifer Ann Thomson
AATF Board Chair

AATF made excellent progress in 2008 towards its goal of improving the agricultural productivity of resource-poor smallholder farmers in Sub-Saharan Africa. We had to deal with some difficult challenges during the year that affected our operations but, thanks to the hard work, creativity and professionalism of our staff, that did not keep us from achieving our targets.

The year opened with the successful negotiation and signing of a tripartite collaborative agreement between AATF, CIMMYT and Monsanto, to develop drought-resistant maize for Africa. This agreement paved way for funding by the Bill and Melinda Gates Foundation and Howard Buffet Foundation. It also gave birth to the Water Efficient Maize for Africa (WEMA) project, a public/private partnership now being implemented in Kenya, Uganda, Tanzania, Mozambique and South Africa. This exciting initiative is addressing one of the most significant causes of food insecurity in Africa. Significantly too, WEMA is responding directly to one of the most urgent global environmental challenges of our times – the threat of climate change.

In mid-2008, we celebrated a landmark event with the first confined field trials of the *Maruca*-resistant cowpea. Cowpea is an important crop for Africa, especially west Africa, but where you find cowpea being grown you also usually find the voracious *Maruca* pod borer.

There is little natural resistance to this devastating insect pest, and the resulting losses to cowpea farmers and traders are huge. AATF and its partners are addressing this problem through the careful application of genetic transformation technologies. Results in the research labs of CSIRO (Australia) have confirmed the presence of resistance genes in a growing number of transformed cowpea lines, and in 2008 we were able to take the next important step in the development process – testing elite lines in confined field trials in Puerto Rico. The results provided encouraging evidence of built-in protection against the insect, under field conditions. Partners in the project are now looking forward to similar field trials in Africa, once the necessary regulatory approvals are obtained.

During the year, Tanzania officially released StrigAway® maize seed in a move towards controlling witchweed (*Striga* sp.), becoming the second country, after Kenya, to make the seed commercially available to farmers in Africa. AATF and project partners CIMMYT and BASF worked with a local seed company, Tanseed International, and the Ministry of Agriculture

to expedite the commercialisation process of the variety. As the availability of its seed increases, StrigAway will provide Tanzania's smallholder maize farmers with an effective tool in their fight against *Striga.*

Another exciting development was the launching of a project to develop rice with enhanced nitrogen use efficiency and salt tolerance. Rice cultivation is spreading rapidly in Sub-Saharan Africa, and the improved varieties expected from this project will enable farmers to get the most from the fertiliser they apply, and to expand production into areas with saline soils.

AATF was also instrumental in bringing about, together with the ABSF and other partners, the first all-Africa Biotechnology Congress, held in Nairobi in September 2008. The issue of biotechnology – and the conflicting and often misleading information that is conveyed to policy makers about it – is a matter of considerable concern. The well-informed voice of the scientific community needs to be heard in the on-going debate. This congress provided such an opportunity and brought together over 400 delegates from Africa and other continents to exchange information, present alternative points of view, and search for common ground.

The year also brought with it some challenges. Some of these were global, such as rapidly increasing food prices and the international financial crisis. AATF also encountered a challenge in its operations when its Executive Director, Dr Mpoko Bokanga, left at the end of the year. As the first Executive Director of the Foundation, Dr Bokanga dedicatedly contributed to building the organisation, especially putting in place inaugural organisational and operational structures in line with our mandate.

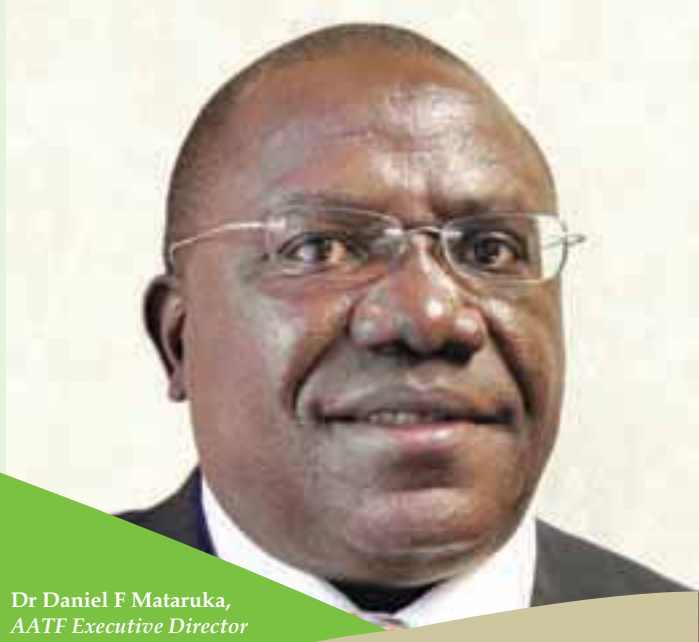
After an extensive search, we were fortunate to bring on board Dr Daniel Mataruka, from Zimbabwe, as the Foundation's new Executive Director. Dr Mataruka has had a distinguished career spanning over 25 years. He started off in 1983 as a maize agronomist working for the Zimbabwe Government's Research and Specialist Services. In 1992, he moved to the University of Natal, South Africa, where he assumed a position in the crop science department. Then in 1996 he moved to Tongaat Hulett Starch (THS), a leading large-scale agro-business company operating throughout southern Africa. His experience in both the public and private sector gives him a unique perspective on the potential contributions that AATF can make and what it will take for the Foundation to achieve its goals. Daniel took up his duties as our new Executive Director in March 2009. Thanks go to our staff, the Board and our partners for their unfailing support during the transition period.

A few changes also occurred in the Board of Trustees. I completed my term and Prof Walter Alhassan was elected in November as Chair for a three-year term. Dr Mike Trimble, one of our first Board members, completed his term. His incisive and well-informed contributions to Board discussions, especially relating to technical aspects of the Foundation's projects, added great value and will be missed. However, the Board was very pleased to welcome Prof Michio Oishi from the University of Tokyo, who began his three-year term in January 2008, bringing to the Board extensive knowledge and experience in biotechnology and genetics.

All in all, AATF had a very good year that saw an expansion of its activities and responsibilities in Sub-Saharan Africa, as well as solid progress towards our goal of providing smallholder farmers with access to proprietary technologies that can significantly improve their productivity. On behalf of my fellow Trustees, and as I complete my term on the Board, I would like to express my sincere gratitude to all AATF staff, our partners, and our many stakeholders – and especially our investors – for their continued confidence in and support for the Foundation.

Jennifer Ann Thomson
Board Chair

Message from the Executive Director



Dr Daniel F Mataruka,
AATF Executive Director

As I took up my responsibilities as AATF's new Executive Director, I was struck by the substantial accomplishments that the organisation has already achieved, and by the extraordinary quality of its staff. A firm foundation has been put in place upon which to build, and I am grateful to the Board and all AATF staff for giving me the opportunity to lead this innovative and highly relevant organisation.

I was not a part of the team in 2008, the period covered by this annual report, but I want to take this opportunity to share my thoughts on the African Agricultural Technology Foundation.

Agriculture is the mainstay of Africa's current economy and must serve as the springboard to future development and prosperity on the continent. But African agriculture faces many challenges. To name but a few:

- Seemingly insatiable insect pests inflict heavy crop losses each year;
- Invasive weeds choke production;
- Extensive erosion and poor soil fertility limit productivity; and
- Frequently occurring droughts and floods destroy crops and threaten food security.

Moreover, African farmers have yet to benefit from new agricultural technologies, such as higher yielding crop varieties that are tolerant to drought and have built-in genetic resistance to prevalent pests and diseases.

I believe that Africa's future rests in the hands of its millions of smallholder farmers. About 70% of all Africans rely on agriculture for their livelihoods, and about 80% of them are smallholders, toiling daily against all odds to provide for themselves and their families.

I believe that improving the productivity of the continent's resource-poor smallholder farmers is the key to unlocking Africa's vast potential for sustainable economic development. To do that we must put modern agricultural technologies into the hands of these smallholder farmers. Further, there are a number of other steps that must be taken along the whole agricultural value chain. These include improving rural infrastructure, making markets more efficient, providing credit to farmers along with small- and medium-scale agro-enterprises, stabilising commodity prices, putting in place policies that favour agricultural development rather than deter it, and so on. The list is a long one, and many of the actions needed fall outside the mandate of AATF.

Our vision of '*prosperous farmers and a food-secure Sub-Saharan Africa*' is clear. So, too, is our mission '*to increase the productivity of Sub-Saharan Africa's resource-poor farmers by facilitating the transfer, delivery and uptake of appropriate proprietary agricultural technologies.*' This uniquely places

AATF to help increase rural incomes and food security. In its first five years, the Foundation has made some strides towards its mission. It is time for us to capitalise on our momentum and the renewed national and international commitment to African agriculture.

I fully subscribe to the AATF vision and mission, and will endeavour to actualise them through four goals I am setting for the organisation. These will be our key priorities going forward:

- To have AATF's footprint on as much of Sub-Saharan Africa as possible. To achieve this, we must spread our projects and activities beyond their current concentration in East Africa along with parts of southern and west Africa;
- To broaden the range of technologies accessed by AATF to include novel breeding techniques, agro-processing (value addition);
- To expand our donor portfolio; and
- To provide exemplary relationship management in dealing with key stakeholders.

Clarity of mind on priorities, however, does not imply an absence of challenges. One of the main hurdles we face is related to the level of understanding and acceptance – both within Africa and elsewhere – of advanced agricultural technologies, such as the genetic modification of certain crops. We can take comfort in knowing that our decisions regarding which technologies to access and promote will be informed by the needs of farmers, the availability of the best options for addressing specific constraints, along with the experience and practical advice from the African scientific community. We will also continue to draw strength from our chosen partners, working as an 'honest broker' with various organisations from around the world.

As AATF's new Executive Director, I pledge operational transparency to all our stakeholders as we grapple together with some of the most intractable constraints to increasing African agricultural productivity. I urge all those who share our vision of a better Africa to join us in our quest on behalf of the continent's smallholder farmers.

Daniel F Mataruka
Executive Director

Our vision of '*prosperous farmers and a food-secure Sub-Saharan Africa*' is clear. So, too, is our mission '*to increase the productivity of Sub-Saharan Africa's resource-poor farmers by facilitating the transfer, delivery and uptake of appropriate proprietary agricultural technologies.*'

Who We Are

The African Agricultural Technology Foundation is a not-for-profit organisation that facilitates public-private partnerships to access and deliver appropriate proprietary agricultural technologies for use by resource-poor smallholder farmers in Sub-Saharan Africa.

AATF provides expertise in identifying, accessing, developing, delivering and using patented agricultural technologies. The Foundation also contributes to capacity building in Africa by engaging institutions on the continent in the diverse partnerships through which it executes its mandate.

AATF is a registered charity under the laws of England and Wales and has been given tax-exempt status in the USA. It is incorporated in Kenya and in the UK and has been granted host country status by the Government of Kenya where it is headquartered.

Vision - what we want for Africa's farmers

Prosperous farmers and a food-secure Africa through innovative agriculture.

Mission - what we do for Africa's farmers

To access and deliver affordable agricultural technologies for sustainable use by smallholders, in particular resource-poor farmers in Sub-Saharan Africa, through innovative partnerships and effective stewardship of technologies and products along the entire food value chain.

Core Values - what keeps us strong

We strive to uphold three enduring core values: Integrity, Dedication and Accessibility. These values guide our decisions, actions and relationships as we work towards fulfilling our mission.

Our Strategy

Facilitating public-private partnerships, technology stewardship and information and knowledge management are key aspects of our strategy. We anchor our activities within three strategic thrusts:

- Negotiating access to proprietary technologies that enhance the productivity of agriculture in Africa;
- Managing partnerships for project formulation, product development and deployment to introduce innovative agricultural technologies to African farming systems; and
- Managing knowledge and information to support technology identification and development, as well as helping create policy environments that are more conducive to smallholder agricultural development.

Our Roots

The model for the African Agricultural Technology Foundation resulted from two years of consultations by the Rockefeller Foundation and the Meridian Institute with several African, North American and European stakeholders.

The sessions, referred to as the 'Biotechnology Dialogues', were held to determine ways to close the growing gap between the agricultural science controlled by developed countries and the needs of the poor in the developing regions of Sub-Saharan Africa. The involvement of stakeholders in these deliberations was ensured through a Design Advisory Committee (DAC), comprising representatives from African national agricultural research services, the Consultative Group on International Agricultural Research (CGIAR) centres, African seed and biotech companies, the Organisation for Economic Co-operation and Development, crop science corporations, and donor organisations. The DAC served as the architect of AATF, defining the major underlying principles and an operational model for the Foundation in addressing food security and poverty reduction challenges. The Committee also elucidated the core rationale for AATF and its fundamental principles, mission and business model.

Governance

AATF is a flexible organisation designed to respond to the changing needs of its stakeholders. The Board of Trustees charts the course by deciding which interventions hold the greatest promise for reducing poverty and increasing food security.

This creates a healthy separation between the setting of priorities and monitoring of progress on the one hand, and day-to-day management and operations on the other. AATF's Board members are distinguished individuals from around the world, while the Foundation's staff are all nationals of countries in Sub-Saharan Africa.

Investors

- *The Rockefeller Foundation:* A knowledge-based, global foundation with a commitment to enrich and sustain the lives and livelihoods of poor and excluded people throughout the world;
- *The United States Agency for International Development (USAID):* The agency responsible for providing and managing US economic and humanitarian assistance worldwide;
- *The United Kingdom's Department for International Development (DFID):* The UK Government department responsible for promoting economic development and the reduction of poverty globally;
- *The Bill and Melinda Gates Foundation:* Guided by the belief that every life has equal value, the Bill and Melinda Gates Foundation works to help all people lead healthy, productive lives. In developing countries, it focuses on improving people's health and giving them the chance to lift themselves out of hunger and extreme poverty. In the United States, it seeks to ensure that all people – especially those with the fewest resources – have access to the opportunities they need to succeed in school and life;
- *Howard Buffet Foundation:* A private foundation that primarily supports agricultural development and clean water delivery in rural areas, focused in Africa and Central America; and
- *The Africa Harvest Biotech Foundation:* A not for-profit organisation designed to use science and technology, especially biotechnology, to help the poor in Africa achieve food security, economic well-being and sustainable rural development.

Partners

- Agricultural producers and consumers;
- National and regional institutions and agencies (NARs, SROs, RECs, ECA, FARA, AU/NEPAD);
- International institutions/agencies (CGIAR, ARIs);
- Local/international NGOs;
- Agricultural technology industry IP holders (Monsanto, Arcadia Biosciences, BASF, DowAgro, Pioneer/DuPont, Syngenta);
- African trade and agribusiness organisations;
- African governments

AATF Milestones – 2008

January

AATF, CIMMYT and Monsanto Company signed a tripartite collaborative agreement to develop drought-tolerant maize for Africa, paving the way for the funding of the project.

The Bill and Melinda Gates Foundation and the Howard G Buffett Foundation provided USD 47 Million in project funding, spread over five years, for the development of drought-tolerant maize for Africa.

February

Arcadia Biosciences and AATF entered into a licensing agreement for the use of Arcadia's technologies to develop nitrogen use-efficient and salt-tolerant rice varieties, which will be made available to smallholder farmers in Africa on a royalty-free basis.

March

The Water Efficient Maize for Africa (WEMA) project, a public-private partnership to develop drought-tolerant maize varieties for Africa, was launched in Kampala, Uganda, at the end of a two-day planning meeting attended by 25 stakeholders, including representatives from countries participating in the project – Kenya, Uganda, Tanzania and South Africa.

April

A review and planning meeting for the Banana Bacterial Wilt project was held in Kampala, Uganda. The participants reviewed progress of the collaborative work of NARO, IITA and AATF towards development of bacterial wilt-resistant

Jacob Mignouna, AATF's Technical Operations Manager, signs the WEMA agreement under the watchful eye of other AATF staff.

AATF's George Njogu hands over groceries to a boy at Meta Meta Children's Home. In the spirit of sharing Christmas, AATF staff contributed money and bought supplies for the children's home.

banana germplasm and developed a road map to guide project work.

A meeting was held in Ouagadougou, Burkina Faso, to define the overall communications strategy for the *Maruca*-resistant cowpea transformation project and outline activities to be carried out in each country participating in the project.

May

A workshop to harmonise WEMA plans was held for all the project partners in Bagamoyo, Tanzania. The partners reviewed and realigned their work plans with the project proposal, budgets and timelines.

June

A review and planning meeting for the *Maruca*-resistant cowpea project was held in Abuja, Nigeria, and attended by 54 participants. The forum discussed the way forward for the successful development and testing of *Maruca*-resistant cowpea varieties, as well as their delivery to farmers in Africa. Discussions focused on activities related to the development and selection of elite lines, trait introgression, testing, regulatory compliance, public awareness and acceptance, and product deployment in target countries.

July

The WEMA project teams assembled in Nairobi for a team-building workshop during which they reached a consensus on modalities for implementing activities to achieve agreed project milestones.

September

The Public Intellectual Property Resource for Agriculture (PIPRA) and AATF signed an agreement on the development of a transposon-based transformation system for the Nitrogen Use-Efficient and Salt-Tolerant (NUEST) Rice for Africa Project.

Representatives of the Open Forum on Agricultural Biotechnology in Africa (OFAB) took part in the First All Africa Biotechnology Congress, held in Nairobi, Kenya. The meeting was attended by over 400 scientists, policy makers, media experts, farmers, researchers, development partners, regulators and entrepreneurs from all over the world, and discussions centred on the future of biotechnology in Africa.

December

Imazapyr-Resistant (IR) maize, also known as StrigAway® maize, was commercialised in Tanzania by Tanseed International Ltd under the trade name *Komesha Kiduha*.

A kick-off meeting for the NUEST Rice for Africa Project was held in Davis, California, USA. The meeting reviewed progress made within the project since 2005, outlined its plan of action for 2009 and beyond, and clarified various institutional roles.

Participants at the WEMA team building meeting held 30 June-2 July 2008 in Nairobi, Kenya

Jacob Mignouna, AATF's Technical Operations Manager, explains the Striga *control project to the Togolese Parliament Speaker during the Heads of State Summit in Addis Ababa held in March 2008.*

Mr Isaka Mashauri, the Chief Executive Officer of Tanseed International Ltd, Tanzania, explains to farmers the effectiveness of IR maize technology in controlling the Striga *weed at a demonstration plot in Morogoro, Tanzania.*

On the Offensive: Expanding *Striga* Weed Control Efforts on Maize in Africa

2.5 million

Striga infests about 2.5 million hectares under maize in the continent, causing economic losses in excess of US $1 billion annually.

Striga, a parasitic weed of maize and other cereals, remains a severe problem limiting the productivity of vast areas of African farmland and the livelihoods of millions of resource-poor maize producers. Years of research and on-farm testing have resulted in the availability of a potent weapon against this aggressive parasitic weed.

Commonly referred to as witchweed, *Striga* is an extremely destructive parasitic weed that dramatically reduces the yield of maize and other cereal crops in Africa and Asia. Indeed, it is not uncommon for farmers to lose entire crops, or to abandon their fields altogether, due to severe *Striga* infestation. In fact, this resilient and deceptively beautiful plant is a leading cause of food insecurity and rural stagnation in Africa. *Striga* infests about 2.5 million hectares under maize in the continent, causing economic losses in excess of US $1 billion annually. For this reason, one of the first projects that AATF formulated after its founding was on reducing the threat of *Striga* to maize production in Sub-Saharan Africa (SSA).

For decades, Africa's smallholder farmers have watched helplessly as *Striga* spreads from field to field. When maize seedlings emerge, their roots exude stimulants that induce *Striga* seeds within their proximity to germinate. The roots of the germinated *Striga* then attach themselves to the maize roots and parasitise the maize plant.

Fortunately, new technologies that control *Striga* are now available and, if widely adopted, can address the problem of food security. Over the past two decades, collaborative research by the International Maize and Wheat Improvement Centre (CIMMYT), the German chemical firm BASF, and Israel's Weizmann Institute of Science has resulted in high-yielding maize varieties and hybrids that are resistant to Imazapyr herbicide, which is effective in killing *Striga*. The resistant maize seeds are coated with the herbicide before planting and, as the maize seedlings emerge, *Striga* attaching itself to the maize roots imbibes the herbicide and is killed. This technology has been commercialized under the trade name StrigAway®. Within a few years of using StrigAway, the *Striga* seed bank in the soil drops significantly, greatly reducing the threat posed by the weed to maize farming and farmers' livelihoods.

From testing to deployment

The *Striga* Control Project involves extensive field-testing and demonstration of StrigAway® in farmers' fields. The project has conclusively demonstrated the effectiveness of this technology, with increases of maize yields up to four times the average yield obtained on *Striga*-infested plots. As with any new technologies and approaches, proving effectiveness is one thing; encouraging widespread adoption and proper use by risk-averse farmers is another.

The *Striga* Control Project therefore lays great emphasis in raising awareness of StrigAway among farmers and encouraging the uptake of the technology and its sustainable use. The project supports product demonstrations, information dissemination, commercialisation and product stewardship. These initiatives are aimed at ensuring consistent availability of high quality IR maize seed and its use by farmers, for effective *Striga* weed control and optimal maize productivity. To varying degrees, these deployment activities are ongoing in Kenya, Uganda and Tanzania.

A STEP forward in Kenya

With support from AATF, a one-year effort was initiated in 2008, in western Kenya, to disseminate *Striga* control technologies. Known as the *Striga* Technology Extension Project (STEP), the project was implemented by the 18-member Western Regional Alliance for Technology Evaluation (WeRATE) and led by the Forum for Organic Resource Management and Agricultural Technologies (FORMAT).

During 2008, the main goal of STEP was to deploy IR maize and other innovative *Striga*-control technologies as a package. The partners sought to identify the *Striga* management technologies that are most appropriate in different agro-ecological and socio-economic settings. They also gave high priority to creating awareness among farmers on the fact that the *Striga* menace is a correctable field condition. The STEP project further sought to devise a broader strategy for expanding and replicating flexible, cost-effective *Striga* reduction initiatives across Sub-Saharan Africa.

A Striga *infested maize field.*

Unfortunately, 2008 was a challenging year in Kenya. At the beginning of the year, the country was engulfed in turmoil resulting from a disputed presidential election. The ensuing widespread insecurity led to higher costs for inputs and transportation, as well as delays in deploying *Striga* technology packages. However, that notwithstanding, nearly all the 25,000 targeted households received the new materials in time for planting. But drought, especially in the Lake Victoria Basin, precipitated widespread crop failures that left farmers unable to pay for the inputs extended to them on credit through the project.

Tanzanian farmers listen to Mr Deogratias Kinawiro (inset), the District Commissioner for Mkinga District, Tanzania during an IR field workshop organised by Tanseed International Ltd and AATF.

Deploying *Komesha Kiduha* in Tanzania

In Tanzania, StrigAway® is known by its Kiswahili name, *Komesha Kiduha*, which means "eradicate *Striga*." Tanseed International Ltd, a private seed company that is leading the *Striga* work in the country, established some 3,000 demonstration plots in the first half of 2008 throughout the zones where the weed is endemic.

The preliminary work through product demonstrations, testing and awareness workshops facilitated the commercial release of the first StrigAway IR maize variety (Tan 222) by the Tanzania Official Seed Certification Institute (TOSCI) in December 2008. In anticipation of its release, Tanseed had produced two tonnes of parent (foundation) seed earlier in the year to meet the projected production of 100 tonnes of certified seed during the following cropping season. Part of the seed is targeted for an expanded product stewardship program, to enhance awareness and uptake; while the rest will be sold to farmers through agro-dealers.

Other awareness activities undertaken to inform farmers about the effectiveness of the *Komesha Kiduha* technology included field days, training workshops and mass media. This work has been instrumental in enabling strong support of IR maize activities by policy makers such as Directors of Research and Crop Production and Regional Commissioners from the Tanzanian Government.

A number of other StrigAway maize open pollinated varieties and hybrids were planted and evaluated in multiple locations across Tanzania to generate data on yield potential and other agronomic traits in preparation for national performance trials. Not surprisingly, the hybrids produced much higher yields compared to the open-pollinated varieties (7-9 tonnes/ha compared to 1.3-4.6 tonnes/ha). In addition, on-farm evaluations revealed a distinct preference among farmers for the hybrids, based not only on their higher yield potential, but also on the appealing white colour of grain and the taste of flour when cooked.

Taming the *Striga* weed in Uganda

In eastern Uganda, 1,000 on-farm trials were established in 2008 in the severely *Striga*-infested districts of Busia, Budaka, Tororo and Namutumba. This work was carried out in partnership with Africa 2000 Network, the lead partner in the deployment initiative, the National Agricultural Research Organisation (NARO), the National Agricultural Advisory Services (NAADS), the Ministry of Agriculture, BASF and CIMMYT. NARO is also testing six promising IR maize hybrids with potential for commercial release in Uganda.

Farmer Kennedy Okumu (centre) when he visited AATF to share the exciting news about his healthy maize crop.

Kennedy Okumu, farmer

Maize is a very important crop for us. It is our main food and almost all of our meals, whether at breakfast, lunch or dinner, include maize. Even during 'big' events, like weddings, chiefs' *barazas* and funerals, we eat maize. We prepare it in different ways, such as *nyuka* (porridge), *nyoyo* (maize and beans boiled together), *kuon* (heavy porridge) and *band abula* (roasted maize). So, every farmer in my area plants maize, primarily for their own use and if there is a surplus, they sell it in the market.

However, my grandmother warned me not to plant maize. She told me that my land had been cursed by our ancestors and as a result, a maize crop would not thrive on it. She advised me to build a house instead of wasting my money trying to cultivate maize. I did not heed her words, and I still attempt to plant maize, but to tell you the truth, my efforts have been largely futile. I've suffered on this land. Season after season, my harvest is poor. This is due to *Kayongo (Striga)*, which just won't let the maize grow. Sometimes I harvest just about six *gorogoros* (a two–kilogramme tin used to measure maize in markets) from my three quarter acre plot, which is not enough for my family. It doesn't matter how many times I weed the farm, *kayongo* always wins.

I was therefore very happy to hear of a maize seed that doesn't get killed by the *kayongo*. I

asked for it just to try. What I've seen is nothing short of a miracle – never mind that I am a herbalist! My maize is very healthy now and my wife is happy to weed the farm, encouraged by the good crop. My neighbours too can see the change. Even our area chief came to see my maize and he too wants to try this miracle maize! And my grandmother is keenly watching to see if the seed will break the curse on our land. Personally, I'm very happy and would like other farmers to get the seed too, so that together we can stock our granaries with this grain, which is so important in our lives.

Initiating *Striga* control work in Malawi

AATF is collaborating with CIMMYT-Zimbabwe to facilitate deployment activities with a local seed company ZUM Seeds Ltd. Initially, this seed company produced 300 kg of OPV StrigAway maize from an initial four kilogrammes of foundation seed. It has also acquired an additional 70 kg of IR maize OPV seed from CIMMYT. Plans have also been made for a stakeholder planning and review meeting in 2009, at which a deployment strategy for Malawi will be developed more fully.

Intensifying the offensive on *Striga* weeds

AATF will sustain efforts to expand *Striga* control initiatives in target countries of SSA. Towards this end, consultations are ongoing with private and public partners in Zimbabwe, Mozambique, South Africa, Nigeria and Ghana to develop StrigAway maize deployment strategies and plans.

The main challenge facing AATF and its partners in the campaign against *Striga* is how to intensify the certified IR maize seed production and its access by farmers in countries where the technology has been proven and commercialised. However, no amount of planning will be effective without adequate resources for implementation.

Thus, AATF is making special efforts to identify and obtain project funds to enable sufficient certified seed production and product stewardship for the benefit of farmers. This will contribute to making the promise of StrigAway maize a reality, and in so doing transform the lives of millions of African smallholder maize farmers.

For more information, contact Gospel Omanya (g.omanya@aatf-africa.org)

Controlled Field-Testing of *Maruca*-Resistant Cowpea for Africa

70-80%

Cowpea farmers continue to suffer crop losses of between 70-80%, due to various biotic and abiotic constraints.

The first ever field trial of Maruca*-resistant cowpea was conducted in Puerto Rico in 2008. This marked a watershed in the quest towards providing smallholder farmers with high-yielding cowpea that can resist the voracious* Maruca *pod borer.*

Cowpea is considered the most important food grain legume in the dry savannas of tropical Africa. It is consumed by nearly 200 million people in Africa, where it is grown on more than 12.8 million hectares of land. The legume is rich in quality protein and serves as an alternative source of protein for people who cannot afford meat and fish. In addition, cowpea has an energy content almost equivalent to that of cereals. It is also a good source of quality fodder for livestock and provides income for millions of people. Morevover, the crop also enhances soil fertility due to its ability to fix nitrogen, in addition to providing good control for soil erosion.

However, cowpea farmers continue to suffer crop losses of between 70-80% due to various biotic and abiotic constraints. Most of the damage to cowpea is caused by the *Maruca* pest, a voracious pod borer that intensely attacks and ruins the crop during the flowering and pod-forming stages. Due to this loss, the average cowpea yields in Africa are quite low, at 0.05 to 0.55 tonnes per hectare, way short of the potential 2.0-2.5 tonnes per hectare, according to studies by the International Institute of Tropical Agriculture (IITA) and the Bean/Cowpea USAID Collaborative Research Support Program (Purdue University).

There are two possible solutions towards controlling the damage caused by the *Maruca* pod borer on cowpea. First is the application of insecticides on the crop. However, the appropriate chemicals are usually expensive and inaccessible to most smallholder farmers. This compels them to use unapproved and hazardous alternatives, which damage their own health and that of the environment. In some cases, farmers simply tolerate the insect damage because they do not have any effective way to control *Maruca*. The second probable strategy to the *Maruca* problem is host plant resistance, where cowpea varieties will have in-built capability to protect themselves against attack by the pest. Once developed, this approach will make it easier and cheaper for farmers to produce cowpeas in areas where this pest is a problem.

This AATF-coordinated project involves inserting into cowpea the gene encoding an insecticidal protein from a widespread and naturally occurring soil bacterium called *Bacillus thuringiensis* or *Bt*. There are more than 500 different strains of *Bt*, each of which is toxic to a specific range of insect species but have been shown to be harmless to humans and animals, for instance birds, fish and beneficial insects. The primary component of *Bt* that is toxic to insects is a crystalline protein (toxin). Therefore,

the project is focusing on the *Bt* proteins known to be toxic to legume pod borers, particularly the nemesis of African cowpea farmers, *Maruca vitrata*.

The ultimate aim is to significantly increase cowpea yields for millions of smallholder farmers across Africa without them having to resort to the use of environmentally dangerous pesticides, expensive inputs which are in any event usually beyond their reach.

Transgenic cowpea tested in the field

One of the major achievements in the long and vigilant process towards developing *Maruca*-resistant cowpea has been the controlled field testing (CFT) of the best experimental cowpea transgenic lines to determine how well they stand up against heavy insect infestation. Puerto Rico was selected as the location for this crucial step not only because of the high prevalence of *Maruca* pest, but also due to the country's well-developed biosafety regulations and protocols. In addition, Puerto Rico shares similar agro-climatic conditions with major cowpea-producing areas in Africa. There is also an established collaborative relationship between the University of Puerto Rico at Mayaguez and project partners. Permission for the research was obtained from the USDA-APHIS Biotechnology Regulatory Service (BRS), the Puerto Rico Department of Agriculture, and the University of Puerto Rico Institutional Biosafety Committee.

The CFT in Puerto Rico included the top 14 transgenic lines developed to date by Dr TJ Higgins and his team at the Commonwealth Scientific and Industrial Research Organisation (CSIRO) Plant Industry laboratory in Australia. In general, this initial CFT indicated that the lines are growing and performing well under field conditions. The trials also showed that the *Bt* protein is affording resistance to *Maruca* pod borers compared to the controls. The results observed in this trial are typical of early event selections for GM crop products.

The project partners view the CFT as a good learning experience with respect to how such trials should be managed and the future selection of transgenic lines to be tested. Information from this first trial is helping researchers identify additional promising transgenic lines from among those being produced at CSIRO. Indeed some of the lines in the CFT conducted in Puerto Rico will be included for additional testing in similar sessions planned for 2009 in that country and possibly in Nigeria. The final event chosen for release will be substantially equivalent to isogenic lines in terms of composition and agronomic qualities.

Dr Mohammad Ishiyaku inspects the performance of cowpea in a greenhouse.

Dr Mohammad Ishiyaku

I began working on cowpea (known as 'beans' or black-eyed peas in Nigeria) in 1989. I got interested in the crop because of its significantly nutritious grain, which contains a high level of protein. It is indeed for this reason that cowpea is known in Nigeria as *'naman talaka,'* a Hausan phrase for 'meat of the poor'. In general, cowpea plays a central role in the lives of my people. It is eaten in different forms at every meal, or as snacks such as *Kosai, moimoi*, *Tubani Kato-da-lage* and *danwake*. We also trade in the crop and feed its fodder to our livestock. Cowpea is known to enhance soil fertility and for controlling soil erosion. It also provides employment and is used as medicine in some instances.

I wanted to join the army combating malnutrition and hunger prevalent among Africans by helping to increase the availability of this incredibly hardy crop through the development of more productive varieties. The production of cowpea is severely constrained, especially by insect pests – particularly the *Maruca* pod borer. Season after season, I witnessed disappointment in farmers' faces when their cowpea harvests fell way below expectation.

The turning point for me in the fight against that insect came in 2001 when the Network for the Genetic Improvement of Cowpea for Africa

(NGICA) was established. Finally, I thought, the predicament facing cowpea farmers was being taken seriously and effective solutions were being sought. And I was right. NGICA, an international voluntary body of individuals committed to the genetic improvement of cowpea, brings together scientists and other specialists from all over the world to share their knowledge and experiences. It is through NGICA that a possible solution for combating *Maruca* was suggested – the genetic transformation of cowpea to build resistance to the insect. When NGICA approached AATF to assist with accessing the rights to the *Bt* gene *(cry1Ab)* to be used in developing *Maruca*-resistant cowpea from Monsanto Company, I started to see hope for our farmers. Today, I see that hope coming closer to reality and I look forward to the day when I will actually be able to share the *Maruca*-resistant cowpea seed with farmers.

In any job, it is important to have the right tools for it in front of you. For me, getting access to the resistance gene and working with a strong, dedicated and well-coordinated partnership has provided me with the tools I need to help my people. This partnership provides me – and other scientists in Africa and abroad – with the opportunity to make a difference to our people's livelihoods.

The other important part of my work is the farmers: I consider them my key partners and I am in frequent contact with them; listening to them, discussing ways of doing things differently, or just chatting about farming and life in general. My close and easy relationship with them is one of my main tools of trade. After all, my own life has been lived among and shaped by these people, on whose labour and sweat the continent largely depends.

Towards regulatory compliance in target countries

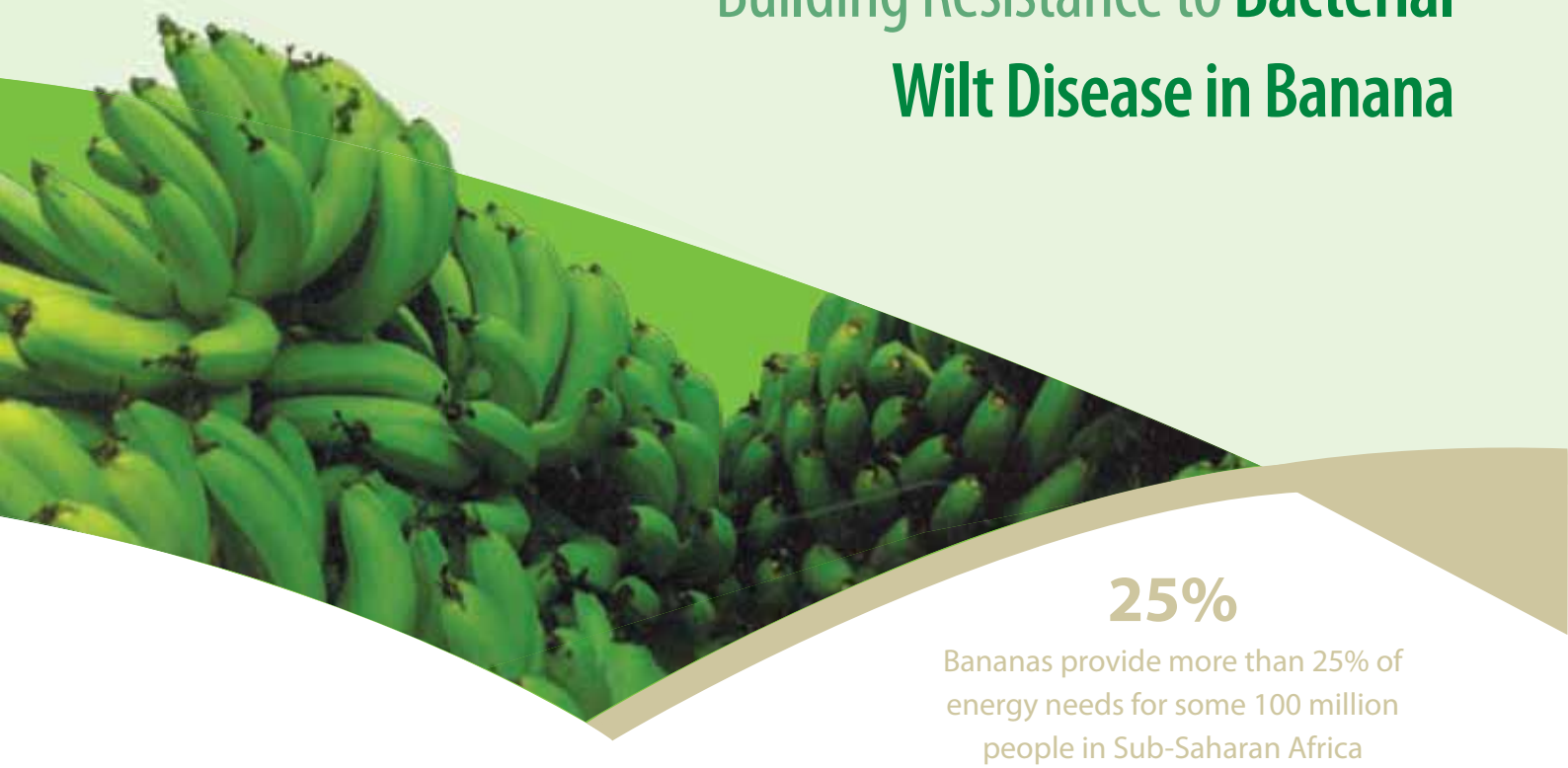
In 2008, AATF initiated the process for carrying out CFTs in 2009 in three pilot countries in Africa – Burkina Faso, Ghana and Nigeria. The regulatory infrastructure in all three countries is still developing, and the level of experience in dealing with applications to field test GMOs varies. Even so, significant progress is being made.

In Burkina Faso, the Institut de l'Environnement et de Recherches Agricoles (INERA) will take the lead in obtaining the needed clearances, while in Ghana, the CSIR-Savanna Agricultural Research Institute (SARI) will be the lead institution. In Nigeria, the Institute for Agricultural Research (IAR), in Zaria, formally established the Institutional Biosafety Committee (IBC) to expedite the review of the *Maruca*-resistant cowpea CFT application made to the National Biosafety Committee at the Federal Ministry of Environment. Approval in Nigeria is expected early 2009. CFT sites have been identified in Ghana and Nigeria and will soon be determined in Burkina Faso.

For more information, contact Nompumelelo H Obokoh (n.obokoh@aatf-africa.org)

A farmer in a cowpea field in Nigeria

Building Resistance to **Bacterial Wilt Disease in Banana**



25%

Bananas provide more than 25% of energy needs for some 100 million people in Sub-Saharan Africa

Banana and plantain are major food sources in several countries in Sub-Saharan Africa (SSA). However, banana farmers, particularly in the Great Lakes region, face a growing constraint in the production of the crop due to the spread of a devastating disease known as banana bacterial wilt or banana Xanthomonas *wilt (BXW). When infected, banana plants rapidly wilt and die. This means a loss not just for the farmers, but for consumers as well, as the increasing shortage of this major staple food pushes up its price on the market.*

About one-third of all bananas produced worldwide each year are grown in Sub-Saharan Africa (SSA), where the crop provides more than 25% of the food energy needs for some 100 million people. East and central Africa are the largest banana producing and consuming regions on the continent. In these countries, the crop contributes more than 30% of the daily per capita caloric intake, as well as a significant portion of the cash income of smallholder farmers.

Unfortunately, the production of this crop is coming under increasing threat from the banana *Xanthomonas* wilt (BXW), caused by *Xanthomonas campestris* pv. *Musacearum*. Loses due to the BXW are currently estimated at more than $500 million annually.

BXW affects nearly all commonly grown banana cultivars, and the damage it causes is as extreme as it is rapid. BXW was first reported in Ethiopia about 40 years ago, where it seemed to remain isolated until 2001 when it was first seen in Uganda, the world's second largest producer of banana after India. Since then, the disease has quickly spread throughout east and central Africa, threatening the livelihoods and food security of millions of people.

The economic impact of BXW is due to the death of the mother plant, which is vital to the normal plant production cycle. Fields infested with BXW cannot be replanted with banana for at least six months due to the carry-over of soil-borne innoculum. And even then, it is difficult to control the disease and impossible to completely eradicate it. Experience with bacterial wilt diseases in other crops shows that resistant varieties are often the most sustainable and cost-effective means of managing the disease. However, there are no known sources of natural genetic resistance to BXW in the banana germplasm that are currently available, which limits the prospects of using conventional breeding to produce resistant cultivars.

The BXW project

In early 2004, scientists from the International Institute of Tropical Agriculture (IITA), in partnership with the National Agricultural Research Organization (NARO) of Uganda, started developing transgenic bananas resistant to BXW. In March 2005, IITA approached AATF seeking to access candidate genes that

could confer resistance against BXW. As a result, the two organisations, in collaboration with NARO, launched a project aimed at producing BXW-resistant banana cultivars through genetic transformation. Since then considerable progress has been made towards moving two resistance genes isolated from sweet pepper, based on work done by Academia Sinica in Taiwan. These genes 'the plant ferredoxin-like protein' *(pflp)* and the 'hypersensitivity response assisting protein' *(hrap)* may provide the urgently needed solution to the BXW pandemic.

Five locally preferred banana cultivars – *Pisang Awak (Kayinja), Nakitembe, Mpologoma, Sukali Ndizi* and *Nakinyika* – have been transformed using *pflp* or *hrap* genes and have been tested under laboratory conditions to determine their resistance to BXW, with convincing results. A number of transformed lines containing either *pflp* or *hrap* genes are now available to researchers for additional laboratory testing and confined field trials. The next step for the project is to demonstrate that stacking the *pflp* and *hrap* genes in the same banana cultivars will enhance resistance. This work begun in 2008 and will be going on in parallel with the preparation of regulatory approval strategies and action plans for target countries in the Great Lakes region of Africa.

The banana micro-propagation audit

It is vital that the laboratory transformation work and the thorough regulatory preparation be complemented by the capacity of target countries to effectively and efficiently implement tissue culture (TC) production practices. The countries also need to be enabled with systems for producing improved banana plantlets. Moreover, it is important that farmers are able to access these plantlets once they are available from the project. For this reason, AATF commissioned an independent technology audit by the Nairobi-based Centre for African Bio-Entrepreneurship (CABE), for the Great Lakes region in 2008, with three primary objectives:

Genetically modified banana at Kawanda Research Station, Uganda

- To assess the current status of TC production facilities and identify the main constraints to adoption and use of TC banana technologies in the region;
- To propose possible interventions that could enhance adoption and use of the latest TC technologies; and
- To review plantlet production and marketing trends, assess the linkages between different institutions involved, and evaluate local policy environments in the Great Lakes countries.

The audit revealed that the laboratories in the region all have the basic facilities needed to produce TC materials, though they vary considerably in their level of development and sophistication.

Still, the production capacity is generally constrained by a lack of appropriate equipment and trained personnel. The study revealed existing strong linkages among key research institutions, such as universities and national agricultural research organisations, and between them and the development partners operating in the region.

AATF staff and Board members during a visit to the Kawanda Research Station in March 2008

These include international development agencies, Non Governmental Organisations (NGOs), Community Based Organisations (CBOs), credit organisations, and so on. Not surprisingly, the CABE study indicates that the main limitation to developing and deploying TC technology in the Great Lakes region is a lack of adequate funding for the process. The initial investments needed for structures and equipment are significant, as are the subsequent costs of sustaining TC work over time. Other hurdles include inefficient production practices, a lack of effective marketing strategies, minimal involvement of farmers and non-supportive policy environments.

The audit made several recommendations for addressing the current system shortfalls, including:

- Setting up a special fund, or making arrangements with credit organisations, to support infrastructure development under soft terms;
- Establishing a forum for stakeholders involved in overseeing the development of TC production facilities and guidelines;
- Exploring ways of increasing the efficiency of TC processes, such as the adoption of 'photoautotropic micropropagation';
- Contracting out laboratory services that are non-core activities or only occasionally needed; and
- Lobbying target country governments in the region to provide import duty waivers on selected laboratory inputs in order to spur TC production.

Next steps

As a follow up to the CABE audit, AATF planned a workshop on TC propagation, to be held in 2009, in collaboration with Academia Sinica. The workshop will address issues of quality control of the TC process, production efficiency as well as opportunities for deploying TC plantlets through public and private sector organisations that specifically target smallholder farmers. Laboratory work will continue apace as well, with additional transformations and *in vitro* efficacy testing being done, especially with respect to stacking the *pflp* and *hrap* genes.

For more information, contact Hodeba J Mignouna (h.mignouna@aatf-africa.org)

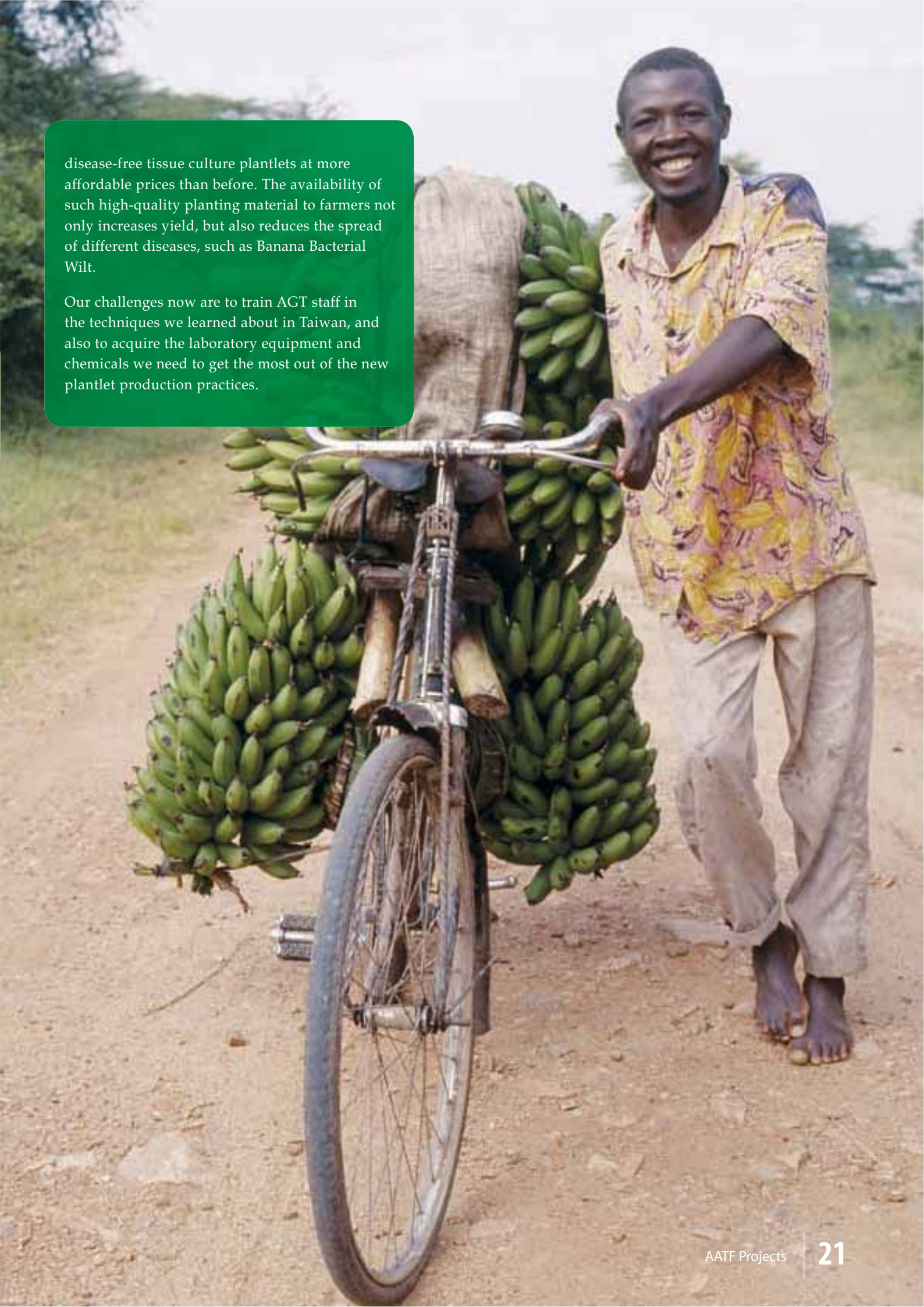
Mr Erostus Nsubuga (left), CEO and owner of Agro-Genetic Technologies Ltd, during a visit to Academia Sinica, Taiwan .

Mr Erostus Nsubuga

Prior to founding Agro-Genetic Technologies Ltd in 2001, I worked in different capacities for various business entities. This afforded me the opportunity to gather entrepreneurial experience in international marketing in Africa, Asia and Europe. AGT is the first and, so far, the only private company in Uganda to use biotechnology (tissue culture) for micro-propagation of different crops. Depending on the type of crop, we can produce up to 10 million plantlets per year. The business is challenging in some instances, but also exciting and satisfying. It provides me with opportunity for continuous learning and to make new friends from all over the world. What I especially enjoy about my work is the fact that it directly contributes to the livelihoods of my customers – smallholder farmers – and through that to my country's economic development.

I am therefore quite focused on expanding AGT and usually welcome initiatives and partnerships that contribute to business growth. In that respect, I was very pleased and privileged to have been invited by AATF to join other tissue culture organisations from the Great Lakes region on a journey to Taiwan, to see and learn about improved production techniques that could help us meet our business goals.

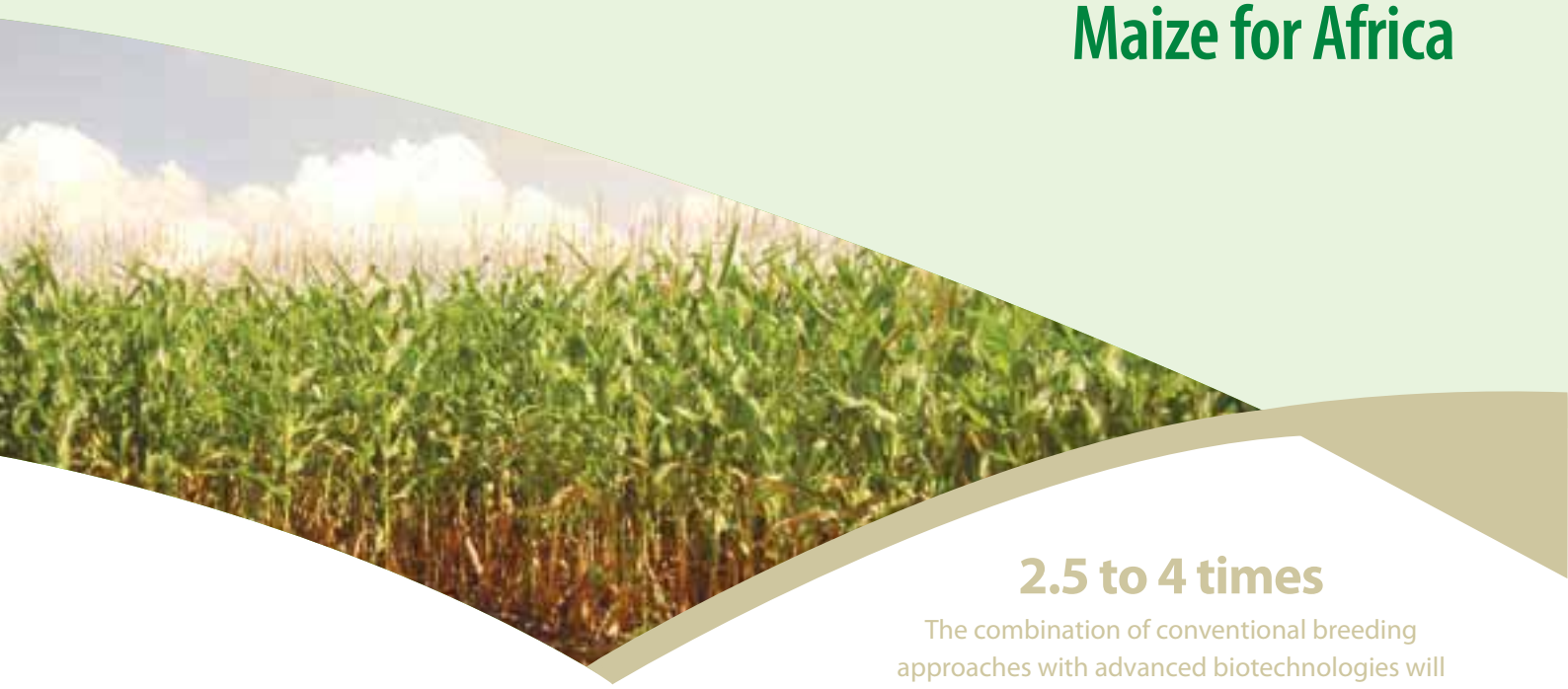
What we saw in Taiwan was very encouraging and offered opportunities for both increasing our levels of plantlet production and for reducing production costs. The new techniques should enable our clients to access more pest- and



disease-free tissue culture plantlets at more affordable prices than before. The availability of such high-quality planting material to farmers not only increases yield, but also reduces the spread of different diseases, such as Banana Bacterial Wilt.

Our challenges now are to train AGT staff in the techniques we learned about in Taiwan, and also to acquire the laboratory equipment and chemicals we need to get the most out of the new plantlet production practices.

Developing **Water Efficient Maize for Africa**



2.5 to 4 times

The combination of conventional breeding approaches with advanced biotechnologies will enable the achievement of targeted genetic gains in 10 to 15 years, 2.5 to 4 times faster than if conventional breeding alone is used.

Drought is a recurring problem in many parts of Sub-Saharan Africa (SSA). Most smallholder farmers in the region grow maize as their primary crop, both for home consumption and for sale in local markets, relying on rainfall to produce their crop. All too often, however maize crop cycles are punctuated by erratic rainfall and periodic dry spells that threaten the livelihoods and food security of millions.

In March 2008, AATF and several partners, including the national agricultural research systems (NARS) of Kenya, Mozambique, South Africa, Tanzania and Uganda, Monsanto Company and the International Maize and Wheat Improvement Center (CIMMYT) launched a major public/private partnership that aims to reduce the risk that periodic drought poses to smallholder African farmers. Known as the Water Efficient Maize for Africa (WEMA), the initiative is funded by the Bill & Melinda Gates Foundation and the Howard G Buffet Foundation for an initial five-year phase. WEMA aims to capitalise on an innovative combination of conventional maize breeding, marker-assisted selection, and state-of-the-art biotechnologies with the ultimate goal of producing higher yielding, drought-tolerant maize varieties that can provide more consistent yields under moderate drought and make them accessible to millions of African smallholder maize producers in SSA.

The WEMA project was made possible by an earlier landmark agreement signed in January 2008 among AATF, Monsanto Company, and CIMMYT. In the agreement, CIMMYT and Monsanto committed to develop new drought-tolerant maize varieties, and to provide royalty-free licensing of the improved materials to AATF in order to facilitate their delivery to smallholder farmers in Africa.

The WEMA partnership will build on the comparative advantages of each partner, enabling them to achieve more together than they would individually.

The project brings together the vast experience of the partners in biotechnology and conventional breeding. For instance, Monsanto brings to the project its proprietary germplasm, capability in conventional and molecular breeding and drought tolerance transgenes gained through its commercial drought tolerance programme. On its part, CIMMYT has decades of field-level experience in conventional maize breeding for drought.

The organisation also has access to advanced maize germplasm that already contains many of the traits preferred by African farmers. The five NARS partners will contribute their expertise in field-testing and facilitate interaction with stakeholders in the respective countries as part of the process towards building up regulatory systems.

As the overall project leader, AATF's capacity for and experience with product development, stewardship and deployment will come in handy. In addition, the initiative will also have strong backing from the Foundation's hard-earned reputation as an 'honest broker' capable of ensuring open and even-handed management of public/private partnerships.

Project organisation and progress in 2008

The WEMA project is organised around four major sets of activities:

- Product development;
- Regulatory compliance;
- Communication and outreach efforts; and
- Project management and governance.

These key activities are carried out through specialised teams whose members are drawn from the partner organisations. The teams support the Project Manager in fulfilling the set goals and milestones. The oversight of the project is provided through an Operations Committee and an Executive Advisory Board.

The project teams responsible for implementing and/or overseeing each of these areas of work have been formed. They have each developed strategies and work plans, which have been moulded into an overall and seamless WEMA implementation strategy.

On the research front, Monsanto and CIMMYT are utilising their elite drought tolerant maize germplasm for use in conventional breeding, the development of double haploid populations, marker-assisted breeding projects, and for the integration of drought tolerant transgenes. The germplasm include elite maize inbred lines that are adapted to tropical mid-altitude ecologies found in SSA. The transgenic drought tolerant (TDT) maize testing was initiated in South Africa to begin the development of appropriate testing and compliance protocols for the project. At the same time, considerable progress was made in the setting up of facilities for the development and testing of the maize germplasm. This included field sites for managed drought trials for conventional breeding at Monsanto and CIMMYT, as well as those for the confined field trials of drought tolerance varieties in each of the five NARs countries.

In the area of regulatory compliance, an overall project regulatory team was established. So far, it has developed a general plan of action for meeting the various bio-safety requirements in the five WEMA countries. In addition, in-country regulatory teams were constituted in Kenya, Uganda, Tanzania and South Africa, each with clear terms of reference to guide their activities. In October, a consultant was commissioned to survey the regulatory landscape in the five partner countries, and the first draft report was delivered at the end of the year. In addition, the WEMA regulatory team collaborated with the project's product development team to establish the criteria for selecting open quarantine sites in the five countries. Using these criteria, the NARS partners proceeded to identify candidate sites for field testing in their countries, and final selection will be completed in early 2009.

A WEMA communications and outreach team was constituted early in the project, comprising experts in communications, public affairs, policy and advocacy from AATF, CIMMYT, Monsanto, the Bill & Melinda Gates Foundation, and the five project countries. An overall strategy and country-specific

Dr Stephen Mugo (right) of CIMMYT explains how the quarantine site at Kiboko field station operates to maize breeders from WEMA National Agricultural Reserach Sysytems during a field trip.

action plans were developed in 2008, the first test of which was in March when the formal public announcement of the project was held in Kampala, Uganda. The event led to considerable – and for the most part very positive – follow up interest from the international media throughout the year.

In terms of project governance, a WEMA Project Executive Advisory Board was established to provide expert input to the project when needed. An Operations Committee was put in place to help ensure timely progress towards achieving project milestones. The Operations Committee interacts at least monthly with the other implementing teams to resolve issues as they arise, and regularly consults with the Advisory Board.

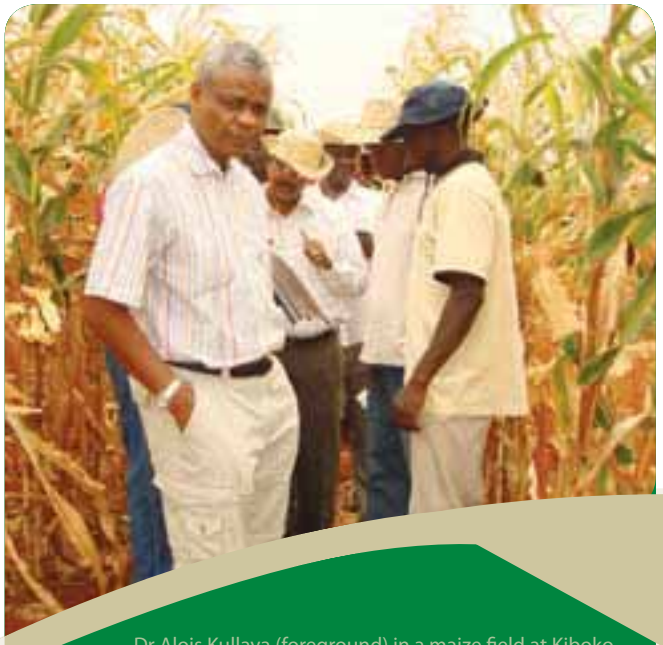
Expected impacts

A number of impacts are anticipated over the life of the project. The royalty-free availability of the drought transgene as well as Monsanto and CIMMYT maize germplasm is expected to stimulate national program and private seed company training and capacity building in activities related to producing improved, drought-tolerant varieties.

The WEMA project will substantially accelerate the delivery of drought-tolerant maize varieties to Africa's smallholder farmers. It is projected that the creative combination of conventional breeding approaches with advanced biotechnologies will enable the achievement of targeted genetic gains in 10 to 15 years, 2.5 to 4 times faster than if conventional breeding alone is used.

Recurring drought is a major problem for millions of smallholder farmers across Sub-Saharan Africa, and the frequency and severity of drought episodes in the region are expected to increase as climate change progresses. By improving yield stability during periods of moderate drought, the new maize varieties will help protect the livelihoods of farmers. In turn, this will potentially enable and encourage farm-level crop diversification and investments in the use of improved crop management practices. At the national level, this will translate into reduced poverty, lower food imports, and a firmer foundation for future economic development.

For more information, contact Sylvester Oikeh (s.oikeh@aatf-africa.org)



Dr Alois Kullaya (foreground) in a maize field at Kiboko, Kenya during a WEMA training on breeding for drought tolerance in maize in September 2008.

Dr Alois Kullaya

I've been working as a plant breeder for the last 28 years, dedicating most of my career to researching ways to improve yields of coconut, Tanzania's most important perennial oil crop. Since June 2008, I've been coordinating the Water Efficient Maize for Africa (WEMA) project in Tanzania. The project seeks to develop drought-tolerant maize varieties, using the tools of biotechnology. I'm very interested in biotechnology and the benefits it can offer to Tanzania's farmers and to the overall food security of the country. In fact, I'm one of the few scientists in Tanzania involved in efforts to get the general public to appreciate the benefits of biotechnology in the country.

Maize is Tanzania's staple food. It is the principal ingredient in the local Tanzanian dishes of *ugali* (stiff mixture of water and maize flour), *uji* (porridge), and *akande* (a mixture of maize and beans), and is cultivated on between two and three million hectares. In Tanzania, as in other countries in Africa, the maize supply has unfortunately become increasingly scarce over the years. Among the major causes of the low yields are inferior maize seeds and low use of fertiliser. The problem is further compounded by drought and pest diseases, which seem to have conspired to ensure maize yields remain

low. As a result, the average maize production in Africa is only one and a half tonnes per hectare, compared to about eight tonnes in many developed countries. As an agricultural scientist, this scenario has been bothering me. In particular, I've been wondering how I can help farmers in my country deal with climate change and drought, especially because of the effect these factors have on their main food source.

Moreover, drought has had an adverse effect not just on farmers, but also on the country as a whole. Because of its widespread use, the diminishing supply of maize has huge economic implications for Tanzania. The country's economy is heavily dependent on agriculture, which accounts for more than 30% of the GDP.

A light at the end of the tunnel for Tanzania's farmers began shining when AATF approached the Tanzanian government to participate in the WEMA project in 2007. When the Ministry of Agriculture, Food Security and Cooperatives appointed me to coordinate the WEMA project in Tanzania, I was very excited. I now have an opportunity to make an important contribution to maize farming in my country, and to help smallholder farmers profit more from their hard work.

In my view, empowering maize farmers to access improved seeds and credit for fertiliser and other agricultural inputs are the low-hanging fruits that should help them to benefit more from their farms. In the long-term, drought-tolerant maize varieties will be a sustainable solution. And in order to achieve this, biotechnology will be very important.

Some people are critical of biotechnology, mainly because they don't understand it, but I look forward to the day when science and technology will be seen as key drivers for African's economic take-off plans.

Our NUEST Rice Project

6%

The demand for rice in African diets is growing at a rate of about 6% per year.

The production and consumption of rice across Africa is rapidly expanding. Unfortunately, the increase in demand for this important staple food is outpacing the ability of African smallholder farmers to produce it. In response, AATF recently launched a major project to increase smallholder rice productivity in marginal areas.

The demand for rice in African diets is growing rapidly, at a rate of about 6% per year when averaged across the continent. However, the production of the crop is increasing at a slower pace, of about 3.5% per year. One of the major constraints to rice production in Africa is soil salinisation, especially in irrigated areas where 2.5 tonnes of salt are deposited per hectare in one crop season from irrigation water. Another challenge is low levels of nitrogen, mainly due to the low usage of fertiliser in SSA, which is estimated at 9kg/ha compared to 240kg/ha in east Asia.

In west Africa alone, about 650,000 hectares of rice production are threatened by salinisation, while more than 3 million hectares of upland (rainfed) rice are affected by low levels of nitrogen. The resulting rice production deficit in Africa – currently about 7 million tonnes per year – forces governments to spend an estimated USD 1.7 billion each year on rice imports, a huge and largely unnecessary drain on foreign exchange reserves.

Currently, most of the increase in rice production comes from expanding the land area under rice. However, a feasibility study conducted by AATF in 2007, showed that if improved varieties are grown on just 10% of this target area, and if those varieties boost yields by only 30% (a low-end estimate), rice farmers would produce an additional 380,000 tonnes of grain each year.

In December 2008, AATF officially launched a project on the genetic transformation of the upland and lowland New Rice for Africa (NERICA) varieties to improve their productivity in nitrogen-poor soils and in fields that have become excessively salty over time. The launching of the Nitrogen Use-Efficient and Salt-Tolerant (NUEST) Rice for Africa Project brought to conclusion over two years of planning, feasibility studies, and negotiation with private sector technology providers, African national agricultural research organisations, and other stakeholders.

The project is funded by USAID and is to be implemented over a 10-year period. It will provide smallholder rice farmers with higher yielding varieties that are well adapted to the upland and lowland rice-growing areas in Africa where nitrogen depletion (in the uplands) and salty soils (in the lowlands) limit production.

Project partners

Discussions with potential technology providers began back in 2005. Two years later, AATF concluded negotiations with Arcadia Biosciences and the Public Intellectual Property Resource for Agriculture (PIPRA). In February 2008, a formal agreement was signed with Arcadia for access to genes that convey nitrogen use efficiency and salt tolerance. In September 2008, AATF entered into a formal agreement with PIPRA for the donation of the needed plant transformation technologies.

The current national agricultural research partners include INERA (Burkina Faso), CSIR-CRI (Ghana), NCIR (Nigeria) and NARO (Uganda). These national research institutes will conduct the necessary field trials to test the performance of the transgenic lines. They will also carry out the marker-assisted breeding needed to move the desired traits into rice varieties already known to and preferred by farmers and consumers. Moreover, these partners will ensure dissemination of new varieties to smallholder rice producers. The role of AATF in the project is coordination of the partnership and facilitation of product delivery to farmers.

Research progress in 2008

In addition to formally establishing the framework and business plan and securing long-term funding for the NUEST project, notable progress was achieved in several research-related areas. During the year, Arcadia Biosciences:

- Established an early *in vitro* screening method for detecting nitrogen use efficient transgenic rice plants;
- Improved the induction of embryogenic callus from mature seed of upland NERICA varieties, testing the use of kanamycin resistance as an alternative selectable marker for rice transformation; and
- Increased the seed of available upland NERICA varieties to ensure adequate genetic material for the transformation experiments, and began the importation of seed of NERICA lowland varieties from the African Rice Centre (WARDA).

Starting in 2008, PIPRA focused on three key project objectives:

- Development of rice transformation protocols using the non-proprietary *GR6 HemL* gene as a selectable marker;
- Validation of *Arabidopsis* AtPhyB as an effective transposon-excision marker in rice (initial tests were inconclusive and are being repeated); and
- Construction of transposon-based plant transformation vectors that are tailored for the African nitrogen use efficient and salt tolerant rice varieties.

These were the early steps towards the development of the specific transformation technologies needed for the project to succeed.

Expected project impacts and benefits

Several benefits are expected from the NUEST rice project:

- Proven world-class technologies for developing rice varieties better suited to low nitrogen and salty soils will be made available to researchers in Sub-Saharan Africa;
- Farmer-preferred rice varieties will be transformed for improved performance in target environments, and later made available to farmers through commercial seed channels;

- The successful introduction of higher yielding transgenic rice that is developed and released in accordance with international bio-safety protocols and regulations will set an example for other similar crop improvement efforts in the future;
- The technical capacity of African agricultural researchers, as well as the facilities they use, will be strengthened by the project, enabling them to engage more effectively in molecular biology and crop improvement activities, follow important biosafety procedures, and efficiently manage participatory on-farm technology testing programmes;
- As the NUEST rice varieties spread, the need for expensive imported nitrogen fertilisers will decline, and/or the economic returns from the use of such inputs will increase;
- As they become more productive, smallholder rice producers should be able to move away from mere subsistence farming and into the realm of commercial farming; and
- The new varieties will enable farmers to reclaim previously abandoned cropland, reducing land shortages in the target areas while increasing rice production.

At current prices, the additional annual production of rice expected through the project would be worth about USD 10 million. This implies an almost full recovery of the 10-year investment of about USD 11 million in the project. Finally, as the importance of rice in African diets continues to grow, the availability of new, more productive varieties that thrive in low nitrogen and salty soils will lead to increased national food security, as well as increased revenue for smallholder rice farmers. Moreover, the potential for diversifying farm operations to include various high value crops and, in irrigated areas, fish production, will help stabilise livelihoods and household nutrition in the target countries.

For more information, contact Nompumelelo H Obokoh (n.obokoh@aatf-africa.org)

Mr Eric Rey, President and CEO of Arcadia Biosciences Inc.

Arcadia Biosciences

Arcadia Biosciences was formed in 2003 with the mission of developing plants that increase the productivity and profitability that farmers obtain from their land, while simultaneously benefitting the human and environmental health.

Our operating premise is that modern biotechnologies can be used to develop improved plant varieties that farmers will want to utilise because they are more productive. We also believe that the use of such plants will create benefits for the health of the people as well as the environment. For example, our technology for nitrogen-use efficiency (NUE) reduces the need for nitrogen fertiliser by about 50%.

This provides an economic benefit for farmers and, because less nitrogen has to be applied, there is less leaching of the element into ground water supplies and lower nitrous oxide emissions into the atmosphere, thereby protecting the environment. Our related technologies for salt tolerance and water-use efficiency create similar opportunities for farmers and have equally significant environmental advantages.

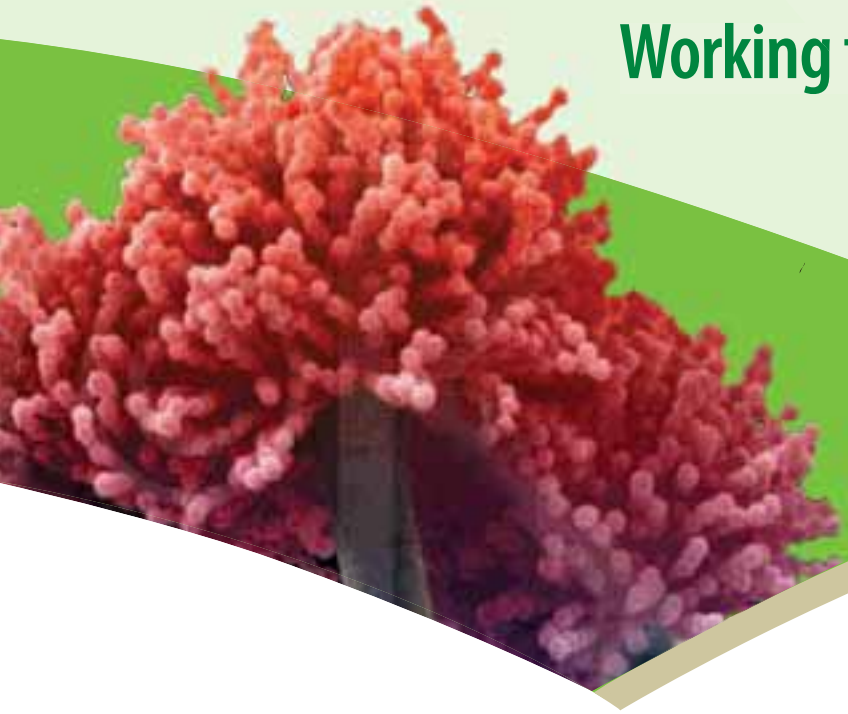
While Arcadia is a for-profit company with a primary focus on conventional technology delivery systems, we are also strongly committed to achieving the largest possible value and reach from our technologies. With this in mind, we established a company policy to make selected

technologies for certain crops available, without charge and when feasible, in developing countries. After adopting this policy, we began to search for opportunities to apply it, and that is how we became acquainted with AATF.

After intensive dialogue, we were convinced that AATF was the ideal partner for our first activity of this type. We were impressed with the professional and pragmatic approach that the Foundation takes in its projects, and we were comfortable that key issues involving product stewardship would be in good hands. Based on these considerations, we donated NUE and salt-tolerance technologies for use in NERICA rice throughout Africa. This donation was made with the specific provision that African farmers would never be charged a fee for the technology.

Our belief is that improved rice varieties developed with these technologies will enable smallholder African rice farmers to sustainably increase their production and their profits – even in the face of variable and often challenging environmental conditions. Our goal is thus to increase smallholder productivity and food security, with a parallel reduction in negative environmental impacts from agriculture.

Controlling Aflatoxin:
Working to Avoid the Unavoidable



4.5 billion

more than 4.5 billion people living in the developing world may be chronically exposed to aflatoxins in their diets.

Aflatoxin is a highly toxic, carcinogenic poison produced by many species of Aspergillus*, a ubiquitous fungus that easily colonises maize, groundnut, and a number of other crops. New, cost-effective bio-control methods now being developed for Africa promise to dramatically reduce this threat to smallholder farmers and consumers across the continent.*

In general, contamination of food by aflatoxins occurs as a result of environmental conditions, especially hot and humid weather, as well as traditional farming methods, such as drying grain on the ground and improper storage practices. Commonly found in tropical climates, the aflatoxin-causing *Aspergillus* strains readily attack crops that are under stress, for instance from drought or insect infestation – the major food production constraints all too frequently encountered in Sub-Saharan Africa (SSA).

Not surprisingly, high levels of aflatoxins are found in food grains in many African countries, including Benin, Burkina Faso, Cameroon, Gambia, Ghana, Guinea, Kenya, Mozambique, Nigeria, Senegal, South Africa and Zambia. In these countries, major staple commodities and cash crops – maize, cassava, sorghum, yam, rice, groundnut and cashews among them – can be badly affected by these poisons. Because of its potentially severe health implications, aflatoxin contamination in food and animal feed can lead to major economic losses. For instance, African countries lose up to US$ 1.2 billion each year due to the rejection of commodities that fail to comply with food safety and quality owing to contamination by mycotoxins including aflatoxins.

Experts consider aflatoxins to be an unavoidable contaminant of food and feed even where good manufacturing practices have been followed. In developed countries stringent food safety regulations and monitoring of susceptible crops successfully limits their levels in the food supply. However, in many developing countries, Africa included, the situation is different. In these regions, governments often lack cost-effective ways to test for aflatoxins, and most smallholder farmers are unable to prevent contamination during the production and storage of their crops. As a result, more than 4.5 billion people living in the developing world may be chronically exposed to aflatoxins in their diets.

AATF is responding to the challenge posed by aflatoxins to the livelihoods and food security of African smallholders by facilitating the development and availability of microbial 'competitive exclusion technology' (CET). This approach can control aflatoxin production in important staple and cash crops.

It involves the establishment of benign strains of selected *Aspergillus* strains in the soils

around susceptible crops as they grow. The goal is for the benign strains to out-compete and largely eliminate the aflatoxin-producing strains of the fungus. This form of biological control – originally developed by the United States Department of Agriculture Agricultural Research Service (USDA-ARS) – has been tested extensively on cotton and peanuts in the USA with considerable success. The technology was subsequently licensed for commercialisation to a growers' organisation under the name of AF36, and to a private company that is marketing it under the name AflaGuard®. In 2005, AATF began negotiating with the company for access to the technology with the aim of adapting it to African conditions. Unfortunately, these negotiations have not progressed as anticipated, forcing AATF to take a different path.

In 2008, the Foundation began working with the International Institute of Tropical Agriculture (IITA) in Nigeria and with the USDA-ARS at the University of Arizona (USA) to develop alternative sources of competitive exclusion technology for use on maize and groundnuts in Africa. However, before investing significant resources in the development of the technology, the partners agreed that a study be carried out to evaluate the technical and commercial viability of using CET to control aflatoxin contamination in an African setting.

The study, which was commissioned by AATF, was completed in 2008 and reached the following general conclusions about the potential benefits of the new bio-control technologies:

- Controlling aflatoxin would contribute significantly to increased crop production, higher incomes, improved nutrition, and better health of people;
- There are clear indications that controlling aflatoxin would help to expand export markets for the affected commodities, especially for groundnuts, and therefore higher trade revenues for countries in Sub-Saharan Africa; and
- Analyses of the profitability potential of using new technologies, conducted under different effectiveness scenarios, indicate that investments in the research and dissemination of CET, even if only 20% effective, will be well placed.

In addition, recent research reinforces the technical viability of CET. Researchers from IITA and the USDA-ARS have developed microbial CET for reducing aflatoxin contamination in maize in Nigeria. They have also identified local benign strains of *Aspergillus* that are capable of overwhelming the toxin-producing strains, which in turn leads to a direct reduction in aflatoxin production in maize. In laboratory and on-station field trials, these competitive strains reduced aflatoxin contamination by 95% to 99%. In larger scale, on-station trials in four locations in Nigeria, aflatoxin production was reduced by 50% to 99%. Moreover, delivering the CET to the field is easy and effective, involving no more than broadcasting onto the soil an appropriate mixture of local benign strains of *Aspergillus.*

Based on this research and the encouraging results of the viability study, the project partners are planning to further evaluate the effectiveness of microbial CET in farmers' fields in Nigeria during 2009. The aim of this next round of testing is to determine the extent to which aflatoxin contamination of maize can be reduced under conditions that resemble real-life farming situations more closely. If these tests are as successful as anticipated, AATF will work with its partners to establish a fully-fledged project for the development and dissemination of locally adapted microbial CET for controlling aflatoxin in maize and groundnuts.

For more information, contact Hodeba J Mignouna (h.mignouna@aatf-africa.org)

Deriving Energy from Cassava:
Developing a Cassava-based Ethanol Industry in Sub-Saharan Africa

75%

Africa produces more than half of the world's supply of cassava

Africa produces more than half of the world's supply of cassava, despite the fact that average yields are the lowest among all cassava-producing countries. The potential for increasing the productivity of this largely subsistence crop is huge. However, African farmers need assuarance regarding the availability of markets for their surplus before they make the necessary investments to increase their produce.

One of the main constraints to cassava production in Africa – almost all of which is produced by smallholder farmers, mainly as a subsistence or survival crop – is a lack of appropriate machinery for processing the crop once it is harvested. Investing in such value-adding technology appeals only to those who have secure access to markets for the processed product. One key to increasing the marketability of cassava is to create alternative uses for it, apart from direct human consumption. Considerable effort has gone into developing other uses, for example as a livestock feed, for the commercial production of starch, and as an additive to wheat flour.

Drawing on the example of using maize to produce ethanol, the United Nations Industrial Development Organisation (UNIDO), together with the African Union (through NEPAD's Pan-African Cassava Initiative) and the government of Brazil, is promoting the use of cassava as a source of biofuel in Africa. In the African setting, however, cassava for ethanol production requires a large number of small-scale cassava processing plants. Without this increased processing capacity, farmers will be unable to capitalise on any of these new market opportunities.

The problem is that locally produced processing equipment is usually of poor quality, even when copied from prototypes produced by foreign manufacturers. At the same time, these foreign equipment suppliers are reluctant to provide machinery to African businesses for fear of piracy and loss of potential market share. The leverage point identified by AATF is to encourage foreign equipment manufacturers to work directly with African entrepreneurs to produce high quality cassava processing equipment. The Foundation has approached some of these foreign suppliers about brokering such partnerships which have been met with cautious interest.

The potential benefits of increased mechanisation of post-harvest cassava processing are huge, especially with ethanol production in the offing. Establishing a cassava-based ethanol industry would increase national energy security, and reward thousands of small- to medium-scale agro-entrepreneurs engaged in cassava processing. Farm-level diversification would help increase

and stabilise incomes, improving the livelihoods of millions of smallholder cassava producers. It would also free foreign exchange being used to import fuel for other development priorities.

AATF is now finalising a proposal for actualising this product concept, which will be submitted to UNIDO, FAO, the Alliance for a Green Revolution in Africa (AGRA) and other potential donors. Assuming the availability of resources, the next step will be to work with potential partners and stakeholders to develop a business plan that will guide project development and implementation.

For more information, contact Hodeba J Mignouna (h.mignouna@aatf-africa.org)

'One key to increasing the marketability of cassava is to create alternative uses for it, apart from direct human consumption.'

Progress, Challenges and Opportunities: **A Synthesis of AATF's First External Review**

Five years since its inception, AATF has made significant progress towards achieving its objectives. The Foundation must now strive to overcome various operational challenges and capitalise on new opportunities.

In March 2008, an independent international panel of experts* in areas relevant to AATF's work concluded the first formal and comprehensive review of the Foundation's efforts to date. The review was carried out in line with the AATF business plan, which required the Foundation to commission an independent review of its activities covering the first four years. The purpose of this process is to evaluate progress, including an initial assessment of impact, as a basis for making recommendations on AATF's future activities and organisational issues.

The Panel met with AATF Board Members, management and staff and with an array of authorities, stakeholders and partners in government and private businesses. The team was afforded the opportunity to travel within Kenya, Uganda and Nigeria to meet with smallholder farmers, a number of community-based organisations and other non-governmental entities. It also obtained the opinions and insights of national, regional and international research institutions and other AATF partners.

In its final report, the Panel observes: 'The review team is impressed with AATF after its initial years. AATF has established and maintained a good reputation as a valued, additional, non-conflicting institution in the fight against low agricultural productivity and related food insecurity and poverty.'

The review team's mission was designed to determine where improvements may be made to strategy, governance and operations. The experts therefore note that their report is 'necessarily, but constructively, critical.' In that spirit, the panel emphasises the validity of AATF's role, mandate and strategic direction.

The panel noted that the political landscape has changed since the original AATF strategy was developed in 2003, especially with respect to the level of attention now being given to reversing decades of neglect of Africa's agricultural sector. However, biotechnology – and especially the use of GMOs – remains controversial. Still, the Panel regarded it '…a central ingredient in the set of tools to be used by AATF to make its mandate work.' The team therefore urges AATF to stay focused on its mandate and 'continue to work with others on delicate advocacy for GMO technology.' The experts however suggest that this should be done in tandem with the promotion of a balanced agenda of projects designed to bring the benefits of advanced agricultural technologies to Africa's smallholder farmers.

* Mr Ebbe Schiøler (Denmark), Dr Hamidou Boly (Burkina Faso), Dr Adrian Dubock (UK), Mr Dreyer Lotter (South Africa) and Dr Shadrack Moephuli (South Africa).

As AATF pursues its objective of proactively accessing proprietary technologies on behalf of African farmers, the Panel feels that the Foundation should broaden its search to include more African institutions. It also recommends greater specificity in AATF's licensing arrangements with technology holders, in order to avoid eventual freedom of operation issues, as well as a strengthening of its product development procedures. AATF is taking these recommendations to heart as it looks to the future.

During its review process, the Panel encountered widespread appreciation of AATF's efforts towards communicating credible information about biotechnology, and for facilitating quality dialogue among relevant audiences, in Kenya and increasingly in other Sub-Saharan Africa countries. The review team observed that this work has contributed to the Foundation's 'high standing in relevant professional and political circles.' The Panel feels that, if the benefits of new technologies are to be broadly realised, AATF must build on its carefully established credibility to provide informed and proactive advocacy for biotechnology from an African perspective. It recommends that the Foundation engage with other organisations active in biotechnology education in Africa to refine the message about potential benefits of biotechnology, and that AATF provide 'project-specific advocacy from within AATF, as an essential part of product introduction.' In addition, the Panel feels that the Foundation can help selected governments develop sensible, efficient and lower cost biosafety regulations that will enable safe, yet more rapid, introduction of new technologies to smallholder farmers.

The Review Panel said it was convinced that, given the importance of the Foundation's mission, AATF is destined to grow. It recommends that AATF embrace and facilitate its growth by developing official links with key organisations and new funding modalities. Formal MoUs should be negotiated with various entities across the continent in order to expand the Foundation's operational footprint in Africa. The Foundation should also strive over time to become less dependent on donor funding, for instance by exploring various complementary forms of funding to ensure longer-term financial stability and sustainability.

The Panel notes that growth will bring with it a spectrum of changes, especially in staff skills and expertise and in the areas of governance and management. The Panel recommends, for example, the recruitment of additional staff with strong private sector credentials in 'commercial biotechnology product development, GMOs and seed company (germplasm) variety licensing.' The aim here would be to facilitate networking with private sector companies and others that need to be involved in introducing new products and encouraging their uptake by farmers. Additional skills in various areas should also be brought on board over time to complement AATF's current staff capabilities.

The Panel notes that the relatively small current size of the Foundation brings with it an enjoyable and productive air of informality and transparency. But as AATF extends its geographic reach and becomes involved in a growing array of projects, it should prepare to adopt governance systems and styles that will allow it to grow as an organisation, expand geographically and deliver its mandate more effectively. This, the Panel notes, may involve redefining management roles and greater delegation.

AATF's Board of Trustees will need to become more focused on matters of policy and technical substance, as opposed to operational issues. And the Panel recommends the formation of a Management Executive Committee made up of the Executive Director and selected managers, and redefining the Foundation's current highly participatory decision making practices to allow subject specialists to make key resolutions.

The Review Panel is convinced of AATF's unique role in capturing the benefits of advanced agricultural technologies on behalf of Africa's resource-poor smallholder farmers. It is equally certain of the organisation's effectiveness to date and its viability for the future. Indeed, the observations and recommendations by the team of experts are aimed at making an already strong organisation even more so, based on the security that AATF will continue on its well-established path towards improving smallholder productivity through science.

Regulating GM Crops in Africa:
Moving in the Right Direction

To exploit the potential benefits of modern biotechnology while safeguarding against potential risks, most African countries have signed the relevant international instruments

Modern biotechnology, boon to some and bane to others, remains controversial across Africa. The key to maximising its benefits and minimising threats is a clear, open and science-based regulatory process that protects the interests of all stakeholders.

Modern biotechnology, especially genetic modification (GM) technology, is heralded as having the potential to resolve a number of critical agricultural constraints. These range from inherently low crop yields to stress-induced limits arising from pests, diseases, soil nutrient deficiencies, salinity and recurrent drought. However, there are persistent concerns about the safety aspects of genetically modified organisms to consumers and the environment. This necessitates a strong, even-handed regulation of GM products.

In order to exploit the potential benefits of modern biotechnology while safeguarding against potential risks, most African countries have signed the relevant international instruments, such as the Convention on Biological Diversity and the Cartagena Protocol on Biosafety. By signing and ratifying these conventions, countries are obliged to put in place the necessary and appropriate legal, administrative and other measures to ensure that the development, handling, transport, use, transfer and release of living modified organisms is done according to internationally acceptable safety standards. Because GMOs should be handled in a manner that prevents or reduces risks to human health and to biological diversity, each signatory to the Convention and to the Protocol is required to develop functional National Biosafety Frameworks (NBFs). This typically involves a four-step process of: 1) formulating a national policy on biotechnology, 2) enacting biosafety laws and regulations that constitute the country's regulatory regime for biotechnology, 3) establishing an administrative system for handling applications and issuance of permits, and 4) establishing a mechanism for public participation in the biosafety decision making process.

As of 2007, only five countries in Sub-Saharan Africa, namely Burkina Faso, Mauritius, South Africa, Sudan and Zimbabwe, had taken these four basic steps towards developing functional NBFs outlined in the Cartagena Protocol on Biosafety. The vast majority of African countries had developed interim NBFs that met some, but not all, of the Protocol's qualifying criteria. During 2008, however, significant progress was made in a number of countries. In Kenya for instance, the Draft Biosafety Bill that had been a subject of debate and amendments since 2002 was finally

passed by parliament into law. This was a watershed development that elevated Kenya into the ranks of African countries with fully functional NBFs.

Elsewhere in east Africa, Uganda approved a National Biotechnology and Biosafety Policy in April 2008. The objective of that policy is to 'contribute to the national goals of poverty eradication, improved healthcare, food security, industrialisation and the protection of the environment through the safe application of biotechnology.' This development leaves Uganda one step away from achieving a fully functional framework for biosafety oversight. This will hopefully be attained once the longstanding Biosafety Bill is debated and passed into law by the country's parliament.

In west Africa, three countries – Ghana, Togo and Mali – edged closer to developing functional NBFs in 2008. In Ghana for instance, a Legislative Instrument was promulgated in January to allow for the conduct of confined field trials on GM crops, pending passage of the Biosafety Bill into law. Towards the end of the year, Togo and Mali each passed Biosafety laws to oversee activities on GM crops. Both countries are expected to soon consider developing enabling guidelines and regulations to ease implementation of the laws.

Clearly, recent developments in Africa on the regulatory landscape for GM crops show that after a period of apparent lull, there is renewed internal sense of purpose in a number of countries to realise the potential benefits of modern biotechnology while safeguarding against potential risks. The challenge – one that AATF will monitor closely in the years ahead – is to sustain this momentum through capacity building, informed debate and sound policy development.

For more information, contact Francis Nang'ayo (f.nangayo@aatf-africa.org)

The Hidden Benefits of **Public/ Private Partnerships**

Personal relationships among participants that dictate how well a partnership will work.

The nurturing of public/private partnerships is central to AATF's strategy for bringing the benefits of new agricultural technologies to Africa's smallholder farmers. While sceptics argue that such partnerships are not worth the extra effort they demand, our experience has shown the contrary to be true.

In recent years, public/private partnerships (PPPs) have become increasingly popular. These ventures are set up to tackle public domain problems that public sector entities may not be able to handle on their own, and which private sector organisations would normally not address, but would benefit from resolving and/or would like to contribute to. The idea is to capture the potential synergies that can be generated when public and private sector organisations work together towards shared goals.

PPPs have been characterised as an organisational form that blends a business mindset with the human element. The business side involves clearly defining the roles along with responsibilities of those involved and carefully monitoring the respective milestones. But it is the personal relationships among participants that dictate how well a partnership will work.

There are those who argue that the energy expended in setting up, managing and working through PPPs is excessive and that direct, fee-based contractual arrangements are more efficient and effective. Proponents of this theory argue that PPPs entail unacceptably high transaction costs and take longer to deliver results. There is also the contention that, because of their emphasis on working in teams, PPPs do not recognise individual effort, which in turn leads to lower morale among those involved.

Higher costs, greater benefits

AATF's belief in PPPs is anchored in the Foundation's experience, which indicates that although PPPs require greater effort to actualise, the rewards far outweigh the costs.

The various project partnerships that AATF currently manages suggest two areas that contribute significantly to the 'costly' nature of PPPs; their 'virtual nature,' and the differences in organisational work cultures that often exist among the partners. However, AATF's experience also shows that, rather than hampering the success of a PPP, these factors can actually be turned into assets, if handled professionally, and with the right amount of sensitivity.

The virtual nature of partnerships calls for clear planning, so that all involved can fully participate and contribute in useful and timely ways. For AATF, this means that project planning meetings look beyond definition of activities and milestones, to spelling out

management structures, methods of implementation and communication processes. This is key to managing the distances and time differences between the partners. In general, emphasis is placed on consultations and sharing of information through frequent meetings of the participants – face-to-face or teleconferences, provision of project reports, newsletters and updates. Such communication efforts often take the bulk of the time during the initial stages of project set-up to ensure that the partners have a clear understanding of the challenges they are addressing and how they will work together to achieve success.

Differences in organisational cultures can be a major challenge to the effectiveness of a PPP. These 'work culture' differences often surface as a result of clashing styles in public institutions and private businesses. Cultural differences may also arise based on where in the world the partners are from – since Europeans, North Americans, South Americans, Asians or Africans may have unique ways of doing things. Furthermore, organisations of different sizes will tend to operate differently, with smaller organisations tending to be more informal and less bureaucratic than larger ones. AATF strives to address these issues by having partners define a 'project-specific way' of doing things that will ensure smooth flow of work from the inception of its activities.

The WEMA way

At the start of the WEMA project (see page 22), AATF worked with the partners to define a desired work culture. The process started by explicitly recognising and characterising the different work styles in each organisation that could affect delivery on milestones or give rise to unrealistic expectations among the partners. The stakeholders then identified the style of work that would best help achieve the project's short- and long-term objectives. This stipulated the WEMA's processes, the governance structure, the roles for specific teams and the relationships between them, how suggestions would be handled and how decisions would be taken, timeframes, and so forth. Defining and internalising a WEMA work culture was a time-consuming process, but it ensured that each partner was clear about what, why and how they would do whatever activity they undertook. It further clarified how individual activities fit together to make the whole, and also what the partners should expect from each other. This has become known as 'the WEMA way' and provides an essential reference point when clarity on a particular issue is needed.

More than milestones

PPPs are unique set-ups that can deliver more than the project's stated milestones and activities. Those who argue for PPPs, including AATF, believe there is higher value in people genuinely working together for a common good: they share a mutual problem, own the processes for resolving it and the eventual solutions. This package often goes unrecognised in the calculus used to gauge the costs and benefits of establishing and managing any sort of partnership. This is especially the case when the partnership draws on the talents and skills of public and private sector organisations, where each partner contributes their own comparative advantage.

For more information, contact Nancy Muchiri (n.muchiri@aatf-africa.org)

Gaining an African Perspective:
Expanding the Open Forum on Agricultural Biotechnology in Africa

In the past several years, donors and the development partners, have increased their efforts towards ensuring that Africa's smallholder farmers benefit more fully from new agricultural technologies. However, the application of biotechnology – and especially GMOs – in the continent remains controversial. AATF is convinced that efforts to reverse decades of neglect of African agriculture must be backed by the proactive sharing of credible information about biotechnology among concerned stakeholders.

One of the key constraints to the adoption of biotechnology-derived products in many African countries is the fact that policy makers are often confronted with contradictory information about the potential benefits and risks associated with these commodities. Often, the passionate debates about biotechnology in Africa over-emphasise the social, ethical and political considerations, at the expense of scientific facts. But amidst the mix of a rapidly growing population, declining agricultural productivity and reduced resources for research in the sector, African policy makers are under pressure to make the right decisions about the testing and distribution of biotechnology products. Therefore, they are often searching for answers and clear guidance on issues related to biotechnology.

In response, in 2006, AATF in partnership with like-minded organisations, including the International Service for the Acquisition of Agri-biotech Applications (ISAAA), Uganda National Council for Science and Technology (UNCST) and Program for Biosafety Systems (PBS) launched the Open Forum on Agricultural Biotechnology (OFAB) in Africa. The initiative, whose inaugural meeting was held in Kenya in September 2006, brings together a wide range of stakeholders in African agricultural development. The forum enables direct interaction among scientists, journalists, industrialists, representatives from civil society organisations, lawmakers and makers and influencers of policy in the agriculture sector. OFAB provides opportunities for these groups to share their knowledge and experience, exchange information, make new contacts and explore new ways of bringing the benefits of biotechnology to Africa's smallholder farmers. At the same time, it affords participants the opportunity to raise concerns, get the facts about risks and deliberate on issues relating to the regulation of GMOs.

Participation in the Kenya Forum's monthly meetings has grown rapidly, reaching a peak in July 2008 when 95 people attended a session titled 'Agriculture, Biodiversity and Biotechnology – A Triad of Potential and Challenges for Food Security in Africa'. The key note for this meeting was given by the Deputy Director General of the Biodiversity International, Dr Kwesi Atta Krah.

In Uganda, where OFAB was launched in 2008, the meetings have been effective in providing pertinent information on varying biotechnology concerns. The forums have also become

platforms for participatory consultations with stakeholders on biotechnology issues. Importantly, the sessions have provided input into the country's draft Biosafety Bill, currently being prepared for submission to Cabinet.

In addition to the growing number of participants and broadening of its geographic presence, the 'flavour' of OFAB discussions has evolved. The Forum is now facilitating debate on a number of potentially high-payoff biotechnology products, biosafety, and biodiversity issues, as well as regulatory, stewardship management, and intellectual property rights issues. These broader discussions reflect a natural progression from the 'hot-button' issue of GMOs, to evidence-based debates on issues of common interest to all those involved in African agricultural development.

As noted in the AATF External Review (see page 34), the Foundation's efforts to facilitate dialogue among relevant audiences and share credible information about biotechnology more widely is largely hailed by the African agricultural development community and beyond. But AATF's work in this area is far from over.

The Foundation will continue to build on what has been accomplished through OFAB, in Kenya and elsewhere, to provide informed and proactive information on agricultural biotechnology from an African perspective. In 2009, AATF together with partners is planning OFAB chapters in more countries, starting with Tanzania.

(www.ofabafrica.org)

For more information, contact Nancy Muchiri (n.muchiri@aatf-africa.org)

Right to left: Drs Kenneth M Hosea, University of Dar es Salaam, Margaret Karembu, International Service for the Acquisition of Agri-biotech Applications and Norah Olembo, African Biotechnology Stakeholders Forum, exchange contacts during the OFAB meeting held in July 2008 in Nairobi.

Participants keenly follow proceedings during the forum meeting of October 2008.

Financial Report

This audited Financial Statement covers the period from January 2008 to December 2008 and provides comparative data for the two previous accounting periods (2006 and 2007).

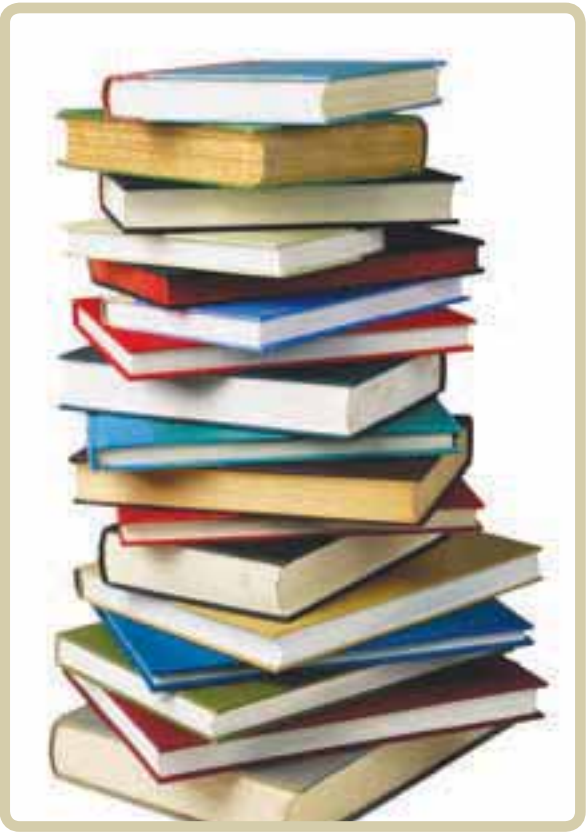
Income

Total income for the period increased substantially compared to the previous years as result of two news donors; the Bill and Melinda Gates Foundation and the Howard G Buffet Foundation. These two foundations are supporting a new AATF project, known as the Water Efficient Maize for Africa (WEMA). The total approved budget for the project (2008-2013) is $47,450,823, with the Bill and Melinda Gates Foundation and the Howard G Buffet Foundation contributing $42,450,000 and $5,000,823, respectively.

We greatly appreciate the vital and continued confidence and support of our founding financial partners: The Rockefeller Foundation, USAID and DFID, and warmly welcome the significant backing from the new donors, B&MGF and HGBF.

Expenditures

The notable increase in total expenditures in 2008 devoted to projects' activities reflects the large increase in total income for the period. Further, an analysis of the funds allocation showcases AATF's operational model and commitment to working through partnerships. Out of the total of $13,085,971 spent, $9,017,257 (69%) was devoted to outsourced research activities. The year's expenditure pattern also clearly demonstrates that more resources were allocated to programmatic activities than administrative overhead, with 90% of the Foundation's expenditure being project related, and only 10% going to support services.



Financial

The tables below summarise the statement of activities and the statement of financial position.

Summary statement of activities (abridged version)

For the period January – December 2008

	2,008	2007	2006
	(US$)	(US$)	(US$)
Income			
Grants	14,794,436	3,508,693	3,595,458
Other income	189,267	83,905	45,345
Total income	**14,983,703**	**3,592,598**	**3,640,803**
Expenditures			
Project related expenses	11,827,954	2,920,759	2,836,385
Management and general expenses	1,258,017	711,131	860,548
Total expenditure	**13,085,971**	**3,631,890**	**3,696,933**
Surplus/(deficit) for the period	**1,897,732**	**-39,292**	**-56,130**
Statement of financial positions (abridged version) As of 31 December 2008			
Assets			
Non current assets			
Equipment and motor vehicles	76,061	30,911	56,789
Intangible assets	-	-	–
	76,061	**30,911**	**56,789**
Current assets			
Bank and cash	541,840	388,538	562,777
Fixed deposit	1,283,669	1,042,076	
Accounts receivables	950,726	323,122	408,435
	2,776,235	**1,753,736**	**971,212**
Total assets	**2,852,296**	**1,784,647**	**1,028,001**
Liabilities and fund balances			
Current liabilities			
Unexpected grants payable	-	1,000,000	-
Accounts payable & accrued expenses	423,184	253,267	457,329
Total liabilities	**423,184**	**1,253,267**	**457,329**
Fund balances			
Restricted	1,283,731	165,528	206,728
Unrestricted	1,145,381	365,852	363,944
Total fund balances	**2,429,112**	**531,380**	**570,672**
Total liabilities and fund balances	**2,852,296**	**1,784,647**	**1,028,001**

AATF Board 2008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   West and Central African Sub-regional Coordinator, Programme for Biosafety Systems (PBS)
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   African Agricultural Technology Foundation
   Nairobi, Kenya

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Publications and Website Officer
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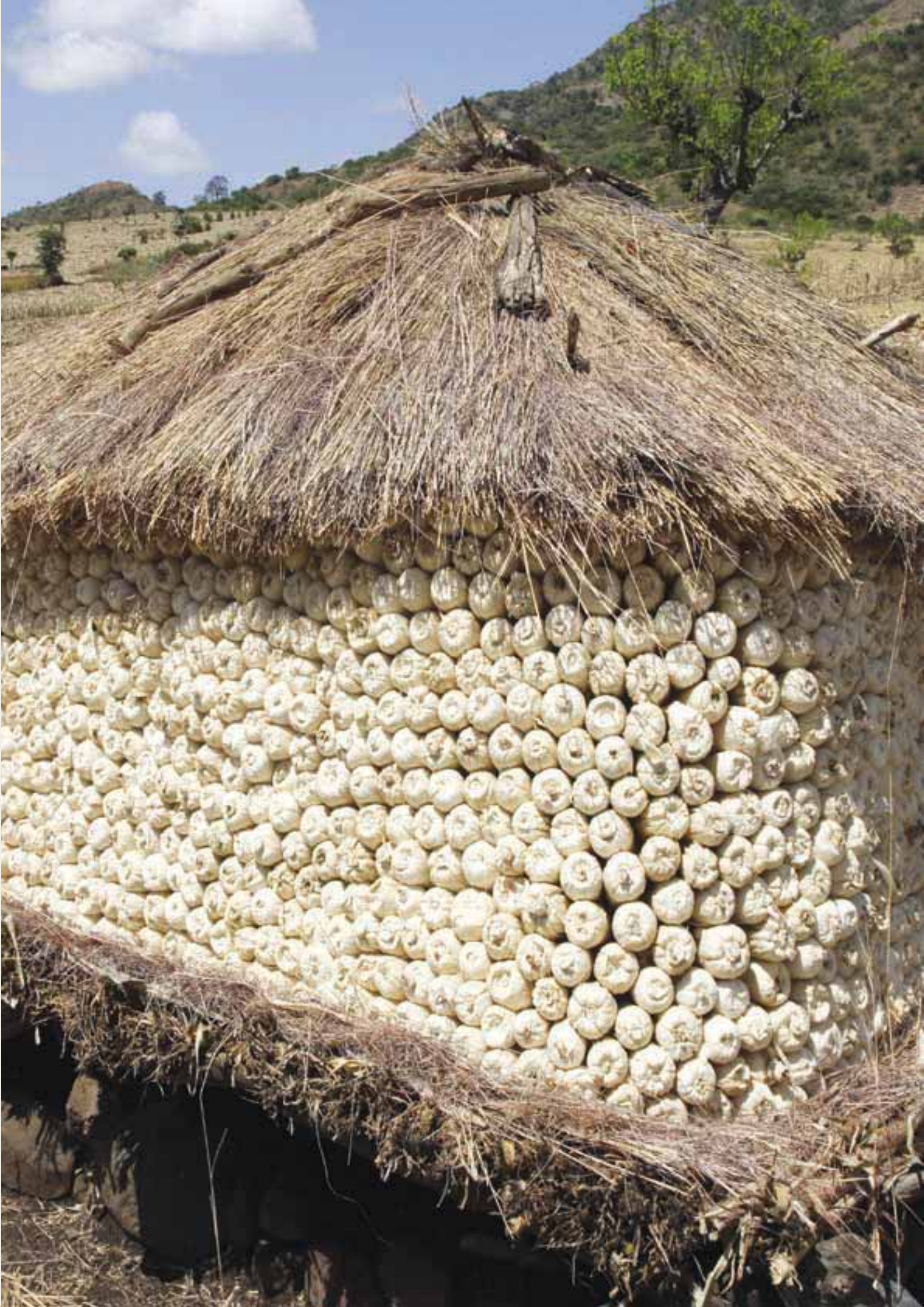

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