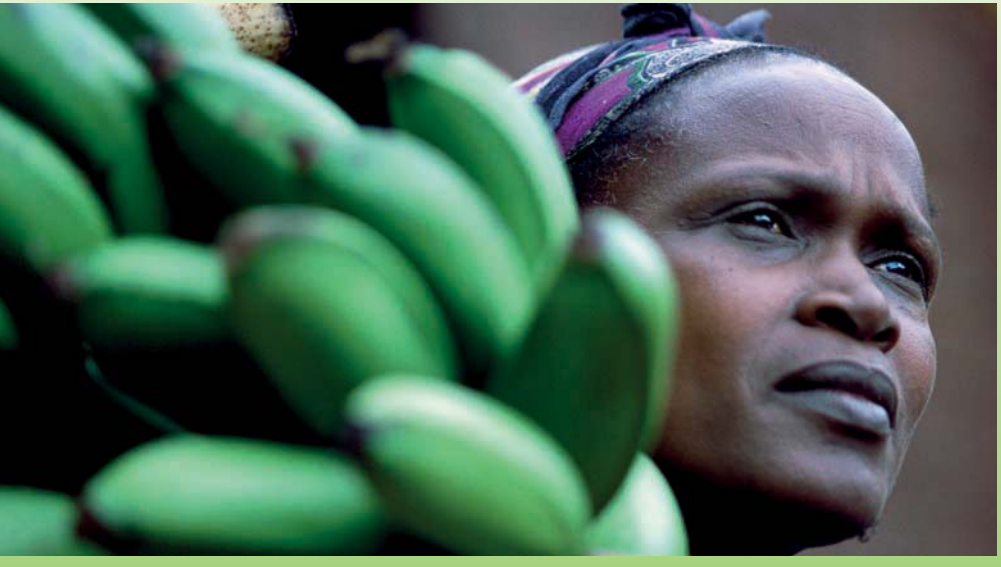
AFRICAN AGRICULTURAL TECHNOLOGY FOUNDATION
FONDATION AFRICAINE POUR LES TECHNOLOGIES AGRICOLES

Annual Report 2011



Practical Solutions for Farmers

Better tools, better harvests, better lives

PRACTICAL SOLUTIONS FOR FARMERS

ANNUAL REPORT 2011

AFRICAN AGRICULTURAL TECHNOLOGY FOUNDATION
FONDATION AFRICAINE POUR LES TECHNOLOGIES AGRICOLES

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

Annual Report 2011. Practical Solutions for Farmers

ISSN 1817-5813

Contributors: Idah Sithole-Niang', Denis T Kyetere, Hodeba J Mignouna, Nancy Muchiri, Grace Wachoro, Abu Umaru, Sylvester Oikeh, Elhadj Moussa Adam, Gospel Omanya, Daniel Otunge, Charity Mutegi, Ranajit Bandyopadhyay, Leena Tripathi, Amos Kimebur

Editors: Nancy Muchiri, Grace Wachoro, Monity Odera

Design and layout: BluePencil Infodesign (www.bluepencil.in), Hyderabad, India

Photographs: Cover – © Eric Miller/Africa Media Online; page 26: Jeremy Jowell/ Africa Media Online; page 36: R. Raman, AfricaRice; all other photographs AATF

Printing: Majestic Printing Works Ltd, Nairobi, Kenya

Cover: *Annoncitata Mukanarambe, a farmer in Rwanda*

Inside front cover: *Momodu Ahiaba, a cowpea farmer in Zaria, Nigeria*

Contents

Who we are

The African Agricultural Technology Foundation (AATF) is a not-for-profit organisation that facilitates public-private partnerships to access and deliver appropriate 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

A prosperous and a food secure Africa.

Mission – what we do for Africa's farmers

To access, develop, adapt and deliver appropriate agricultural technologies for sustainable use by smallholder farmers in Sub-Saharan Africa (SSA), through innovative partnerships and effective stewardship along the entire value chain.

Core Values – what keeps us strong

The Foundation strives to uphold three enduring core values: **Integrity**, **Dedication** and **Accessibility**. These values guide the decisions, actions and relationships as AATF works towards fulfilling its mission.

Our Strategy

The AATF strategic re-positioning is that of a Centre of Excellence in agricultural technology access, development and deployment. Its niche is an innovative response to challenges of low productivity in SSA agriculture which are anchored on three strategic goals:

- access to proprietary and associated technologies;
- develop and adapt technologies; and
- deploy and commercialise technologies for impact.

Our Roots

The model for the African Agricultural Technology Foundation resulted from two years of consultations (2000–2002) 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 smallholder farmers 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 systems, 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. The management and staff are responsible for the day-to-day management of operations and project development.

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 nationals of countries in Sub-Saharan Africa.

Investors

- *The United States Agency for International Development (USAID)*: provides economic, development and humanitarian assistance around the world in support of the foreign policy goals of the United States.
- *The United Kingdom's Department for International Development (DFID)*: a department of the British Government that leads Britain's fight against global poverty, delivering UK aid around the world.
- *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.
- *The Howard G Buffett Foundation (HGBF)*: is a private family foundation that works to improve the standard of living and quality of life for the world's most impoverished and marginalised populations. The Foundation's primary funding areas are agricultural resource development for smallholder and subsistence farmers, and clean water delivery to vulnerable communities in Africa and Central America.

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

Highlights Year 2011

January

- Training on issue management and communication around confined field trials (CFTs) is held in Abuja, Nigeria from 19–21 January, for the *Maruca* Resistant Cowpea Project and is attended by partners from Nigeria, Burkina Faso and Ghana.

February

- A Product Development meeting for the *Maruca*-Resistant Project is held in Dakar, Senegal from 24–27 February to review the 2010 methodology and data from Nigeria's confined field trial (CFT) and map out a detailed work plan for 2011.
- Her Excellency Mrs Rhoda Tumusiime, the African Union (AU) Commissioner for Rural Development and Agriculture pays a courtesy call on AATF. Discussions centre around finalisation of the Memorandum of Understanding that will structure how the two organisations could collaborate further and help mainstream AATF activities into the Comprehensive Africa Agriculture Development Programme (CAADP) process.

Above: HE.Hon Rhoda Tumusiime (centre) with AATF staff when she visited the Foundation's offices in February 2011

Participants who attended the Maruca-*Resistant Cowpea Project stakeholder awareness workshop in Farako Ba, Burkina Faso in July 2011*

- The Water Efficient Maize for Africa (WEMA) Project holds its third annual review and planning meeting in Zanzibar, Tanzania. The meeting was attended by over 60 participants where each Project team presented their 2010 activities and plans for 2011. Dr Emily Twinamasiko, NARO's Director for Research and Coordination was elected as the chair of the Project's Executive Advisory Board.
- The Nigerian chapter of the Open Forum for Agricultural Biotechnology in Africa (OFAB) holds a special session for the country's senate in Abuja to create awareness on biotechnology and the need to support passage of the country's Biosafety Bill.

March

- The WEMA-Uganda Project harvests its first confined field trial (CFT) of the transgenic drought-tolerant maize in Kasese, Uganda. The WEMA Project's first CFT was done in South Africa in 2009.

April

- The AATF Board of Trustees holds its 17th Board meeting in Nairobi, Kenya.
- The WEMA-Kenya Project harvests its first CFT of the transgenic drought-tolerant maize in Kiboko, Kenya.

June

- The Aflatoxin Control Project launches its development and commercialisation activities for Nigeria and Kenya at an event in Nairobi, Kenya, presided over by Dr Wilson Songa, Kenya's Agriculture Secretary.
- The WEMA Project deployment team holds a meeting with seed companies in Nairobi to introduce and discuss deployment of the expected drought-tolerant maize varieties.

July

- *Maruca*-Resistant Cowpea Project holds a stakeholder awareness workshop in Farako Ba, Burkina Faso attended by 40 participants including policy makers, government officials and farmers. The workshop updated stakeholders on the progress made by the Project in the region and the country and also created awareness on biotechnology.
- WEMA and OFAB-Uganda hold a biotechnology stakeholder meeting for the community around Kasese, Uganda to update them on Project progress and create awareness on biotechnology. The meeting was attended by over 60 participants including the local leadership, media and farmers.
- The Nitrogen Use Efficient Water Efficient Salt Tolerant (NEWEST) rice product development team holds a meeting in Kampala, Uganda to review progress made in developing transgenic lines, and field preparations for CFTs.
- The *Maruca*-Resistant Cowpea Project holds a CFT management training workshop for 40 team members in Burkina Faso.

August

- WEMA product development team members from the five Project countries tour trial sites in Kenya and Uganda to evaluate drought-tolerant conventional trials.
- The OFAB-Kenya team holds a two-day strategy development meeting in Nairobi, attended by 30 participants representing key biotechnology stakeholders in the country.
- OFAB launches its fifth chapter in Ghana as a collaboration between AATF and the Council for Scientific and Industrial Research at an event attended by over 50 participants including representatives from government and biotech stakeholders.

Participants at the Open Forum for Agricultural Biotechnology Kenya Chapter strategy development workshop held in Nairobi in August 2011

September

- The *Maruca*-Resistant Cowpea Project holds a stakeholder workshop and (CFT) site visit in Zaria for over 80 participants to provide an update on progress made in developing a *Maruca*-resistant cowpea in Nigeria.
- AATF holds discussions with the World Intellectual Property Organization (WIPO) on areas of cooperation around patent information services and capacity building, and participates in WIPO General Assembly.

October

- The Partnership for Aflatoxin Control in Africa (PACA) holds a workshop in Nairobi to explore how to increase investments and efforts towards aflatoxin control where AATF is nominated to sit on the interim committee that will set up an operational structure for the Partnership under the leadership of the African Union Commission.

November

- The WEMA-South Africa team holds a CFT community sensitisation meeting in Lutzville, Western Cape, attracting over 40 participants including farmers, media and local leaders. The community was updated on project progress and provided with information on biotechnology.
- The AATF Board of Trustees interviews candidates for the position of Executive Director at its 18th Board meeting in Kampala, Uganda.
- Over 45 WEMA Project spokespeople are trained on presentation skills in Tanzania as part of the Project's continuous capacity strengthening to enhance communication with different stakeholders.

December

- WEMA Project organises two workshops for 15 journalists in Kenya and 25 in Mozambique to enhance their understanding of agricultural biotechnology.

Dr James Gethi, the WEMA-Kenya Country Coordinator and Dr Walter Trevisan, the WEMA-Monsanto Corn Breeding Lead speak to journalists who visited the WEMA-Kenya confined field trial site in December 2011

Message from the Board Chair

The importance of access to agricultural technologies by our smallholder farmers continued to be a subject of much discussion during 2011. The key role that agricultural technologies play in improving productivity for smallholder farmers and the great impact that adoption of these technologies can make to livelihoods is recognised at the highest regional, sub-regional and country levels. Similarly, the many constraints to productivity and difficulties that affect farmers' access to appropriate technologies have been identified and various suggestions made. As these discussions continue, the challenge of feeding one billion people in Africa continues to be a cause for concern and a matter of urgency especially as the population is expected to hit the two billion mark in 20 years' time and severe challenges such as climate change emerge to complicate matters.

With a mandate of accessing and delivering appropriate agricultural technologies to smallholder farmers, AATF and its partners made good progress during 2011 that we are happy to share with you.

Work on developing a *Maruca*-resistant cowpea made significant progress by successfully conducting the first confined field trial (CFT) in Burkina Faso, while Nigeria installed its third CFT.

Efforts towards developing bananas resistant to banana *Xanthomonas* wilt (BXW) disease received a boost with access to the latest version of the *pflp* gene from Academia Sinica, Taiwan. The Project continued to develop and test lines that are resistant to BXW in Uganda. Scientists working on the Project also began developing farmer-preferred cultivars in Kenya with promising results.

The Water Efficient Maize for Africa (WEMA) project that is developing drought-tolerant maize varieties that can stabilise yield under moderate drought for use by smallholder farmers in Sub-Saharan Africa (SSA) submitted two varieties into National Performance Trials (NPTs) in Kenya. More than 25 varieties are set to go through the same process in the other Project countries in 2012. In addition, a technology request was prepared and sent to Monsanto Company to access their insect-resistant trait for stacking with the drought-tolerant trait in the Project.

Under the Nitrogen-Use Efficient Water-Use Efficient Salt Tolerant Rice Project, AATF successfully negotiated access to water use efficiency technologies (drought tolerant traits) and updates of the salt tolerance and nitrogen-use efficiency technologies being used in the Project from Arcadia Biosciences. We also signed a non-exclusive patent license agreement for a plant transformation system that will cover the vectors and other inventions that belong to the University of California. Significant advances were made by Arcadia Biosciences in the transformation work of generating and characterising the transgenic events that are set to be tested under CFT before the end of 2012 in Uganda.

"With a mandate of accessing and delivering appropriate agricultural technologies to smallholder farmers, AATF and its partners made good progress during 2011..."

Striga control work in Kenya received a boost through the Integrated *Striga* Management for Africa (ISMA) Project coordinated by the International Institute of Tropical Agriculture (IITA) where AATF as a sub-grantee received US$ 493,000 for Imazapyr Resistant (IR) maize technology delivery and stewardship activities. In Tanzania and Uganda, preparations are underway to commercialise the IR maize technology once the herbicide is registered.

I am also glad to report that AATF continued expanding its partnerships and collaborations so as to comprehensively and holistically address smallholder farmer constraints in SSA. AATF worked with partners to develop joint proposals to address the aflatoxin contamination problem in maize and peanuts in Nigeria and Kenya; and the *Striga* infestation in maize under the ISMA Project in the same countries. The two proposals were approved and work on the two Projects began in 2011.

The Board of Trustees also made some significant progress. We successfully recruited Dr Denis Tumwesigye Kyetere as the Executive Director for AATF in December 2011. Dr Kyetere assumed office in January 2012. Dr Kyetere who is the former Director General of the National Agricultural Research Organisation in Uganda has over 30 years' experience in agricultural development, and has served on various Boards in SSA. With his wide-ranging experience and knowledge of Africa's agriculture, hands-on participation in partnership formation and management, product commercialisation, resource mobilisation and donor relations, the Board has confidence that Dr Kyetere will lead AATF to greater heights.

In this regard, I would like to take this opportunity to thank our partners enormously for their support, advice and patience during the time we sought to fill this critical position at AATF. I would also like to take this opportunity to thank Dr Jacob Mignouna, the Director of Technical Operations, for exceptional leadership as the Acting Executive Director during that period and indeed the entire AATF staff who continue to preserve the institutional memory that is pivotal to our success as AATF delivers on its mandate.

The Board bid farewell to Dr Peter Matlon and Dr Mishio Oishi who left to pursue other equally important commitments. The Board appreciates their time and dedication as it welcomes Mr Kwame Akuffo-Akoto and Dr Jinkun Huang who joined as new members in 2011. The Board fondly remembers Dr Robert Harness, who passed away in August 2011. Dr Harness was an independent consultant specialising in biotechnology policy, product regulatory approval and public acceptance programmes. He had a great and positive impact on AATF during his tenure, and AATF will miss his engagement, participation and contribution to various discussions. May his soul rest in peace.

Looking back, 2011 was a good year for AATF and on behalf of the Board I would like to most sincerely thank all AATF partners, investors, staff and Board members for their support and commitment to the fulfillment of the AATF vision and mission.

Prof Idah Sithole-Niang'

Chair, AATF Board of Trustees

Message from the Executive Director

I joined AATF in January 2012 and was therefore not part of the team that accomplished the results being covered in this report. However, I would like to take this opportunity to share my vision and plans for AATF going forward.

I wish to first of all commend the staff, management and Board of AATF for the excellent work that they continue to do. Bringing proprietary technologies on a royalty-free basis for use by smallholder farmers in Sub-Saharan Africa (SSA) and doing that through partnerships and collaborations with others is no mean feat. The few months I have been at AATF have given me enough experience and evidence to say this.

I believe that agricultural technology can and should make a difference to our farmers' lives. To achieve this, business as usual will not get these technologies into the hands of the farmers – there is a lot more that needs to be done, some differently.

My key priority will be to support AATF attain its mission – to ensure smallholder farmers in SSA have access to the same affordable and productive agricultural technologies available to farmers in most parts of the world. I will therefore focus on innovative partnerships – partnerships that will effectively deliver on the goal and effective product stewardship that will ensure the responsible management of the agricultural technologies from their development stage to commercialisation and use. This will ensure quality products are realised through our projects and that the intended farmers use them in the best way.

I will also focus on expanding the AATF resource and technology base and positioning AATF to effectively respond to the needs of smallholder farmers

in SSA. To achieve this, it will be important that the AATF niche in the agricultural development agenda – that of providing an innovative response to challenges of low productivity in SSA's agriculture – is recognised. This will call for re-positioning AATF as a centre of excellence in agricultural technology access, development and deployment. In line with this, I am working with the AATF Board, management and staff to finalise a strategy-refresh exercise that seeks to ensure that the Foundation responds to the changing and challenging agricultural environment in which we are operating in.

To support AATF move its mandate forward, I will focus on the following key areas to support excellence:

"My key priority working with AATF will be to support AATF attain its mission – to ensure smallholder farmers in Sub-Saharan Africa (SSA) have access to the same affordable and productive agricultural technologies available to farmers in most parts of the world."

1. *Innovative partnerships as the means through which AATF will attain its goals:* AATF depends on the collaboration and goodwill of others. Structuring partnerships to effectively respond to and deliver on the AATF mandate will continue to be a key focus for the Foundation. The partnerships approach will be embedded and embraced at all stages in the projects' value chain, from formulation to development and deployment.
2. *Impact driven and results based management:* AATF has recorded enormous progress during its last eight years of operation and this points to great promise towards farmers' access and use of proprietary technologies. This progress also captures useful lessons that can be shared with others. Focus will now be directed towards tracking this progress and lessons, reporting on them and seeking feedback from stakeholders which will require a robust monitoring and evaluation system.
3. *Expanding technological base to include both long and short term projects that will provide AATF with a stream of products*: The challenges of SSA agriculture are acute and urgent and AATF will work towards responding to this need. There will therefore be need to balance the products portfolio to include all technologies. These could be transgenic, conventional, mechanical or chemical based.

4. *Strengthening AATF's capacity to deliver*: This will take into account building staff competence to balance scientific and commercial orientation, looking at internal support systems such as monitoring and evaluation and knowledge management; and expanding the financial resource base to support current and future planned work.

I am aware that there are various challenges ahead and I therefore call on all our partners, friends, associates and especially staff, to continue with their support and advise, that has been invaluable to the Foundation in the past.

I pledge AATF's continued commitment to our investors, partners and smallholder farmers in SSA to deliver on its mandate.

Dr Denis Tumwesigye Kyetere
Executive Director

Striga Control in Maize Project

Uganda prepares to deploy seed to control *Striga* infestation in maize

The year 2011 saw significant progress made towards continued efforts to deploy the Imazapyr Resistant (IR) maize technology in Kenya, Uganda and Tanzania. IR technology comprises of a herbicide-resistant maize seed that is coated with the Imazapyr herbicide. The technology prevents the development of *Striga* seedlings on the maize roots and also kills the *Striga* seeds that are in the vicinity of the roots of the maize seedling.

In Uganda, the National Agricultural Research Organisation (NARO) submitted three promising lines for National Performance Trials (NPTs) evaluation during the long rains season. These were harvested in September 2011 and the three IR maize varieties showed better performance than the commercial checks. The varieties will undergo another test in the 2012 season.

According to an 'Ex-ante impact assessment of *Striga* control in East Africa' conducted by Kilimo Trust in 2010, *Striga* causes maize losses estimated at 76,568 tonnes annually estimated at US$ 17.9 million in Uganda. Introduction and uptake of the *Striga* control technologies such as IR maize varieties could save the country about 6.9 percent of food requirements that is usually lost to *Striga* infestation.

In Kenya, the commercial sale of IR maize variety (WS 303) is on-going. During 2011, 38 tonnes of certified seed were produced with 21 tonnes sold to farmers through agro-dealer networks – reaching at least 10,000 farmers in the

Above: Monica Akinyi, a farmer in Siaya county in western Kenya displays a maize cob from her Imazapyr Resistant maize farm during a farmer field day held in the area

Striga hot spots of western Kenya. Another 0.34 tonnes was used for awareness and education in farmer field demonstrations. Sale of the seed was supported through various promotion and education channels. These included agro-dealer training on IR maize seed technology benefits, handling and use that attracted a total of 59 participants; establishment of 340 strategic technology demonstration plots mainly along foot paths, roads and near market places; and organising over 30 farmer field days in Nyanza and Western regions. In addition, the revolving fund started by AATF to support IR technology access by farmers through agro-dealers facilitated 12-fold increase of seed sales from 1.7 tonnes in 2009 to 21 tonnes in 2011.

In Tanzania, Tanseed International Company planted 120 hectares from which 95 tonnes of seed was harvested. However, the seed was not coated for commercial seed sales because the process of registration of the Imazapyr herbicide is still ongoing. However, about seven tonnes was coated with the herbicide for use in demonstrations in the country, while about 50 tonnes was sold as grain to recover production costs by Tanseed International Company.

A woman prepares maize for sale at a market in Kisumu, Kenya

Integrated *Striga* Management for Africa Project

Striga control efforts in Africa received a major boost following approval of a joint US$ 6.8 million proposal by the Bill & Melinda Gates Foundation under the Integrated *Striga* Management in Africa (ISMA) Project. Coordinated by the International Institute of Tropical Agriculture (IITA), ISMA brings together the International Maize and Wheat Improvement Center (CIMMYT), the International Center for Insect Physiology and Ecology (ICIPE), Tropical Soil Biology and Fertility of the International Center for Tropical Agriculture (TSBF-CIAT), AATF and BASF. Following the approval of the proposal and subsequent funding, the ISMA Project was launched in May 2011 in Nairobi. AATF's role in the Project is to support delivery of IR maize technology delivery and stewardship of seed dissemination. One of the key achievements for AATF under the ISMA Project was the establishment of over six integrated large demonstration plots that showcased all the technologies under ISMA to enable viewing, evaluation and selection by farmers.

"The year 2011 saw efforts bear fruit in Uganda and Tanzania to commercialise the IR maize varieties and the increase of seed production and uptake in Kenya."

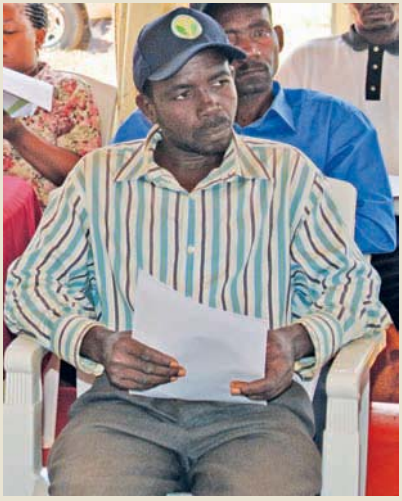
– Dr Gospel Omanya, Seed Systems Manager, AATF

A Striga*-infested maize farm*

In Sub-Saharan Africa (SSA), *Striga* infests about 20 million hectares of arable land. Serious infestation by the weed often results in total crop loss and even abandonment of arable land, leading to increased food insecurity and rural poverty among an estimated 100 million farmer households in SSA. Cereal crop yield losses in the whole of Africa are estimated to be US$ 7 billion annually.

Inadequate seed production and distribution remain a challenge, partly due to limited capacity and priorities of seed companies, lack of irrigation facilities and delays in herbicide registration. In addition, a number of agro-dealers continued to experience limited capital availability that impacted their capacity to stock seed. AATF and partners are pursuing support systems such as credit access systems involving seed companies, agro-dealers and farmers. A pilot revolving fund set up in 2010 has realised improved sale of certified seed to farmers living in *Striga* hot spots with at least 90 percent repayment rate.

"The year 2011 saw efforts bear fruit in Uganda and Tanzania to commercialise the IR maize varieties and the increase of seed production and uptake in Kenya," says Dr Gospel Omanya, the Seed Systems Manager at AATF. During 2012, efforts will be concentrated on supporting efforts towards the registration of the IR herbicide in Uganda and Tanzania. This will enable seed companies commercially produce and sell seed so that farmers whose maize production is perennially hampered by the infestation of *Striga* can have access to the innovative technology. Efforts will also be made to strengthen commercial seed delivery channels in the three countries.



"I didn't know the *Striga* seed lives in the soil,"
Stephen Mloka

My name is Stephen Mloka from Kiswira village, Matombo division in Morogoro South region of Tanzania. I am a farmer and I mainly grow maize, rice and bananas. Maize is the main crop that I grow. I am not sure how big the land I plant maize is. Here we don't measure land unless you are ploughing with a tractor. I plant about three kilograms of maize which I recycle from the last harvest. I don't buy maize seed for planting. I do the same for the rice that I plant. On average, I harvest about two bags of maize from the seed I plant. This is not enough for me and my family and I normally have to supplement by buying from the market.

Maize is a very important crop not only for my family but also for the people in this area. However, we face very serious challenges that seem to be getting worse with time. Drought and weeds like the one called *kiduha* (*Striga*) really affect our maize farming. Since we do not have a choice, we continue planting the maize year in year out despite these challenges. We would really benefit from a technology that can help us overcome the *Striga* problem.

We have been trying to control *kiduha* by uprooting it. However, this has not been effective. Today, I have heard from the experts that uprooting the weed may not be so effective since the *Striga* seed is in the soil. This is something that I didn't know. Further, I have heard that mixed farming and intercropping with some specific beans would help reduce the problem of *Striga* on our farms. I have also heard that there is a new maize seed called *Komesha kiduha* (stop *Striga*) but I have not had a chance to try it. From what I have heard today about its effectiveness, I would like to give it a try. The experts have said that the maize seed helps by killing the *Striga* seeds that are in the soil. I think this may be the solution since our method of uprooting does not seem to help.

Bt Cowpea Project

Burkina Faso undertakes confined field trials for *Maruca*-resistant cowpea

Burkina Faso became the second country in Africa to evaluate the efficacy of *Bt* cowpea against the *Maruca* pod borer as it carried out its first confined field trial (CFT) in Farako-Ba, Bobo-Dioulasso. The CFT approval was granted to the Institut de l'Environnement et de Recherches Agricoles (INERA) and planting was carried out in August 2011.

Preparations towards the CFT planting included designing the trial facility and presenting it to the Agency for the National Biosecurity (ANB), construction and inspection of the site by ANB and a two-day CFT compliance management training workshop to enhance capacity of personnel involved in managing CFTs on the theory and practice of confinement. These preparations and advice by the regulatory agency contributed to the successful conduct of the CFT by the Burkina Faso team that ensured compliance to the regulatory requirements.

The Institute of Agricultural Research (IAR) in Zaria, Nigeria, planted its third CFT in August 2011 following approval by the Federal Minister of Environment after review and recommendations from the National Biosafety Committee (NBC).

The Council for Scientific and Industrial Research Organisation (CSIRO) in Australia provided the seed for both the Burkina Faso and Nigeria CFTs. The

Above: Project partners inspecting the crop at the Cowpea confined field trial in Zaria, Nigeria

candidate lines were selected after passing stringent criteria for single copy of the transgene; good levels of *Bt* expression, absence of vector backbone sequences, homozygosity, high mortality in *in vitro* bioassays using flowers and first/second instar *Maruca* larvae and phenotypes similar to the parental control.

To ensure that there was an adequate supply of lab-reared *Maruca* larvae, the Project contracted the International Institute of Tropical Agriculture (IITA) in Ibadan, Nigeria, to supply the larvae in addition to training the Project technical teams on how to establish and maintain the *Maruca* colony. Following this, IAR, Nigeria and INERA, Burkina Faso set up fully functional rearing facilities to provide continuous supply of *Maruca* for the subsequent field and greenhouse experiments.

Both CFTs were harvested in November 2011 and the teams conducted the required postharvest trial site monitoring for emergence, removal and destruction of volunteer plants. Results from the two CFTs show that both were successful and clearly indicated that there are at least two promising lines from which to choose for backcrossing and further biosafety and molecular studies.

Ghana still awaits approval from the country's NBC to conduct its CFT. The application was submitted to the NBC in May 2011 and a technical committee constituted to review the application.

Project team members at the Burkina Faso Maruca *rearing facility in Farako Ba*

A cowpea trader at her market stall in Abuja, Nigeria

Regulatory compliance

The two CFTs in Nigeria and Burkina Faso were subjected to periodic inspection audits for compliance. The regulatory officials from the Federal Biosafety Office, Nigeria and the ANB in Burkina Faso reported no breaches regarding CFT compliance. The Project also received approval from USAID following satisfactory review of the Initial Environment Examination report in respect of the previous CFT.

Communications and outreach

One of the challenges being faced by the Project's communication team in its endeavour to create awareness on the need for farmers to adopt biotechnology is the low levels of understanding of GM technology in the target countries.

The Project therefore supported and participated in biotech awareness activities in Ghana, Nigeria and Burkina Faso. In Ghana, a seminar on biotechnology for parliamentary select committees that discussed the status of biotechnology in the country, the provisions of the Biosafety Bill and socio-economics of biotechnology was held. In Nigeria, presentations were made at Science journalists' conferences while Burkina Faso held a Project progress briefing event for key stakeholders.

Both Nigeria and Burkina Faso also carried out one-day community sensitisation meetings to raise awareness on the trials being carried out at

the stations and provide stakeholders with an opportunity to interact with the Project scientists.

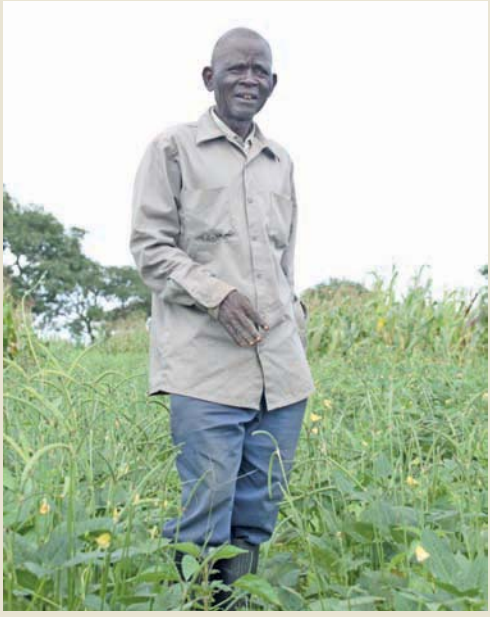
A workshop on issue management and communications around CFTs was held in Abuja, Nigeria, and was attended by Project partners. The workshop included a practical session on message development.

Planning and review meeting

The annual Project review and planning meeting was held in January 2011 in Dakar, Senegal, and was attended by the Project's principal investigators and entomologists from the three countries and the Project's Advisory Committee members. The partners reviewed each country's insect rearing capability in preparation for the 2011 CFTs; the methodology and data from the 2010 CFT conducted at IAR, Zaria; progress made at CSIRO towards the generation and characterisation of new transgenic events for the CFT in 2011; and the transformation with new constructs targeting the *Cry1Ab* to the chloroplast. In June 2011, the Project held another meeting in Purdue University that also reviewed progress in addition to discussing sustainable funding.

> *"The year 2011 recorded tremendous progress on many fronts with the two trials in Nigeria and Burkina Faso recording positive results ..."*
>
> – Dr Nompumelelo Obokoh, Cowpea Project Manager

"The year 2011 recorded tremendous progress on many fronts with the two trials in Nigeria and Burkina Faso recording positive results with distinct and marked difference in the level of *Maruca* damage between the conventional cowpea plants which were heavily damaged and the transgenic plants that showed no apparent damage," says Dr Nompumelelo Obokoh, the Cowpea Project Manager. "Following this success, the fourth CFT in Nigeria, the second in Burkina Faso and the first in Ghana will be established in 2012 to better evaluate and compare the efficacy of *Bt* cowpea against *Maruca* using the promising lines from the 2011 CFTs," she adds.



"I look forward to a high yielding cowpea variety that is resistant to pests and diseases,"

Momodu Ahiaba

I am Momodu Ahiaba from Samaru Zaria, in Kaduna State, Nigeria. I have a family of five members. I am a farmer and I grow cowpea as the main crop. I have grown cowpea for the last 25 years. I can say it is my livelihood. However, I also grow other crops like maize and soy bean.

Given the importance of cowpea in Nigeria and to me and my family, I plant cowpea on half of my farm. Out of a total of four hectares, I plant cowpea on two hectares. Every season I harvest between 15 and 25 bags (1.5 – 2.5 tonnes). Cowpea is a major source of income for me. I usually don't take my produce to the market. People come to my home to buy. However, I don't sell everything, I keep aside an amount for home consumption.

As every other farmer, I would wish to get a better yield for my crop. When possible, I plant improved cowpea seed varieties. One of the challenges I face is attack by insects especially the one known locally as *tsutsan wake* (*Maruca* pod borer). I try to control them by spraying which sometimes I do up to seven times in some seasons. The spraying works but it is capital intensive and the chemicals can also be harmful if not well managed. For it to be effective, one has to spray the cowpea early – within two weeks of planting.

I look forward to cowpea seed varieties that can control the attack by pests. I believe such varieties would reduce my costs of growing cowpea, increase my yields and also the income I get from the sale of the crop. I would want researchers to develop seeds that are high yielding and are resistant to pests and diseases.

Banana Bacterial Wilt-Resistant Project

Development of Kenyan banana varieties with resistance to bacterial wilt begins as promising trial results are reported in Uganda

Work on developing banana varieties that are resistant to the Banana *Xanthomonas* Wilt (BXW) disease in Kenya began in 2011 following promising research results in Uganda that demonstrated that constitutive expression of the sweet pepper *hrap* or *pflp* gene in banana resulted in enhanced resistance to *Xanthomonas* (Xcm) wilt. These results paved way for initiating the transformation of additional farmer-preferred cultivars in Kenya.

The International Institute of Tropical Agriculture (IITA) began the process of generating more transgenic lines with additional farmer-preferred cultivars at the Biosciences east and central Africa (BecA) hub based at the International Livestock Research Institute (ILRI) in Kenya. The embryogenic cell suspensions of a plantain cultivar *Gonjamanjaya* were transformed and about 300 transgenic plantlets obtained and validated for presence of the transgene. Molecular analysis (PCR) was performed with all the 300 lines and the presence of the transgene was confirmed. Fifty PCR positive lines were multiplied and transferred to pots in a glasshouse. The next step will be to evaluate these lines for disease resistance. The remaining lines will also be multiplied for disease evaluation.

The cultures of dessert banana cultivar *Gros Michel* and *Cavendish*, and plantain cultivar *Gonjamanjaya* were initiated at the IITA/BecA hub. The embryogenic callus was obtained for banana cultivar 'Gros Michel' and plantain

Above: The Banana Bacterial Wilt-resistant confined field trial in Kawanda, Uganda

cultivar *Gonjamanjaya* which were transferred to a liquid medium for initiating cell suspension. The cell suspensions of both the cultivars were used for transformation using pBI-Hrap, pBI-Pflp and pBI-Hrap-Pflp gene constructs.

The BXW disease threatens the livelihood of millions of farmers in eastern Africa who rely on banana as a staple food and for income generation. The disease, which was first identified in Uganda in 2001 and subsequently reported in the Democratic Republic of Congo, Rwanda, Tanzania and Kenya, is very destructive, and infects all banana varieties. Scientists at the International Institute of Tropical Agriculture (IITA) and Uganda's National Agricultural Research Organisation (NARO), together with AATF, have been working to develop varieties with resistance against *Xanthomonas* through the use of transgenic technologies using the plant ferredoxin like protein (*pflp)* gene and hypersensitivity response assisting protein (*hrap)* gene isolated from sweet pepper by Dr Teng-Yung Feng of Academia Sinica in Taiwan. The Project is developing a transgenic banana with resistance to BXW from East African preferred germplasm.

In Uganda, the transgenic plants (mother plants and first ratoon) and non-transgenic plants under confined field trials (CFT), were evaluated for BXW resistance through artificial inoculation at the National Agricultural Research Laboratories in Kawanda. Plants were then assessed for disease symptom development and 12 lines (7 lines with *hrap* gene and 5 lines with *pflp* gene) were identified as showing 100 percent resistance. However, all transgenic lines have significantly higher ($P \leq 0.05$) resistance in comparison to the control non-transgenic plants. The bunch weight and size of transgenic lines of the harvested mother plants were found to be similar to the non-transgenic plants. The best 10 lines will be tested further with more replicates in another CFT at Kawanda in 2012.

Project partners tour the confined field trial site in Kawanda, Uganda

Hawking fried bananas at a market centre in Uganda

More than 100 transgenic lines of dessert cv. *Sukali Ndiizi* and 200 lines of plantain cv. *Gonjamanjaya* with stacked *hrap* and *pflp* genes were generated and validated for the presence of transgenes by PCR. Analysis on these lines and evaluation for efficacy against BXW showed that both genes were present and were expressed in resistant lines. Stacking is expected to enhance the durability of resistance against *Xanthomonas*.

The Project Principal Investigator (PI) at IITA, Dr Leena Tripathi says that transgenic lines with stacked gene constructs should have more durable and enhanced resistance in comparison to a single gene. This, she says, could be a useful strategy for developing broad-spectrum resistance as the elicitor-induced resistance is not specific against particular pathogens. Dr Tripathi and her team are also testing the bananas for resistance to fungal diseases like black sigatoka, a leaf spot disease of banana plants.

Regulatory compliance

Investigations on the efficacy of the transgenic banana continued under CFTs at Kawanda in Uganda. A compliance audit mission was carried out at the CFT site in November 2011 and no incidences of compliance infraction were identified. The CFT consisted of 65 lines (40 lines with *hrap* gene and 25 lines with *pflp* gene) that showed enhanced resistance in screen house trials that were planted for further evaluation.

In Kenya, an application was filed with ILRI's Institutional Biosafety Committee for contained use of transgenic banana. The revised application was further submitted to the National Biosafety Authority in Kenya and approval was obtained.

The Project's regulatory strategy – that will guide its regulatory approval process taking cognisance of the regulatory environment in the five countries of Uganda, Kenya, Rwanda, Burundi and Tanzania, and capacity needs essential for conducting sound CFTs – was developed and is under review.

Technology negotiations for additional genes

AATF successfully negotiated for access to an additional gene construct – modified *pflp* with signal peptide from Academia Sinica, Taiwan, for use in the Project. The gene was sublicensed to IITA. The construct was validated for the presence and integrity of the gene and two transformation experiments were initiated at the BecA hub. AATF also initiated the process of filing of patent applications protecting the new *pflp* gene in Uganda and Kenya.

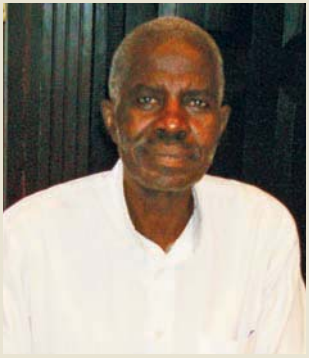
Outreach and capacity strengthening

The Project PI, Dr Tripathi presented a keynote speech at the International Society for Horticultural Science GMO 2011 conference in South Africa and at the Plant Transformation Technologies II conference in Vienna which focused on the development of transgenic bananas for *Xanthomonas* wilt resistance.

> *"Following the progress made in the Project, the next steps will include developing transgenic lines with additional cultivars, including plantain and dessert bananas preferred in east and central Africa ..."*
>
> – Dr Leena Tripathi, Project Principal Investigator

Muwonge Abubaker from Uganda who has been working on his PhD under the Project since 2008 progressed with his research thesis on 'Enhancing resistance against *Xanthomonas campestrisis* pv. *Musacearum* in bananas by co-expressing *pflp* and *hrap* genes'. He is expected to finalise and get his doctorate in 2012. Another PhD student from Kenya, Kenneth Mburu, is undergoing training in banana tissue culture transformation at ILRI's BecA hub.

"Following the progress made in the Project, the next steps will include developing transgenic lines with additional cultivars, including plantain and dessert bananas preferred in east and central Africa, filing an application with the National Biosafety Committee in Uganda for approval to conduct a CFT of transgenic banana with stacked genes and conducting a CFT in Kenya to evaluate the transgenic lines for BXW resistance," says Dr Tripathi.



"I urge scientists to develop technologies to address the banana bacterial wilt disease effectively," *Lubega Ben*

My name is Lubega Ben. I am a farmer from Kayunga district, Bugere county in Uganda. Banana farming has been my main occupation for over 40 years now. Bananas are and have been very important as a food security crop and for income generation for my family. Though right now my children have all grown up and left home, bananas are what has seen them through their schooling and also fed them.

I have about 15 acres of land and four acres are under banana farming. I harvest about 200 banana bunches every year, most of which I sell. However, the harvests could be better if we had better methods that could control the banana bacterial wilt (BBW) disease that has affected banana farming in this country since the year 2000. Apart from the BXW disease, we also face other problems like the banana streak virus, *black sigatoka* and other insects we call *kayovu* and *kaasa* that attack the banana roots and the butt.

The BXW disease is very widespread in Uganda. We have been using methods like immediate removal and destruction of the affected stumps, early removal of the male bud as this is where the bacteria affects first and planting of clean stumps to control the spread of the disease. However, these methods are not very effective. I would say there is about a 30 percent success rate which is not very effective for farmers who depend on banana farming for their livelihood.

I would urge our scientists to work on these banana production challenges. I would personally be ready to welcome any new technologies that would especially address the BBW disease. I hear there are scientists working on this but nothing has been released as yet. In addition, other critical areas like lack of fertilisers (and where available they are expensive), lack of irrigation facilities, poor storage facilities, lack of transport to markets and value addition for bananas need to be addressed.

Water Efficient Maize for Africa Project

Conventional drought-tolerant maize varieties submitted for national performance trials

The Water Efficient Maize for Africa (WEMA) Project made significant progress during the year as it entered two conventional hybrids into National Performance Trials (NPTs) in Kenya. One of the two hybrids performed well. However, both hybrids will be re-entered into the NPT in 2012 while another over 25 drought-tolerant hybrids will be submitted into NPTs in Kenya and Uganda during 2012.

The WEMA Project is developing drought-tolerant maize varieties through conventional breeding, marker assisted breeding and biotechnology. The conventional varieties are expected to be available to farmers from around 2014 while the transgenic varieties developed through biotechnology or genetic modification will be available from around 2017 subject to the necessary regulatory approvals in the WEMA countries. The participating countries are Kenya, Uganda, Tanzania, Mozambique and South Africa.

Testing of the WEMA transgenic varieties continued under confined field trials (CFTs). A total of five notifications/renewals and four seed import permits for CFTs were received from the regulatory authorities in Kenya, South Africa and Uganda. A key development was the harvesting of the first CFTs of sub-tropical germplasm planted in late 2010 in Kenya and Uganda. A second round of CFTs was done in Kenya and Uganda. South Africa planted the third round of trials.

Above: The WEMA–Kenya team members participate in the planting of the second confined field trial in Kiboko, Kenya in August 2011

These trials were successfully managed to reach the targeted yield reduction under moderate drought stress of 40–60 percent compared to well-watered condition.

Using the doubled haploid (DH) method, the Project developed 6,000 lines which were tested in Kenya, Uganda and Tanzania. Results from the top 10 DH hybrids showed a significantly higher yield than the mean of year 2008 commercial checks grown under optimum moisture conditions and managed drought conditions. The DH technology allows for the development of maize inbred lines in less time than traditional methods.

Preparing for deployment

As the first five-year development phase (2008 – 2012) of the WEMA Project draws to an end, and advances into the deployment phase, a team was constituted in 2011 to develop a deployment strategy. The team, consisting of representatives from the WEMA partner organisations, regional seed trade associations, regional cereal growers associations, and NPT representatives from regional maize working groups was tasked to address the sustainable delivery of WEMA products to farmers during the second phase of the Project. The team held a meeting in June 2011 to develop the deployment phase milestones and activities. The team also held a consultative meeting with 16 seed companies from the five WEMA countries to seek their input into the seed dissemination strategy for phase two.

WEMA Product Development Team members compare notes after touring one of the Project's conventional maize trial site in Kigumba, Uganda

A maize trader at a market in western Kenya

Communications and outreach

The WEMA Project continued with its communications and outreach efforts to keep stakeholders engaged with the Project and updated on the progress it was making towards developing and making available the drought-tolerant maize varieties to smallholder farmers. WEMA was showcased and presented in over 57 local and international events including 12 agricultural shows and exhibitions, four national and community stakeholder meetings, 10 CFT site visits where different stakeholders were hosted, and 15 scientific conferences and workshops. The Project continued with proactive engagement with the media which resulted in over 72 mentions in both regional and global media. The first Project progress report covering activities from March 2008 – March 2011 was produced and shared with stakeholders.

In addition, the partners developed and submitted a chapter titled 'Water Efficient Maize for Africa Project as an example of a Private Public Partnership' for publication in the book *Biotechnology in Agriculture and Forestry* Vol. 67 by Springer.

Regulatory compliance

Regulatory compliance for the WEMA Project is a key factor that has great bearing on its success. During the year, the capacity for regulatory compliance within the Project was enhanced through holding of stepwise (at planting, growth, harvest and postharvest) compliance training workshops in Kenya,

Uganda and South Africa. As a result, all sites and trials were found to comply with the regulatory requirements as confirmed by both internal project regulatory audits and external regulatory audits carried out by the regulatory agencies.

Capacity strengthening

Various capacity strengthening activities were undertaken for project teams to enhance their contribution towards the attainment of the Project milestones. The product development team members participated in a study tour to Thailand where they were exposed to various aspects of field operations such as use of tools that can speed up planting, and use of field data collectors to improve the speed and quality of data collection. A workshop on presentation skills was held for Project members to improve their engagement with various stakeholders and the media. Media training support was provided through workshops on biotech reporting and science writing for journalists in Kenya, Mozambique and South Africa that also updated participants on the progress the Project was making.

"As the project progresses into the last year of phase one in 2012, all teams will be preparing for the deployment phase which includes activities that will involve getting the WEMA products into the hands of smallholder farmers."

– Dr Sylvester Oikeh, WEMA Project Manager

Project meetings

The annual review and planning meeting was held in February 2011 in Zanzibar and was attended by more than 60 participants. This annual meeting brings together all partners working in the Project to report on progress and plan for the year ahead. It is one of the key factors that has contributed to the progress and success of the WEMA Project thus far. During the meeting, Dr Emily Twinamasiko was elected chair of WEMA's Executive Advisory Board (EAB) that is made up of Director-Generals/Directors of the eight institutions that make up the WEMA partnership. The EAB plays an oversight role in the Project.

"As the Project progresses into the last year of phase one in 2012, all teams will be preparing for the deployment phase which includes activities that will involve getting the WEMA products into the hands of smallholder farmers," says Dr Sylvester Oikeh, the WEMA Project Manager at AATF.

"With a drought-tolerant seed I can increase the acreage under which I plant maize," *Obadiah Mule*

My name is Obadiah Mutua Mule. I am a farmer in Mamiloki village in Machakos county in Kenya. I grow a mixture of food crops such as maize, millet and various types of beans. We face various challenges in this area. One of the key challenges is lack of adequate water. We depend on rainfall which is very little. This area is therefore prone to drought. Even when dams are constructed, we cannot afford to pipe the water into our homes and use it for watering our crops. Another challenge is that agricultural inputs such as sprays and fertilisers are expensive and we cannot afford them.

Maize is one of our most important food crops and we eat it in various forms such as *ugali* (a mixture of maize flour and water cooked until stiff) and our traditional food *muthokoi* (pounded maize to remove the husks). Porridge is also another meal which is good for children. However, maize is usually the first to be affected by the frequent drought. Most of the time we harvest nothing. The little maize that survives the drought is eaten when green where it is roasted or boiled.

I have seven children and providing for them is not easy. I have to buy maize from the market which is very expensive. In order to provide for my family, I do casual jobs like digging for people. This year's long rains failed. The rains came briefly and then disappeared completely. I had planted maize but it didn't survive. I harvested absolutely nothing from my farm.

If we can get a maize seed that can do well even in drought-prone areas, it would really help. I am willing to spend money to buy that seed if I know that I will harvest something substantial at the end of the season. I will even increase the acreage under which I plant maize.

Nitrogen-Use Efficient Water-Use Efficient and Salt Tolerant Rice Project

Uganda approves testing of rice in confined field trials

Following significant strides made in product development since the inception of the Nitrogen-Use Efficient (NUE), Water-Use Efficient (WUE) and Salt Tolerant (ST) Rice Project in 2008, preparations began in earnest in 2011 to test the transgenic events in confined field trials (CFTs) in Ghana and Uganda. The Uganda National Biosafety Committee (NBC) granted approval to the Project in December 2011 to test the transgenic rice lines for nitrogen-use efficiency and drought tolerance, which rank high as production constraints in Uganda. The approval followed an application lodged by the National Agricultural Research Organisation's National Cereal Crops Research Institute in July 2011.

Preparing for field trials

In preparation for the trials, CFT site development and land preparation involving construction work, and nitrogen depletion and soil analysis were done at the Crops Research Institute in Ghana and the National Agricultural Research Organisation in Uganda.

Sensory tests were also done in Ghana by the Food Research Institute of the Council for Scientific and Industrial Research, aimed at evaluating four Nerica rice varieties to determine their consumer acceptability. The four varieties (NericaL19 (Togo) = L28, NericaL19 (AfricaRice) = L29, Nerica4 = N4 and Jasmine85 = L41), were evaluated for appearance (whiteness), aroma, taste,

Above: Various local rice varieties that will be considered for back-crossing with NEWEST lines being tested and compared for yield, maturity, and grain size among other characteristics.

initial cohesion (the extent to which rice grains stick together), hardness and mouth feel. The best alternatives for the check sample were L28 and L29; with L29 being scored as 'like very much' due to its appearance, great taste, good cohesion, mouth feel and aroma.

Technology negotiations

AATF commenced negotiations with Japan Tobacco for access to their PureIntro® transformation technology for use in the Project. The PureIntro® is an agrobacterium-mediated plant transformation technology that is recognised worldwide as the standard transformation system. The technology reduces development costs and time. PureIntro® has been licensed by Japan Tobacco to around 50 private and public entities worldwide for numerous crops including maize, rice, wheat, barley, sorghum, banana, sugarcane, switch grass, miscanthus and turf. The negotiations are expected to be finalised in 2012.

In addition, AATF and the University of California (UC), Davis signed a non-exclusive patent license and bailment agreement for a plant transformation system that will cover the GATD vectors and other inventions that belong to the UC, Davis. Technology license agreements with Arcadia Biosciences were also concluded to include the water-use efficiency (drought tolerant technology/gene) and updates of the salt tolerance and nitrogen-use efficiency technologies being used in the Project.

Rice is an important staple food and a commodity of strategic significance across much of Africa. Driven by changing food preferences in the urban and rural areas and compounded by high population growth rates and rapid

The NEWEST Rice Product Development team members during a meeting held to review the Project's progress in Kampala, Uganda.

Rice on sale at a store in Accra, Ghana

urbanisation, rice consumption in Sub-Saharan Africa (SSA) has increased by 5.6 percent per annum over the years, more than double the rate of population growth.

However, the area under rice production in SSA has stagnated at about 8 million hectares producing about 14.5 million tonnes per year against an annual consumption of 21 million tonnes. These production and consumption trends imply a production deficit of about 6.5 million tonnes per year valued at US$ 1.7 billion that is imported annually.

The slow growth in domestic rice production has been attributed to the very low yield being achieved by rice farmers in SSA. Several abiotic factors account for the low rice production, but nitrogen deficiency and drought have been cited as leading constraints to upland rice production, while high salinity is increasingly becoming a major problem in many rice growing areas of Africa.

Review meeting

A product development team meeting was held in Kampala in July 2011 to review the progress made at Arcadia Biosciences in developing the transgenic lines, field preparation for CFTs and develop strategies to mobilise supplementary funds for the Project. The meeting participants also determined the measure of success by defining the proof of concept (gene effect/event performance); developed protocols for field experiments, phenotyping (agronomic evaluations), data collection and analysis; and developed the

experimental design for NUE seed increase in 2011 and for the experiment/field efficacy trial to be established in 2012.

According to Dr Jacob Mignouna, the Project Manager at AATF, "significant strides were made during the year towards preparing for testing of the transgenic events that will see Uganda install the first CFT for the Project in 2012 and consequently the Project will continue with efforts towards securing approvals to conduct the trials in Ghana in 2012."

"Significant strides were made during the year towards preparing for testing of the transgenic events that will see Uganda install the first CFT for the Project in 2012..."

– Dr Jacob Mignouna, Rice Project Manager, AATF

"I want to grow upland rice that does not need a lot of water,"
Florence Apochi

I am Florence Apochi from Osudoku-Asutsuare of the Greater Accra region, Ghana. Rice farming is my main occupation. I have grown rice for about 24 years and it is a source of livelihood for my family. It helps meet our financial needs and is also a source of food.

I grow rice on about one hectare of land. On average, I harvest about 44 bags which after drying is about 22 bags. Given that I depend on the rice I grow to meet my family's financial needs, I sell all that I harvest. The price per bag is about 60 Cedis (USD 32) during the planting season and 80 Cedis (USD 42) off season. I would say that the market prices are not very good. They can be better. We could also benefit from access to good markets which I believe would give us better prices for our produce. Since I sell all that I harvest, I normally go back to the farm to scout for any left-over rice for family consumption.

The kind of harvest I get could be much better. But we have challenges with fertilisers and other inputs. With available and affordable fertilisers I can produce more from my farm. The other important challenges that affect my rice farming and those of other farmers in this area are access to water to grow the rice as we pay for irrigation facilities provided by the government, poor rice seed varieties, tedious weeding and attack of the crop by birds. To try and overcome some of these challenges, I have joined a cooperative to assist me in accessing loans to purchase farm inputs.

What I would really want is better rice seed varieties that can give me higher yields as I don't grow anything else on my farm apart from rice. Therefore, I would urge researchers to work on better rice seed varieties. I would also really want to grow upland rice that does not need a lot of water and is easier to grow.

Aflatoxin Biological Control Project

Aflatoxin control technology tested in Kenya

Following the confirmation of the effectiveness of aflasafe™ to significantly reduce the risk posed by aflatoxins in maize and peanuts in Nigeria, similar work in Kenya progressed significantly in 2011 to evaluate efficacy of several Kenyan atoxigenic strains version of the biocontrol product named aflasafe KE01™ in on-station trials. AATF, in partnership with the International Institute of Tropical Agriculture (IITA), United States Department of Agriculture – Agriculture Research Services (USDA-ARS), Kenya Agricultural Research Institute (KARI) and the Ministry of Agriculture initiated the process for the evaluation of the biocontrol technology in maize.

Approval by the Kenya Standing Technical Committee on Imports and Exports (KSTCIE) paved way for the repatriation of 13 indigenous strains of *A. flavus* belonging to 11 vegetative compatibility groups, the operational unit of evolution within the species. These strains were evaluated for their potential to displace aflatoxin-producing strains on maize in Kenyan fields. The trials were conducted at KARI stations in Katumani and Kiboko, and the Bura Irrigation Scheme managed by the National Irrigation Board. Soil and maize samples from these trials were shipped to the USDA-ARS laboratory in the USA for further analysis that involved strain characterisation and aflatoxin analysis.

From the results, four strains were selected for further evaluation as they were highly competitive and widely distributed in Kenya across counties, years and

Above: Preparing the land for planting maize for the on-station trial for aflatoxin biocontrol in Bura, Kenya

substrates. Application of the biocontrol strains on the soil surface eliminated or drastically reduced the highly toxigenic *A. flavus* strain and *A. parasiticus* that naturally occur at high frequency in crops and soils in Katumani and Kiboko (93–100 percent displacement). Aflatoxin was reduced significantly by application of atoxigenic strains in treated plots, with a reduction of 85 percent in the treated plots (after adjusting for movement of atoxigenic strains).

Work in Nigeria continued during the year. Thirteen (13) tonnes of aflasafe™ were produced at IITA, Ibadan and distributed to farmers in Kaduna and Kano states. Field efficacy trials and demonstrations were conducted in collaboration with Commercial Agriculture Development Project in Kaduna, Kano and Enugu states; and the Millennium Village Project of the United Nations. Aflasafe™ was used by 434 farmers (309 for maize and 125 for groundnuts) to treat 855.5ha (783.5ha for maize and 72ha for groundnuts) in the three states.

During the efficacy trials in Nigeria, extension agents and farmers were trained on aflasafe™ application techniques where emphasis was placed on demonstrating the most appropriate stage for treatment of the crop, various field operations that must be carried out before aflasafe™ application, precautions during post-treatment period, and method of calibrating the amount of aflasafe™ to be used in fields of various sizes. The extension agents subsequently trained other farmers. Training materials including leaflets containing basic information on aflatoxins, instruction on aflasafe™ application in the field, and soil and grain sampling protocols were distributed to farmers and extension agents.

Dr Ranajit Bandyopadhyay discussing with farmers on the use of aflasafe™ in Kaduna, Nigeria

The carry-over effect of treating farmers' fields with aflasafe™ in Nigeria was also studied. According to Dr Ranajit Bandyopadhyay, the Aflatoxin Control Project Coordinator at IITA, fields that were treated with aflasafe™ continuously for two years (one application per year) showed 90 percent aflatoxin reduction while fields that were treated for the first year, but untreated during the second year showed 65 percent reduction in aflatoxin contamination levels.

Poor storage of maize grains harvested from treated and untreated fields was mimicked in experimental trials and then quantified for aflatoxin concentration to determine the carry-over efficacy during storage, of the field-applied strains used for treatment. Maize grains from continuously treated fields had a mean of 12.4ng/g of aflatoxin levels compared to 133.1ng/g in untreated control fields while samples from fields treated during alternate years had a mean of 25.9ng/g and untreated fields had a mean of 94.4ng/g. Thus, aflatoxin reduction in continuously applied and alternately applied fields was 91 percent and 73 percent, respectively.

Aflatoxins are metabolites produced by some species of fungi in the genus *Aspergillus*, the most notable being *A. flavus* and *A. parasiticus.* These fungi invade crops during maturation in the field and during storage contaminating them with aflatoxins. Maize and peanuts are the most susceptible crops to pre-harvest and post-harvest aflatoxin contamination particularly during periods of moisture stress during crop growth and when insect damage is prevalent.

Aflatoxin biocontrol is an effective means of controlling aflatoxins especially when other aflatoxin management strategies are used. Other strategies include insect control, timely harvesting, rapid grain drying, proper transportation and good storage, as well as good manufacturing practices. Results have shown that it is possible to reduce the aflatoxin burden significantly at harvest and during storage. Even where grains are not properly stored, the principle of competitive exclusion continues in the stores and is able to maintain lower levels of aflatoxin concentration when compared to levels in grains from untreated fields.

Capacity strengthening

Two KARI staff members were trained in 2011 to build the capacity of Kenyan scientists to work with the aflatoxin biocontrol technology. Dr Charity Mutegi worked for one month under the supervision of Dr Ranajit Bandyopadhyay

A woman sells peanuts at a market in Luanda western Kenya

in IITA, Ibadan, while James Karanja spent six months in the USDA-ARS laboratory in Arizona, USA under the supervision of Dr Peter Cotty. Renovation of a facility to establish a mycotoxin research facility at KARI was started.

Regulatory approvals

The process of obtaining registration approval for aflasafe™ in Nigeria continued. The dossier containing the efficacy data of aflaSafe™ was submitted to the National Agency for Food and Drug Administration and Control (NAFDAC) by IITA. Following comments received from NAFDAC, the dossier is being revised for final submission so as to obtain final registration approval.

In Kenya, engagement with the regulatory authorities commenced to gain insights on registration requirements for biological control agents in the country. The next step will be to apply for an experimental use permit from the relevant authorities for on-farm trials that will involve establishing efficacy, generating toxicology and ecotoxicological data and establishing the best rate of application of the biopesticide on maize crops.

Africa-wide Aflatoxin control

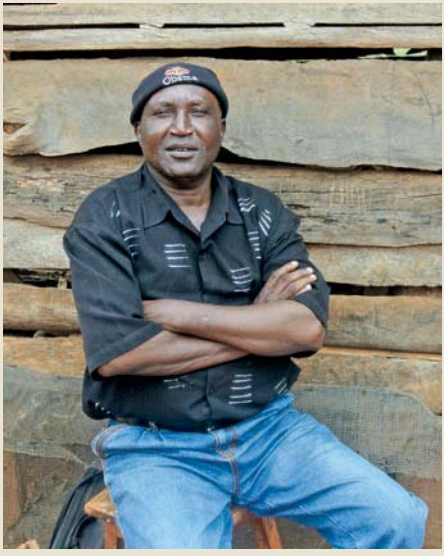
AATF and IITA continued to support and participate in the initiative to create an Africa-wide Partnership for Aflatoxin Control in Africa (PACA). This is a multi-donor and multi-institutional collaborative endeavour to increase investments and efforts towards aflatoxin control. At the last PACA meeting

organised by the Africa Union in 2011, AATF was nominated into the interim steering committee to represent implementing partners and contribute to the development of the partnership design and structure that is expected to be launched in 2012.

"Aflatoxin biocontrol activities carried out in both Kenya and Nigeria demonstrate that the application of aflasafe™ is effective in the control of aflatoxins both in the field and in storage and this is a technology that should be promoted widely for adoption," said Dr Bandyopadhyay.

"Aflatoxin biocontrol activities carried out in both Kenya and Nigeria demonstrate that the application of aflasafe™ is effective in the control of aflatoxins both in the field and in storage and this is a technology that should be promoted widely for adoption."

– Dr Ranajit Bandyopadhyay, Aflatoxin Control Project Coordinator, IITA



"An aflatoxin control product can save lives,"
Moffat Matolo

My name is Moffat Matolo from Iteta village, Kaiti in Makueni county of Kenya. I know the effects of aflatoxin contamination in maize very well. It is attributed to three deaths in my family. Previously before this incidence, I had heard about the problem on radio, but had never taken it seriously until it happened to my family.

In 2005, the rains came early catching us unawares just as we were about to harvest maize. To prevent damage by rain we quickly harvested and stored the maize on the floor. As it was not completely dry, we had to air it outside for many days. However, the rains continued for a prolonged period and instead of drying, the maize continuously got wet.

When we thought the maize had dried considerably, we milled it for home consumption. Shortly afterwards our whole family fell sick and seven family members were hospitalised. Unfortunately, my father, brother and a nephew did not make it. The hospital informed us that we were suffering from aflatoxin contamination from the maize. Our dogs and chicken also died as they had fed from the same maize flour. Initially we thought our family had been bewitched. However, agricultural and health officers visited our home and told us about aflatoxin contamination, how it comes about and how we can reduce it. That is when we realised the seriousness of aflatoxin contamination. This incidence sensitised people in the area about aflatoxin contamination as many were not aware.

Since then, we ensure that the maize dries in the field as much as possible before harvest and that we air it after harvest on tarpaulin or canvas and not on the bare ground. We then store it on a raised and ventilated area to minimise aflatoxin contamination. I have not as yet heard about any product that can control aflatoxin contamination but I can assure you I would be willing to buy it if it can save lives.

Open Forum on Agricultural Biotechnology in Africa

OFAB fifth chapter launched in Ghana

The Open Forum on Agricultural Biotechnology in Africa (OFAB) continues to be a valued platform for creating awareness and sharing knowledge on agricultural biotechnology in Africa to enhance public understanding and appreciation of the technology.

With Africa still lagging behind in exploiting the potential benefits of commercialisation of biotechnology products, because of misperception and information gaps, OFAB has continued to address these shortcomings by providing a forum for stakeholders to deliberate on the issues in an effort to raise their understanding and appreciation of the technology for informed decision making.

The Forum aims to enhance knowledge-sharing and awareness creation on agricultural biotechnology among key stakeholders such as policy makers, legislators, scientists, farmers, regulators and the media, among others.

In the period under review, all OFAB chapters made efforts to reach out to policy makers to provide them with credible information on agricultural biotechnology and the need for the establishment of science-based biosafety regulatory systems to facilitate research, development and deployment of innovative biotechnology crops to farmers in Sub-Saharan Africa. The Nigerian Parliament passed the Biosafety Bill which is currently awaiting presidential assent to become law while Ghana enacted its Biosafety Act.

Above: Participants at the OFAB-Ghana launch in Accra, Ghana

Initiated in September 2006 by AATF and its partners, OFAB has grown into five chapters – Kenya, Uganda, Tanzania, Nigeria and Ghana. The newest chapter was launched in Ghana in August 2011 as a collaborative initiative between AATF and Ghana's Council for Scientific and Industrial Research (CSIR). Each country chapter held several monthly meetings where topical issues were discussed by a cross-section of stakeholders.

OFAB sessions provide opportunities for participants to raise issues of concern, regarding biotech such as those related to safety, health, trade, ethics and potential risks and have them addressed by various experts through detailed presentations and discussion sessions with opportunity for questions and answers.

The OFAB-Ghana chapter was launched on 18 August 2011 by Ghana's Minister for Environment, Science and Technology, Hon Ms Sherry Ayittey. The Minister underscored the centrality of public awareness in creating a favourable environment for the application of modern agricultural biotechnology to boost food security, reduce poverty and conserve the environment.

The Chapter went on to hold four monthly meetings in 2011, focusing on the use of biotechnology to solve food security challenges and the need for the country to have a favourable biosafety regulatory environment. The meetings attracted large numbers of participants and wide media coverage.

Dr Dorrington Ogoyi of the University of Nairobi makes a presentation on behalf of his discussion group during the OFAB-Kenya strategy development meeting in Nairobi, Kenya

The OFAB chapters in Kenya, Tanzania, Uganda and Nigeria also held their monthly meetings where various biotechnology and biosafety issues were discussed. A total of 30 meetings were held by the chapters in 2011.

The OFAB-Nigeria chapter held a different type of event dubbed *Poster OFAB*. It attracted poster presentations from the agricultural research institutes and universities in Nigeria, the National Biotechnology Development Agency, AATF and the Programme for Biosafety Systems.

During the session, scientists and experts made formal poster presentations focusing on the relationship between science, technology, innovation, environmental protection, policy, trade, social benefits sharing and their impacts on economic development.

The session provided an opportunity for extensive interaction with participants where scientists presented their findings and challenged investors, policy and decision makers to create an enabling environment for proffering solutions that will influence policy and further bridge the gap between research and development.

The chapter also organised sessions outside Abuja where participants visited confined field trial (CFT) sites for the Bio-cassava Project in Umudike, and the *Bt* cowpea in Zaria. A forum was held for senators to provide them with information on biotech in preparation for their participation during the tabling of the Biosafety Bill in parliament in February 2011. This milestone event afforded policy makers an opportunity to interact with a wide range of scientists and have their concerns addressed in a highly interactive and open manner. Presentations covered the Biosafety Bill, the place of biotechnology in Nigeria, and the status of biotechnology and biosafety in Africa.

The Tanzania chapter supported a national agricultural stakeholders' workshop organised by the Agricultural Council of Tanzania. The discussions focused on opportunities and challenges of increasing agricultural productivity in the country.

The meeting discussed the agricultural inputs distribution systems, agricultural financing, taxes and levies in the agricultural sector, and the use of biotech crops as an option for increasing agricultural productivity. During the period, the Tanzania chapter also convened a discourse on the role of biotechnology for socio-economic development in the country.

Key discussion issues included the need to put the national biotechnology policy into practice. They also called for a review of the restrictive biosafety regulatory

regime to facilitate adoption and application of modern biotechnology in both productive and social sectors in the economy.

The Uganda chapter organised a session to discuss the national biotechnology and biosafety legislation with regulators. Another forum held in Kasese sensitised the local communities on modern biotechnology and addressed their concerns openly and objectively. The participants also visited the Water Efficient Maize for Africa (WEMA) Project CFT site to learn more about the benefits of the technology.

The highlight of the Kenya chapter activities was the development of its strategic plan through a two-day participatory workshop attended by key biotechnology stakeholders in Kenya. The strategy development process will guide the other chapters and also inform the development of the global OFAB strategic plan.

"OFAB can reach wider audiences by utilising different platforms, such as holding special sessions in the countryside, using social media tools like Facebook and holding special events like exhibitions to enhance visibility and deepen its impact."

The growth of OFAB into a mature brand and a valued platform for the exchange of information on agricultural biotechnology necessitated the development of its own logo to make it distinctive and uniform across Africa.

Key lessons learnt during the period were that OFAB can reach wider audiences by utilising different platforms, such as holding special sessions in the countryside, using social media tools like Facebook and holding special events like exhibitions to enhance visibility and deepen its impact.

Financial Report

These audited financial statements cover the period from January 2011 through December 2011 and provides comparative data for the previous accounting period, 2010.

Funding overview

AATF main investors in 2011 were:

- Bill & Melinda Gates Foundation
- Department for International Development (DFID), UK
- Howard G Buffett Foundation
- United States Agency for International Development (USAID)

Sub-grants were received from:

- International Maize and Wheat Improvement Center (CIMMYT)
- International Institute of Tropical Agriculture (IITA)

CIMMYT and IITA received grants from the Bill & Melinda Gates Foundation for the Integrated *Striga* Management for Africa (ISMA) and the Aflatoxin Biocontrol Projects. As a result of the partnership with the two institutions and its involvement in both Projects, AATF received sub-grants from them to perform Project specific tasks.

AATF appreciates all its investors for their contributions that are making a difference towards its work of assisting resource-constrained farmers access innovative and affordable agricultural technologies that improve their lives.

Statement of financial position

As at 31 December 2011 (US$)

	2011	2010
ASSETS		
Non-current assets		
Equipment and motor vehicles	71,028	111,500
Intangible assets	9,273	1,693
	80,301	113,193
Current assets		
Grants receivable	115,655	280,360
Other receivables	204,489	287,431
Bank deposits	4,246,018	2,010,259
Bank and cash balances	1,627,153	2,306,114
	6,193,315	4,884,164
Total assets	6,273,616	4,997,357
EQUITY AND LIABILITIES		
Current liabilities		
Unexpended grant payable	2,617,178	2,705,628
Deferred income	21,211	37,811
Payables and accruals	418,405	324,669
	3,056,794	3,068,108
Fund balances	3,216,822	1,929,249
Total liabilities and fund balances	6,273,616	4,997,357

Statement of comprehensive income (abridged version in US$)

For the year ended 31 December 2011

	2011	2010
INCOME		
Grant income	17,378,542	12,165,298
Other income	92,338	96,001
Total income	17,470,880	12,261,299
EXPENDITURE		
Project related expenses	15,019,092	10,166,965
Management and general expenses	1,164,215	1,580,474
Total expenditure	16,183,307	11,747,439
Surplus for the period	1,287,573	513,860
Percentage of management and general expenses to the total operating expenses	7.19%	13.45%
Percentage of project related expenses to the total operating expenses	92.81%	86.55%
	100%	100%

Financial status

The funding received as at 31 December 2011 was adequate for the Foundation's needs as all expenditures for the year were fully catered for by the income. The Foundation's finance is healthy both in terms of expenditures/income ratio and project expenditures/general operating expenses ratio.

In addition to the figures above, the independent auditors' opinion was that "proper books of accounts have been kept by the Foundation, and the accompanying financial statements give a true and fair view of the state of financial affairs as at 31 December 2011 and its surplus and cash flows for the year then ended in accordance with International Financial Reporting Standards and the requirements of the Kenya's Companies Act".

AATF Board Members 2011


1

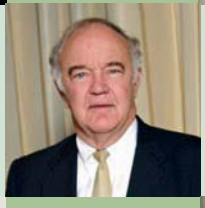

2


3


4


5


6


7


8


9


10


11

1. Prof Idah Sithole-Niang
Board Chair
Professor, Department of Biochemistry, University of Zimbabwe, Harare, Zimbabwe

2. Ms Josephine Okot
Vice Board Chair
Managing Director, Victoria Seeds Ltd, Kampala, Uganda

3. Mr Kevin Nachtrab
Senior Patent Counsel, Johnson & Johnson, Belgium

4. Prof Michio Oishi
Director, Kazusa DNA Research Institute, Kazusa-Kamatari, Kisarazu, Chiba, Japan

5. Prof Gordon Conway
Professor of International Development, Centre for Environmental Policy
Imperial College, London, UK

6. Dr Peter Matlon
Adjunct Professor Department of Applied Economics and Management,
Cornell University, Ithaca, New York, USA

7. Dr Robert Harness (deceased)
Independent Consultant Biotechnology Policy, USA

8. Dr Mariame Maiga
Regional Gender and Social Development Adviser, CORAF/WECARD Dakar, Senegal

9. Dr Wilson Songa
Agriculture Secretary, Ministry of Agriculture, Nairobi, Kenya

10. Dr Adrianne Massey
Principal, A Massey & Associates, Chapel Hill, North Carolina, USA

11. Mr Kwame Akuffo-Akoto
Chief Financial Officer, Alliance for a Green Revolution on Africa, Nairobi, Kenya

AATF Staff 2011









1. Hodeba Jacob D Mignouna
Director, Technical Operations / Acting Executive Director

2. Moussa Elhadj Adam,
Director, Finance and Administration

3. Alhaji Tejan-Cole
Legal Counsel

4. Francis Nang'ayo
Regulatory Affairs Manager

5. Gospel Omanya
Seed Systems Manager

6. Nancy Muchiri
Communications and Partnerships Manager

7. Nompumelelo H Obokoh
Project Manager, Cowpea

8. George Marechera
Business Development Manager

9. Sylvester Oikeh
Project Manager, WEMA

10

11

12

13

14

15

16

17

18

10. Peter Werehire
Publications and Websites Officer

11. Grace Wachoro
Project Communications Officer, WEMA

12. Umaru Abu
Communications/ Administration Officer, Abuja Office

13. Francis Onyekachi
Programme Officer, Abuja Office

14. Joseph Ndwiga
Programme Officer, Agri-Business

15. Pauline Mundia
Programme Assistant

16. Peter Musyoka
Programme Officer, Seed Systems

17. Jane Achando
Associate Legal Officer

18. Jacquine Kinyua
Executive Assistant to the Executive Director


19
20


21

22
23


24

25
26


27

19. Stella Simiyu-Wafukho
Programme Officer, Regulatory

20. David Tarus
Programme Assistant

21. Amos Kimebur
Accounting Officer

22. Maurice Ojow
Project Accountant

23. Caroline Thande
Administrative Assistant, WEMA

24. Nancy A Okita
Administrative/Human Resource Associate

25. Fatuma Wario
Administrative Assistant/ Events Coordinator

26. Gordon Ogutu
Protocol and Liaison Assistant

27. George Njogu
Driver

AFRICAN AGRICULTURAL TECHNOLOGY FOUNDATION
FONDATION AFRICAINE POUR LES TECHNOLOGIES AGRICOLES

African Agricultural Technology Foundation

PO Box 30709 – 00100

Nairobi, Kenya

email: aatf@aatf-africa.org • website: www.aatf-africa.org

Telephone and Fax

Direct

Switchboard: +254 (0)20 422 3700

Fax: +254 (0)20 422 3701

Via USA

Phone: +1 650 833 6660 3700

Fax: +1 650 833 6661 3701