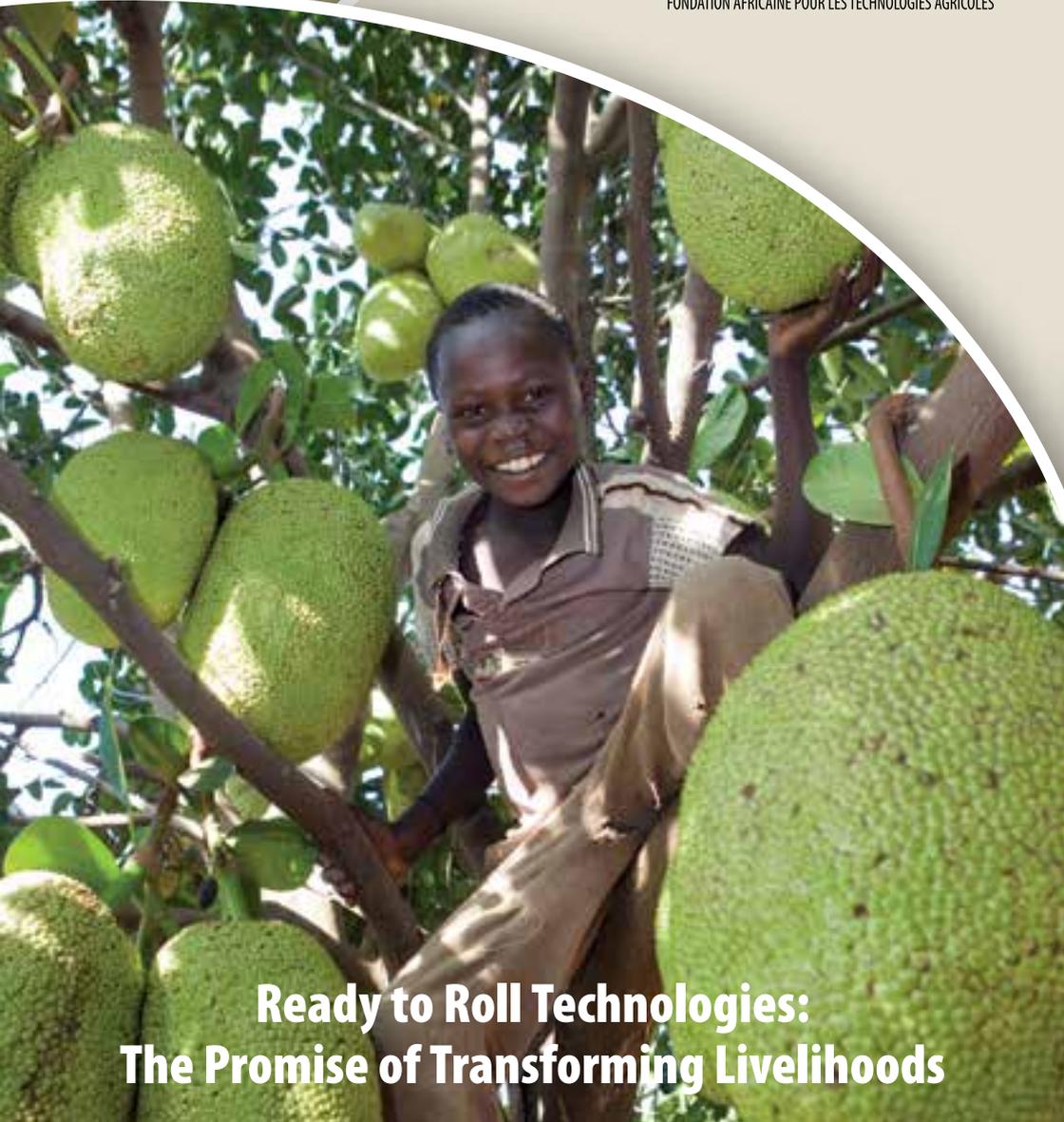


ANNUAL REPORT  
**2015**



AFRICAN AGRICULTURAL TECHNOLOGY FOUNDATION  
FONDATION AFRICAINE POUR LES TECHNOLOGIES AGRICOLES



**Ready to Roll Technologies:  
The Promise of Transforming Livelihoods**

*Better tools, better harvests, better lives*



*Ghana woman farmer carrying cocoa fruits.  
Copyright: thefrogblog.org.uk*

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

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*Contributors:* Abu Umaru, Alhaji Tejan Cole, Caroline Muchiri, Daniel Otunge, David Tarus, Denis T. Kyetere, Edgar Wavomba, Elhadj Moussa Adam, Everlyne Situma, Francis Nang'ayo, George Marechera, Gospel Omanyia, Grace Muinga, Idah Sithole-Niang, Jonga Munyaradzi, Kayode Sanni, Leena Tripathi, Mohammed Duba, Nancy Muchiri, Prince Addae, Sylvester Oikeh, Wandera Ojanji

*Editors:* Nancy Muchiri, Peter Werehire and Wandera Ojanji

*Design theme concept:* Nancy Muchiri, Peter Werehire, Wandera Ojanji and Everlyne Situma

*Design and layout:* Predon Company Limited, Nairobi, Kenya (info@predon.co.ke)

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*Cover:* A boy climbs up a jackfruit tree in Buwanyanga Village - Sironko, Eastern Uganda. Copyright: Jake Lyell

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*Girls harvesting fruits from the Pomme du Sahel, a nutritious and drought-tolerant fruit tree which is native to Niger and Burkina Faso. Copyright: ICRISAT*



## Who we are

# African Agricultural Technology Foundation

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 agricultural technologies. AATF also contributes to capacity building in Africa by engaging institutions 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 and is registered as a charity in Nigeria.

### **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 resource-constrained 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 Foundation's niche is an innovative response to the challenges presented by low productivity in the agriculture sector in SSA. Three strategic goals guide the organisation:

- Access appropriate technologies;
- Develop and adapt technologies; and
- Deploy and commercialise technologies for impact.

These goals are anchored on strong and effective institutional programming and a conducive environment.

## Our Roots

The AATF model was arrived at after two years of consultations between the Rockefeller Foundation and the Meridian Institute and stakeholders from Africa, North America and Europe.

The sessions, also referred to as 'Biotechnology Dialogues', were held to determine how the growing gap between agricultural science which is controlled by developed countries and the needs of smallholder farmers in the developing regions of Sub-Saharan Africa (SSA) can be narrowed. The involvement of stakeholders in these deliberations was facilitated by a Design Advisory Committee (DAC) comprising representatives from African national agricultural research systems (NARS), 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, the AATF architect, was charged with defining the main underlying principles and operational models the Foundation needed to address 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 that is 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 the 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 SSA.

## Partners

- African governments
- Agricultural producers and consumers
- National and regional institutions and agencies: NARS, Sub-Regional Organisations (SROs), Regional Economic Communities (RECs), Economic Communities in Africa (ECA),

Forum for Agricultural Research in Africa (FARA), Africa Union/New Partnership for Africa's Development (AU/NEPAD)

- Farmers and farmer groups
- International institutions and agencies such as the CGIAR and Agricultural Research Institutes (ARIs)
- Local and international NGOs
- Agricultural technology intellectual property (IP) holders (Monsanto, Arcadia Biosciences, Academia Sinica, BASF, DowAgro, Pioneer/DuPont, Syngenta)
- African trade and agribusiness organisations

## Investors

The Rockefeller Foundation, United Kingdom Department for International Development (DFID) through UK aid, and the United States Agency for International Development (USAID) were the original funders of AATF. The funding they provided enabled the establishment of the Foundation, initiation and implementation of projects, and building capacity to leverage additional support from other investors for both core and projects. The Bill & Melinda Gates Foundation and PepsiCo have also previously provided core funding for operational support.

	<p>UK aid from the UK government provides core funding that supports the Foundation's operations such as building institutional capacity and strengthening corporate governance. It partially supports some projects, complementing project funding from other investors and wholly funds others.</p>
	<p>USAID supports the Nitrogen-Use Efficient, Water-Use Efficient, and Salt-Tolerant Rice Project; Pod-Borer Resistant Cowpea Project; and the Water Efficient Maize for Africa (WEMA) project. It also supports the <i>Striga</i> Control in Maize project under Feed the Future Partnering for Innovation.</p>
	<p>The Bill &amp; Melinda Gates Foundation supports the WEMA, Open Forum on Agricultural Biotechnology in Africa and the Hybrid Rice: Breeding by Design projects.</p>
	<p>Howard G. Buffet Foundation supports the WEMA project.</p>
	<p>Syngenta Foundation for Sustainable Agriculture supports the Seeds2B project.</p>



*A black-winged Lovebird adult, feeding on berries, Lake Langano, Oromia Region, Ethiopia.*  
Copyright: FLPA / Alamy Stock Photo

# 2015 highlights

## January

- *Striga* Control in Maize (StrigAway) Project trains agro-dealers on StrigAway technology in Kenya, Tanzania and Uganda.
- WEMA plants stacks hybrids of MON87460 with MON810 or MON89034 in CFTs for the first time in South Africa.
- NEWEST Rice and PBR Cowpea projects hold a media and presentations skills training for principal investigators and communication focal persons to strengthen their capacity to effectively engage with the media and other stakeholders.



*Batiemo Joseph, Principal Investigator for PBR Cowpea Project in Burkina Faso having a mock interview during the training in January 2015*

## February

- Hybrid Rice Project harvests the first trial of hybrid rice varieties in Busia County, Western Kenya.
- Seeds2B begins evaluation trials of six Irish potato varieties in Marondera, Zimbabwe.
- WEMA holds its 7th annual review and planning meeting in Maputo, Mozambique.
- NEWEST Rice Project holds its annual review and planning meeting in Kampala, Uganda and holds a workshop to develop the communications strategy



*Harvests of the first hybrid rice trial in February 2015 in Busia County, Kenya*

## March

- Seeds2B Project Operation's Committee (OPSCOM) holds its first meeting in Harare, Zimbabwe. The committee primarily oversees and guides project undertakings to ensure achievement of set objectives and management of emerging issues.
- Seeds2B Project attends the 'India-Africa Partnership in New Technologies



*Edgar Wavomba (AATF) highlights avenues for Seed Sector Cooperation between India and Africa at a Seminar on 'India-Africa Partnership in New Technologies in Agriculture' held in New Delhi in February 2015 (Photo courtesy of RIS)*

in Agriculture' meeting organised by Research and Information System for Developing Countries (RIS), New Delhi, India. The meeting helped AATF and Syngenta Foundation for Sustainable Agriculture (SFSA) strengthen collaboration with Indian seed companies to support the identification, testing and commercialization of better performing improved crop varieties in Sub-Saharan Africa (SSA).

- NEWEST Rice Project exhibits and makes presentations at the Global Forum for Agricultural Innovations in Abu Dhabi, United Arab Emirates.
- AATF exhibits its projects at the Africa Seed Traders' Association Congress in Victoria Falls, Zimbabwe.

## April

- AATF and Kenya Agricultural and Livestock Research Organisation (KALRO) jointly submit an application dossier for environmental release of insect-protected (*Bt*) maize to the National Biosafety Authority (NBA) in Kenya.
- Nigeria's National Biosafety Management Agency (NBMA) holds a three-day workshop in Abuja to develop guidelines for stakeholders on implementation of the Biosafety Law that the President assented to.
- Open Forum on Agricultural Biotechnology in Africa (OFAB) and the International Service for the Acquisition of Agri-biotech Applications (ISAAA) organise the Biotechnology and Biosafety Communication Conference held in April, Nairobi, Kenya attended by over 100 global participants.
- OFAB, ISAAA and Cornell Alliance for Science conduct a workshop on effective



*James Okeno (left) and Daniel Otunge (right) explain AATF work to a visitor at the AATF booth during the AFSTA meeting held in Victoria Falls, Zimbabwe*



*AATF staff (from left) Abed Mathagu (Programme Officer, Regulatory Matters), Denis Kyetere (Executive Director), Francis Nang'ayo (Senior Manager, Regulatory Matters) review the Bt maize application dossier before submission to NBA*



*Margaret Karembu and Nicholas Nyange of OFAB Kenya and OFAB Tanzania respectively during the training held in Nairobi*

grassroots/community mobilising and organising for 20 OFAB chapter coordinators and project officers.

- OFAB in collaboration with *AfricaBio* and ISAAA organises a seeing-is-believing tour of South Africa's GM fields for over 30 stakeholders (farmers, regulators, manufacturers, media cereal millers and seed traders) from Kenya as part of its information and knowledge sharing efforts.



*Ayub Macharia Ndaruga, Director, Environmental Education, Information and Public Participation, NEMA, comparing Bt Cotton and Conventional Cotton*



*Stakeholders who participated in the seeing-is-believing tour of South Africa's GM fields*

## May

- WEMA Project's drought-tolerant trait MON87460 is approved for environmental release in South Africa.
- WEMA Project recommends five new conventional hybrids for commercial release in Kenya, bringing the total release by the Project to 59 since 2013.
- AATF in collaboration with the Seed Trade Association of Kenya (STAK) holds a special genetically modified organisms (GMOs) sensitisation workshop for all STAK members in Kenya to introduce the next generation transgenic products of the WEMA

products to seed companies in Kenya.

- WEMA Project trains seed companies in Kenya and Uganda on legal obligations under License Agreements.

## June

- NEWEST Rice Project conducts a CFT compliance audit at Nobewam that establishes no case of compliance infraction.
- Hybrid Rice Project conducts seed production training in Malindi, Kenya focusing on seed production, data collection, land preparation and management practices suitable for

production of pure seeds in the field and laboratory. Also included in the training was how to use the aWhere weather tool in determining where and when to produce seeds.

- Hybrid Rice Project holds an annual review and planning meeting in Arusha, Tanzania
- PBR Cowpea Project begins conducting CFTs in multi-locations to obtain field data in three different agro-ecological zones where cowpea is mostly grown.

## July

- AATF, BASF and Bayer facilitate delivery of a seed treater to Meru Agro, Tanzania to strengthen its processing capacity and quality of herbicide treated seed.
- WEMA holds an integrated pest management training workshop for its partners, seed companies, extension service providers from the Ministry of Agriculture, non-governmental organisations (NGOs), and farmers in Kenya.

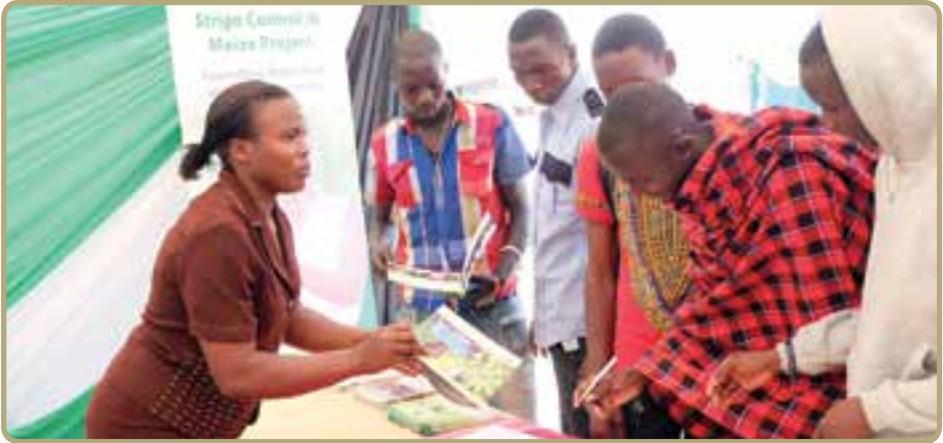
- Seeds2B Project highlights its achievements at a workshop in New Delhi on enhancing seed imports from India, organised by the National Seed Association of India.

## August

- The *Striga* in Maize Control Project holds a training cum sensitisation and awareness workshop for sales representatives, lead farmers, and extension and community mobilisers in Mbale, Uganda. The workshop attracted over 32 participants.
- The *Striga* in Maize Control Project exhibits at the *Nane Nane* agricultural show in Tanzania. Over 1,000 farmers visited the AATF stand where they were briefed on the StrigAway technology. The project distributed over 2,000 StrigAway brochures, leaflets and t-shirts, alongside other AATF publications, to farmers and other stakeholders during the show.



Camille Renou (seated left), Syngenta Foundation for Sustainable Agriculture, looks on as Edgar Wavomba of AATF addresses participants at the workshop on enhancing seed exports from India.



*AATF's Joachim Jovita explains to farmers how the StrigAway technology controls the Striga weed in maize farms at the Nane Nane show in Tanzania*

- The *Striga* in Maize Control Project conducts post-harvest trainings for farmers in Kenya and Tanzania.
- Hybrid Rice Project holds the third round of trainings for breeders on the development of 2-line hybrids.
- PBR Cowpea Project hosts biosafety regulators from National Biosafety Management Agency (NABMA), seed regulators from National Seed Council, scientists from National Biotechnology Development Agency (NABDA), media personnel, and other stakeholder partners at its CFT site at the Institute for Agricultural Research, Zaria, Nigeria.
- NEWEST Rice Project participates in training on Marker Assisted Breeding at Michigan State University, Lansing, USA. The training aimed at enhancing capacity of breeders who will be responsible for the introgression of the NEWEST traits into farmer preferred varieties. The breeders were also trained at the Arcadia Bioscience facilities in Sacramento, California on agrobacterium-mediated

transformation of rice and molecular characterisation of events to enhance their capacity on the genetic transformation technology.

### September

- AATF, BASF, and Bayer facilitate delivery of a seed treater to Victoria Seeds, Uganda to strengthen processing capacity and quality of herbicide coated seed by the partner company.



*A seed treater for Victoria Seeds, Uganda, facilitated by AATF, BASF, and Bayer.*

- AATF field staff in Kenya are trained on product stewardship and data collection and management during product field demonstrations.
- Seeds2B Project holds consultative workshops with seed sector stakeholders in Malawi and Zimbabwe to clarify crop specific pathways for varietal release and registration requirements for distinctness, uniformity and stability (DUS) tests and value for cultivation and use (VCU) tests.

UK Aid renews its support to AATF for another five years with a larger commitment of US\$ 14.6million.



(Right) Mr. Rufus Ebegba, DG National Biosafety Management Agency and Stakeholders during the visit to PBR Cowpea CFT site in Zaria

## October

- AATF and the Centre for Coordination of Agricultural Research and Development for Southern Africa (CCARDESA) sign an MOU to enhance food security in SSA. The agreement provides for cooperation in enhancing technology access and delivery in CCARDESA countries especially in relation to rice, cassava and maize; building knowledge sharing on innovative technologies and policies, and building youth empowerment through agri-business.



Timothy Simalenga (left), the Executive Director CCARDESA, and Denis Kyetere, AATF's Executive Director, during the MoU signing ceremony in Nairobi



Denis Kyetere (left), AATF's Executive Director, and Duncan Barker, Livelihoods Adviser, Agricultural Research Team at the Department for international Development (DFID), put pen to paper on renewed support to AATF as some AATF staff look on

## November

- AATF and African Women in Agricultural Research and Development (AWARD) through the World Agroforestry Centre (ICRAF) sign an agreement on institutional strengthening in gender-responsive agricultural research and capacity building to enhance food security in SSA.
- Nigeria commissions the NEWEST Rice Project CFT at the National Cereals Research Institute, Badeggi.



*Wanjiru Kamau-Rutenberg (left), AWARD's Executive Director, and Denis Kyetere, AATF's Executive Director, exchange signed agreements*

## December

- The *Striga* Control in Maize Project holds its 2<sup>nd</sup> annual review and planning meeting on commercialisation of StrigAway (IR) maize technology in East Africa in Kampala, Uganda.
- WEMA holds a science reporting workshop for journalists and scientists in Uganda



*Lucy Ogbadu (second left), NABDA Executive Director, commissions the CFT facility at NCRI, Badeggi, Niger State, Nigeria*



*Man harvesting ripe cocoa pods from a tree in Ghana. Copyright: flowerphotos / Alamy Stock Photo*



**Idah Sithole-Niang**  
*Chair, Board of Trustees*



**Denis T. Kyetere**  
*Executive Director*

## Message from the Board Chair and Executive Director

Over the last year, AATF continued to deliver on its promise to avail agricultural technologies to small-scale farmers and transform Africa into a continent that is food secure. Our various partnerships continued to deliver tangible benefits.

In recent years, AATF has focused on cultivating diverse collaborative arrangements, which are essential for building a food secure future. We therefore continued to explore collaborative opportunities with organisations on various strategic matters of interest such as technology access and delivery, knowledge and experience sharing and policy advocacy. Our strategic partnership with the Centre for Coordination of Agricultural Research and Development for Southern Africa (CCARDESA), for example, better enables joint provision of seamless support to member countries through technical

expertise and advice on intellectual property and liability management in agriculture. The new partnership with the African Women in Agricultural Research and Development (AWARD) serves as an anchor for AATF's wider agenda of gender-led scientific research in Africa.

Vigorous engagement with our donors resulted in continued support for our projects. These include US\$ 5.6 million from the Bill & Melinda Gates Foundation (BMGF) to support the Open Forum on Agricultural Biotechnology (OFAB) programmes; and a 5-year renewed support with a larger commitment of US\$ 14.6 million divided into core funding (US\$ 11 million) and performance-based funding (US\$ 3.6 million) from the United Kingdom Department for International Development (DFID). We are also pursuing new donors and given the progress made and visible developments, we are hopeful we will succeed.

Jointly with our partners, we continued with activities towards the creation of an enabling environment for the commercialisation and adoption of biotech products in the project countries. For instance, following the application to the National Biosafety Authority, Kenya, for environmental release of the Water Efficient Maize for Africa (WEMA) Project's *Bt* maize in Kenya, we held various discussions with stakeholders, influential individuals and organisations on matters biotechnology. The end result was positive supportive statements regarding the application that we believe contributed to the forward-looking assessment by the regulatory agencies.

We recorded good progress in all projects, in line with overall plans and expectations:

The WEMA Project released five new hybrids bringing total number released since project commencement to 59. It also received approval for environmental release of the transgenic single trait for drought tolerance (MON87460) in South Africa – a first outside the USA. The project submitted an application for environmental release of its insect-pest protected maize (*Bt* maize) in Kenya. In addition, WEMA commenced the testing of stacked drought tolerant and insect-pest protection traits in South Africa.

The Nitrogen-Use Efficient, Water-Use Efficient and Salt-Tolerant (NEWEST) Rice Project identified six promising events – NUE 12, 9, 8, 15, 7 and 11 – that performed better than the checks across the trials sites in Ghana, Uganda and Colombia (International Center for Tropical Agriculture – CIAT) from 2012, when the trials started, to 2015. These events had a yield gain of more than 10 percent (the target set in the

proof of concept) above the checks. NUE 12 and 9 posted yield advantages of 16 and 12 percent respectively above the checks under the different nitrogen levels of 0, 30, 60 and 90 N Kg/ha. In addition to the six that performed well across board, NUE 2 and 3 outperformed the New Rice for Africa (NERICA4) check by an average of 30 and 20 percent respectively during multiple trials at CIAT, Columbia. A total of 15 events were initially evaluated at CFTs from which these eight were selected for further testing.

The breeding activities of the Hybrid Rice Project entered the fifth round of crosses to develop a new set of S-lines. The results of the 2-line rice hybrids yield testing in eight locations showed that 30 hybrids had 1 tonne/ha yield advantage over commercial checks in the target countries.

The *Striga* Control in Maize Project recorded a 14 percent increase in its seed sales in Kenya from 91 tonnes in 2014 to 104 tonnes in 2015 despite suffering lower seed production due to challenges of drought and MLN disease. To build and sustain seed production, the project facilitated acquisition of two more seed treaters for two companies in Tanzania and Uganda.

The Pod-Borer Resistant (PBR) Cowpea Project recorded promising results from the CFTs established in multi-locations in the three agro-ecological zones where cowpea is mostly grown. The efficacy trials of the Cry1Ab gene in the transgenic PBR Cowpea-1 developed from the farmer's variety showed near complete control of *Maruca*. The project, working with Donald Danforth Plant Science Center, is collating additional data from Monsanto on MON810 to develop the dossiers required for regulatory approvals of the PBR *Bt* cowpea seed. Stacking the transgenic PBR cowpea varieties with an

additional gene, Cry2Ab, is in progress at the Commonwealth Scientific and Industrial Research Organisation (CSIRO) Australia.

The Seeds2B Project has completed its first set of evaluation trials for tomato, potato and soybean in Malawi and Zimbabwe with promising lines being identified. Efforts are on-going to scale up the testing of high performing crop varieties identified from the completed trials. Market analyses, validation of crop profiles and the development of the Seeds2B Project Business Plan are underway after the completion of the project feasibility study.

OFAB made notable achievements including organising a 'seeing-is-believing' tour to South Africa for 35 key stakeholders from Kenya to support understanding of biotechnology. The year was productive with enactment of the Nigeria Biosafety Act and subsequent establishment of a Biosafety Agency. In addition OFAB also successfully supported the review of Ethiopia's Biosafety Law to remove the strict liability clauses from the Biosafety Proclamation and Biosafety Directives that are necessary for implementation of the Biosafety Law.

Under the Cassava Mechanisation and Agro-processing Project (CAMAP), farmers recorded yields of between 18 and 32 tonnes per ha in Nigeria and between 23 and 44 tonnes in Zambia which was about 40 percent increase above the usual, an increase that generated more income for the farmers. A number of service providers have now started providing services to the farmers for a fee in line with the sustainability plan of the project.

AATF continued to spearhead implementation of COMPRO II Objective 3 activities with specific focus on fast-tracking adoption of Registration Guidelines for Biofertilisers and Inspector's Training Manual. In addition, AATF prepared four country-specific policy briefs to facilitate emergence of fully functional policy and regulatory regimes for biofertilisers in Kenya, Ghana, Uganda and Nigeria.

2015 was indeed a very productive year for AATF and partners. We are grateful to our dedicated AATF staff team, partners, investors, the researchers and other professionals who work with us to deliver on our promise to smallholder farmers for a food secure Africa. We look forward to an even more exciting 2016!



*Man harvesting coconuts in Zanzibar, Tanzania.  
Copyright: TravelCollection / Alamy Stock Photo*



## **Striga Control in Maize Project**

### **Mixed fortunes for *Striga* Control in Maize Project as MLN and drought rear their ugly heads**

**I**t was a year of mixed fortunes for the *Striga* Control in Maize Project following the outbreak of Maize Lethal Necrosis (MLN) and a severe drought that affected production of Imazapyr Resistance (IR) maize seed, traded as StrigAway®. The MLN disease wiped out the entire Kenya Seed Company's 40.5 hectares of IR basic seed crop in Baringo County. A severe drought, on its part, hit Freshco production field in Baringo County causing some plants to either produce small cobs or fail to form cobs all together. These resulted in a drop in production of certified IR maize seed in Kenya from 121 tonnes in 2014 to 112 tonnes. It was however not all gloom as sales increased by about 15 percent during 2015 standing at 104 tonnes, up from 91

tonnes in 2014, a sign of sustained interest in the technology by farmers thanks to Freshco Seeds Company's efforts.

Despite these challenges in seed production, the project had a key achievement in 2015. A new IR maize hybrid, Meru IR-621, was released in Tanzania to add to the four IR maize varieties being marketed in the three countries: two open pollinated varieties (Freshco 425-IR in Kenya and TAN222 in Tanzania); and two hybrids (H528 in Kenya and Longe 7H-IR in Uganda). With the new hybrid, the three countries now have one hybrid each.

The project continued to boost seed treatment and delivery in the three countries by providing seed treaters to Meru Agro Ltd. in Tanzania and Victoria Seeds in Uganda.



*H528-IR maize demonstration farm in Homa Bay County, Kenya*

The seed treaters, which were acquired and delivered in partnership with BASF and Bayer, will strengthen the seed companies' processing capacity and quality of herbicide coated seed. The project also trained Meru Agro and Victoria Seed personnel in handling and use of the seed treaters.

In addition, the project continued with capacity strengthening of stakeholders on safe handling of the StrigAway technology and managed to train 60 agro-dealers in the three countries, 40 data collectors from Kenya and Uganda, and 34 seed company

staff in Kenya. The safe handling training was also offered to over 11,000 farmers, with 4,730 (43%) of them being female.

## **Project overview**

*Striga* is a major parasitic weed that infests about 20 million hectares of arable land in Sub-Saharan Africa (SSA). Serious infestation by the weed often results in total crop loss and even abandonment of some arable land, leading to increased food insecurity and rural poverty among smallholder



*Field training of enumerators on data collection by AATF staff in Tanzania*

farmers and their families. By controlling *Striga* weed infestation, the Project aims to increase maize grain yields as a contribution to food security. To accomplish this, the Project is facilitating access to and delivery of StrigAway® maize seed.

The Project partnership includes the International Maize and Wheat Improvement Center (CIMMYT), BASF, seed companies, NGOs, and government extension services in Kenya, Uganda and Tanzania.

## Looking forward

'To boost quality production of seeds, we will continue to train personnel of the recipient seed companies to effectively utilise the seed dressers. We will also continue to encourage seed companies to invest in irrigation facilities to avoid the vagaries of weather,' Gospel Omanyia, Senior Manager, Deployment, AATF.





*Picking cashew fruits with nuts, Burkina Faso.  
Copyright: Joerg Boethling / Alamy Stock Photo*



## Efficacy trials confirm resistance of transgenic cowpea to pod-borer pests

The Pod-Borer Resistant (PBR) Cowpea Project continues to make progress towards getting the *Maruca* resistant technology to farmers in Nigeria and Ghana by 2019. The release of PBR cowpea to farmers requires that the seed should undergo food, feed and environmental safety assessments and the project therefore continued its safety assessments on candidate events for gene flow and effect of the gene on non-target organisms.

The project conducted efficacy agronomic equivalence and insecticide reduction trials. Efficacy of the *Cry1Ab* gene in the transgenic farmers' variety, PBR Cowpea-1, showed near complete control of *Maruca*, from data obtained following confined field trials in multi-locations in

Zaria, Kano and Zamfara in Nigeria – three different agro-ecological zones where cowpea is mostly grown.

Agronomic equivalence trials carried out in Nigeria and Burkina Faso included spraying of insecticides recommended for growing cowpea in each country. Plant tissue samples including those from young leaves, fodder and grain were collected for compositional analysis.

Insecticide reduction trials conducted in Nigeria indicated that PBR cowpea will require less insecticide sprays in a season to complement the near complete control of *Maruca* by the *Bt* gene to produce cowpea yields comparable with five insecticide sprays that farmers currently use to control the cowpea insect pests. The project

recommends combination of the PBR cowpea with about two to three insecticide sprays to effectively control other insect pests such as pod sucking bugs, thrips and aphids.

Confined field trials for environmental safety assessments for non-target organisms (NTO) and seed density trials were repeated in 2015. The CFTs established in Nigeria, Burkina Faso and Ghana to study the relative abundance of NTOs on transgenics, non-transgenics and wild cowpea confirmed the 2014 findings that the distribution and abundance of each type of insect was similar among the transgenic, isogenic and wild cowpea plants. Seed density trials were carried out to determine if gene flow could lead to increased seed production and persistence of wild cowpea in the environment. The trials established in the three countries showed no evidence that wild cowpea can become a weed due to gene flow.

The Project, working with Donald Danforth Plant Science Center, is collating additional data from Monsanto on Cry1Ab protein characterisation and safety profile to develop the dossiers required for regulatory approvals of the PBR Bt cowpea seed.

## Product development

Stacking the transgenic PBR cowpea varieties with an additional gene, *Cry2Ab*, was in progress at the Commonwealth Scientific and Industrial Research Organisation (CSIRO), Australia. The transgenic variety PBR Cowpea-1 was being multiplied in Ghana and Nigeria.

Malawi will plant their first PBR cowpea CFT in January 2016 following receipt of permit from the biosafety regulators in June 2015. Trial personnel were trained on compliance of the guidelines stipulated in the permit as well as trial management in December 2015.



Participants during the seed production and stewardship stakeholders meeting held 9 November 2015 in Abuja, Nigeria

## Information sharing and stakeholder engagement

The project continued to involve stakeholders in the project and to update them on progress made on various aspects. A key event was held in Abuja during November for government officials, seed regulators, National Seed Council of Nigeria and Variety Release Committee, seed companies, farmer out growers and scientists on deployment and stewardship of PBR cowpea seed.

The project carried out consultations with the International Centre of Insect Physiology and Ecology (ICIPE), the International Institute of Tropical Agriculture (IITA) and the Alliance for a Green Revolution in Africa (AGRA) on development of an integrated pest management (IPM) strategy, seed production and seed distribution, respectively.

## Project overview

*Maruca* is a major insect pest in West Africa. It is responsible for 20 to 80 percent yield loss in the cowpea crop. The project is developing cowpea varieties with genetically-enhanced insect protection using gene transfer technology to control the infestation of the *Maruca* pod-borer in the crop. With the *Bt*

gene, which confers resistance to the pod-borer insects, transferred into improved cowpea varieties, smallholder farmers will be able to increase their yields by over 20 percent due to reduced damage from the pod borers and the high yielding capacity of the *Bt* varieties. This will greatly enhance household and national food security and economic status. The project's goal, therefore, is to develop and disseminate farmer-preferred and locally adapted *Maruca*-resistant cowpea varieties in Sub-Saharan Africa. Partners in this project include CSIRO, the Institute of Agricultural Research, Nigeria, the Council for Scientific and Industrial Research, Ghana, the Institute of Environment and Agricultural Research, Burkina Faso and Bunda College, Malawi.

## Looking forward

'The project intends to obtain permits from regulators in Ghana and Malawi for CFT trials especially at Damongo and Manga in Ghana. We are hopeful that the first CFT at Bunda College, Lilongwe University of Agriculture and Natural Resources, will go on in 2016 as planned as we prepare to apply for deregulation of the cowpea varieties sometime in 2017,' Prince Addae, Cowpea Project Manager, AATF.





*A bird eats a pawpaw on the tree.  
Copyright: Gustav Gonget /G&B Images*

## Great achievements in development and commercialisation of WEMA products

**I**t was yet another remarkable year for the Water Efficient Maize for Africa (WEMA) Project. Great achievements were recorded in technology development, release of commercial hybrids, production and sale of certified seed.

### Commercial release of DroughtTEGO® hybrids

WEMA successfully released 24 new varieties in Kenya, South Africa and Tanzania, up from 19 released in 2014 in Kenya, South Africa, Tanzania and Uganda.

The project is set to release more varieties in the coming years following the impressive results from the WEMA-Wide Trials in Eastern and Southern Africa. The top 10 medium-maturity hybrids in Kenya,

Tanzania and Uganda produced 11–28 percent higher grain-yields than the mean of the commercial checks under drought-stressed environments, while another top 10 early-maturity hybrids gave 16–51 percent higher grain-yield than the mean of the commercial checks under similar conditions. This implies that in the coming years, the seed market will have a larger pool of better performing varieties for greater options by the farmers.

### Seed production and sales

Remarkably, the project produced 1,986 tonnes of certified seed of DroughtTEGO® hybrids in Kenya, Tanzania and Uganda, a nine-fold increase over the 2014 production



*Julius Mugo, ICSEED's extension officer talks to farmers at a WEMA field day in Kirinyaga County*

of just 217 tonnes. The team also more than doubled production of foundation seed for DroughtTEGO<sup>®</sup> hybrids, delivering 67 tonnes in 2015, up from 26 tonnes in 2014. This volume of foundation seed will be used to bulk the production of certified seed for sale to farmers in the coming years. There was also a dramatic increase of over 300 percent in the sales of DroughtTEGO<sup>®</sup>

certified hybrid seeds to farmers, shooting from 114.5 tonnes in 2014 to 481.7 tonnes in 2015. Cumulatively, within three years of the commencement of deployment of the DroughtTEGO<sup>®</sup> hybrids, a total of 786 tonnes of seed have been availed to farmers for cultivation, reaching about 200,000 farm-households and benefitting about 1.2 million people in the project countries.



*On-farm de-tasseling training at Farm Africa, Kilosa, Tanzania, in 2015*

## Milestones in transgenic development

A major boost for the project's transgenic (genetically modified organism – GMO) work was deregulation of the drought-tolerant MON87460 in South Africa in May 2015 making it the second country in the world after the United States of America to deregulate the trait. This means that South Africa can proceed to test its stacked drought tolerant and insect-pest protected maize - a first on the continent to have both traits for farmers.

CFT of the same drought tolerance trait in Kenya and Uganda continued to produce impressive results. In Kenya, three hybrids recorded 17-42 percent more yield gains than the conventional hybrids under both drought-stress and optimum-moisture conditions while in Uganda, the

transgenic insect-pest protected maize yielded between 39 and 122 percent above the conventional hybrids.

After successfully concluding the confined field trials (CFTs) of the insect-pest protected *Bt* maize that started in 2013, the project partnership in Kenya applied to the National Biosafety Authority (NBA) for environmental release of the transgenic maize in Kenya with high expectations for approval. This historical application was a first for Kenya in many instances and if passed will open opportunities for farmers to access maize seed that will protect their crop against the devastating effect of stem borers. This will save the farmers from unnecessary costs on pesticides, and protect the environment through reduced use and release of dangerous pesticides into the environment.



*Sylvester Oikeh, Project Manager WEMA, submits the application for environmental release of the insect-pest protected Bt maize to the Kenya National Biosafety Authority (NBA) CEO Willy Tonui as AATF's Francis Nang'ayo, KALRO's Murenga Mwimali and NBA's Dorington Ogoyi look on.*

## Project Overview

Maize is the most widely grown food crop in Africa and it is the main food source for more than 300 million people on the continent. Its production is severely affected by drought and insect pests, which negatively impact yields leading to hunger and poverty. The Project is developing maize hybrids that are suitable for moderate drought conditions and are resistant to insect pests, using a combination of conventional, marker assisted breeding and advanced biotechnology techniques. The partnership includes AATF as the Project coordinating institution, the International Maize and Wheat Improvement Centre (CIMMYT), Monsanto Company, and the national agricultural research systems in the five project countries: Kenya Agricultural and

Livestock Research Organisation (KALRO); National Agricultural Research Organisation, Uganda; Institute of Agricultural Research (IIAM), Mozambique; Tanzania Commission for Science and Technology (COSTECH) and Agricultural Research Council of South Africa.

## Looking Forward

'The project will continue engaging seed companies through commercialisation licenses and provision of seed licenses, trainings on deployment issues, stewardship, agro-dealership, data collection and management for enhanced commercialisation of conventional and transgenic maize seed,' Sylvester Oikeh, Project Manager WEMA



*How we do it...!*

## Twists and turns: Obtaining regulatory approvals for testing and deployment of transgenic products

Managing regulatory affairs at AATF is a specialised enabling function for project implementation that encompasses continuous scanning of the policy and regulatory environment of target countries to identify regulatory bottlenecks likely to hinder testing and deployment of technologies and products. This then leads to formulation and implementation of country-specific strategies, plans, tactics or schemes for addressing the regulatory hurdles in order to secure approvals for product testing and deployment. Since such approvals typically specify conditions to be adhered to, AATF and partners routinely go through a training drill of 'dos and don'ts', all geared to ensuring compliance with approval requirements.

For instance, at the inception of the Water Efficient Maize (WEMA) project in 2008, AATF spearheaded an exploratory study in each of the partner countries of Kenya, Uganda, Tanzania, Mozambique and South Africa to assess the regulatory terrain with special focus on reviewing existing policies and regulations for genetically modified organisms (GMO's) as well as determining procedures for handling and processing applications for confined field trials (CFTs). In the process, a number of potential issues were identified and prioritised for redress via engagement of policy makers and regulators. This effort kicked off the process of revising the then functionally restrictive Biosafety Decree in Mozambique and amending the Biosafety Regulations in Tanzania. To date, both countries have progressed to usher in workable regulatory systems to a level that has permitted commencement of CFTs.

In those WEMA partner countries where no major issues were identified (South Africa,

Kenya and Uganda), AATF partnered with national institutions to implement plans for securing permit approvals for product testing and more recently for product release. A combined total of 42 CFT permit approvals have been granted for WEMA project alone during 2010–2015. More significantly, WEMA project secured two approvals for general release of drought tolerant maize in South Africa and for insect-protected GM maize in Kenya. The narrative is the same for Pod-Borer Resistant Cowpea and Nitrogen-Efficient, Water-Efficient and Salt-Tolerant Rice projects, where AATF and partners sought and secured CFT permit approvals to allow for CFT and multi-location evaluations in Nigeria, Burkina Faso, Ghana and Uganda.

Therefore, the regular grant of permit approvals over the last eight years clearly demonstrates the confidence regulatory authorities have in the work of AATF and partner institutions. AATF on its part continues to work diligently to cultivate trust with regulators by ensuring the highest level of compliance with approval requirements. Indeed, no cases of compliance infraction have ever been reported in the eight countries where AATF activities involve working with transgenic crops.

Looking ahead, and as more countries gain experience working with and regulating transgenic crops, the development, commercialisation, use and movement of GM products in Sub-Saharan Africa will be a routine process that will enhance availability and safe use of this technology. It is our belief that the precedent set by AATF in the various countries will provide invaluable lessons for the countries and other development partners.



*Farmers pick oranges in Amuria, Uganda.  
Copyright: Jake Lyell / Alamy Stock Photo*



**NEWEST** Nitrogen & Water Efficient  
Salt Tolerant Rice

## **Trials of hope: Milestones achieved in NEWEST Rice Project as Nigeria commissions trial facility**

**D**uring 2015 some key milestones were realised for the Nitrogen-Use Efficient, Water-Use Efficient and Salt Tolerant Rice (NEWEST) Project. The Nigerian Government commissioned the newly constructed confined field trial (CFT) facility at the National Cereal Research Institute (NCRI), Badeggi, Niger State, a bold step and boost in the development and adoption of transgenic rice varieties for Africa's most populous and highest importer and consumer of rice. With the commissioning, Nigeria becomes the third country undertaking trials for NEWEST rice in Africa.

Another milestone for the project was identification of six promising events – NUE 12, 9, 8, 15, 7 and 11 – that performed better than the checks across the trial sites in Ghana, Uganda and Colombia (International

Center for Tropical Agriculture – CIAT). These trials were carried out from 2012 to 2015 during which time 15 events were evaluated and six of these were selected based on better performance above the checks. These events had a yield gain of more than 10 percent (the target set in the proof of concept) above the checks. NUE 12 and 9 posted yield advantages of 16 and 12 percent respectively above the checks under the different nitrogen levels of 0, 30, 60 and 90 N Kg/ha. In addition to the six that performed well across board, NUE 2 and 3 outperformed the New Rice for Africa (NERICA4) check by an average of 30 and 20 percent respectively during multiple trials at CIAT, Columbia.

A new experimental design was developed to validate the field efficacy of selected NUE events in order to make the

final selection of two lead events, out of which the first will be used for the transfer of the NUE gene to farmer-preferred varieties while the second will be a back-up to replace the first if there is any challenge with the first.

To enhance quality trials, the project acquired laser levellers for fine levelling of land in the respective sites of the national partners in Ghana, Uganda and Nigeria.

Seeds of nine NUE rice lines (NUE 7-NUE15) and the 19 NEWEST rice lines (NEWEST 1-NEWEST 19) which were yet to be evaluated were shipped by Arcadia Biosciences, California, to CIAT in Colombia in July 2015. The seeds will be used to carry out CFTs and physiological experiments that will provide supplementary information to the trials being conducted by national partners in Africa.

## Project overview

Rice demand in Sub-Saharan Africa exceeds production and large quantities of the grain continue to be imported to meet domestic demand. Several abiotic factors account for the low rice production, but nitrogen deficiency and drought have been cited as the leading constraints to upland rice production, while high salinity is increasingly becoming a major problem in many rice growing areas of Africa. The Project is developing farmer-preferred and locally adapted rice varieties with enhanced nitrogen-use efficiency, water-use efficiency and salt tolerance.

The Project is implemented under a partnership that includes AATF as the Project coordinator, Arcadia Biosciences, the Public Intellectual Property Resource for Agriculture, CIAT, and the national



*The NEWEST Project Advisory Committee (PAC) during a visit to the CFT site in Namulonge, Uganda, in February 2015*



*Ghana CFT 4 at maturity stage*

agricultural research systems in the three partner countries: the National Agricultural Research Organisation, Uganda; Crop Research Institute (CRI), Ghana; and the National Cereal Research Institute, Nigeria.

## Looking forward

'The project will support the in-country teams in Ghana and Uganda to conclude applications for CFT permit extension

for a further three years and apply for authorisation to relocate the CFT site in Ghana from the current site at Nobewan in Kumasi to an upland location at CRI Station in Kumasi. In addition, the project will use the newly developed experimental design to conduct CFTs in the respective project countries for selecting and confirming the NUE lead events for introgression into farmer-preferred varieties,' Kayode Sanni, NEWEST Project Manager, AATF.





*A Hadzabe hunter collecting wild fruit from a bush in Tanzania. Copyright: Eyal Bartov / Alamy Stock Photo*



## Demand for mechanisation shoots up as cassava farmers bag bumper harvests

**G**ood or bad rains, cassava farmers in Nigeria and Zambia recorded bumper harvests and made money, courtesy of the Cassava Mechanisation and Agro-Processing (CAMAP) Project.

In Nigeria, where poor rains affected the crop, farmers managed to harvest between 18 and 26 tonnes per hectare from the usual average yields of 9 to 12 tonnes. In Zambia, where the rains were good, yields shot up to 46 tonnes per hectare for some of the farmers, outperforming India that enjoys the world's best yields averaging 35 tonnes per hectare. These highly improved yields in Zambia and Nigeria were attributed to cassava mechanisation combined with use of best agronomic practices and high yielding, disease-resistant varieties – something that had never been practiced before in both countries.

Encouraged by improved harvests of better quality cassava tubers, coupled with aggregation of the tubers by farmers to allow bulk sales that resulted in direct purchase of cassava from farmers, the local processors increased their prices for the quality and more easily available tubers. Farmers in Nigeria earned up to US\$1,430 per hectare compared to US\$560 per hectare before CAMAP, while in Zambia, farmers earned as much as US\$1,941 per hectare.

Buoyed by the unprecedented yields, commercial and small scale farmers from other countries – Ghana, Mozambique, Tanzania and the Democratic Republic of Congo – sought technical support for mechanisation from CAMAP and the project is currently pursuing mechanisms for outscaling to these countries.



*Eng Oloruntoyin Zubair showing CAMAP fields (well weeded crops) in Kwara State*

In Nigeria, new states that joined the project – Edo, Oyo and Delta states – have committed an additional 1,000 ha for cassava mechanisation.

The CAMAP partnership in Zambia set up a 10 ha pilot farm for cassava mechanisation in Kawambwa District to demonstrate to both small and large scale farmers the efficiencies and benefits of mechanisation considering the anticipated demand for cassava from processors like Sunbird Bioenergy who have planned to set up a cassava processing plant to produce ethanol.

Most encouraging during 2015 was the willingness from farmers to pay for mechanisation services. They continued their support of the project's commercial business model by seeking mechanisation services from the project for specialised cassava planting, cultivation, weeding and root digging and repaying the amounts owed during the field operations or upon sale of tubers depending on their financial

ability. They also participated in identifying local service providers for land preparation to ensure that there is continuity once the project comes to an end as these local service providers will provide the services on commercial business basis. The farmers eagerly participated in the 'stem for stem system' where a farmer ploughs back 60 percent of his or her cassava stems into the project for use by new farmers, and retains 40 percent for own use and sale. Through this way, the project will reduce the initial cost of enrolling into the project by farmers.

The project assisted private companies like Crest Agro and Afolabi Agro Divine Venture Ltd in Nigeria, cooperatives like PamRone in Uganda and farmer groups in procuring the mechanisation equipment for their use.

In 2015, the number of households in Nigeria, Uganda and Zambia benefitting from CAMAP increased to about 4,500 households (27,000 farmers), up from 1,650 farmers in 2014, a 173 percent increase. The growth is phenomenal considering that an increase by 371 percent has been recorded over the last 3 years, from 350 households in 2013 to 4,500 by end of 2015.

## Project overview

Africa is the world's largest cassava producer, accounting for nearly 55 percent of the world's output. However yields

per unit area on the continent are the lowest in the world (10 tonnes per hectare compared to 35 tonnes per hectare in India). CAMAP aims at transforming the cassava sector in Sub-Saharan Africa by enhancing commercial production, processing and market linkages based on business models that engender sustainability. It also aims to address key constraints to cassava production in Africa, related to limited use of improved varieties, poor agronomy, and lack of mechanisation and processing. The Project partnership consists of AATF as the Project coordinator, the Zambia Agricultural Research Institute (ZARI); National Centre for Agricultural Mechanisation (NCAM) and the National Root Crops Research Institute (NRCRI), both in Nigeria, Governments of Osun, Ogun, Kogi and Kwara States, Nigeria; and the National Crops Resources Research Institute (NCRRI), Uganda.



*A farmer in Osun State Nigeria collects cassava stems after harvesting for re-use as seed in the following season.*

## Looking forward

'The actualisation of the revolving fund in Nigeria, Uganda and Zambia will ensure the sustainability of the project in years to come. The planned setting up of a processing plant for cassava by Sunbird Bioenergy Africa in the Kawambwa District in Zambia will be a major incentive to farmers to venture into commercial cassava farming and a great opportunity to improve their livelihoods,' George Marechera, Business Development Manager, AATF.



*How we do it...!*

## **Role of AATF in use of intellectual property in African agriculture**

Intellectual property (IP) management at AATF runs through product development, adaptation and commercialisation stages of the projects. It is a strategic function that is founded on the reason for AATF's existence – need for a mechanism through which Sub-Saharan Africa (SSA) could benefit from innovative agricultural technologies and in the process close the growing gap between the developing and developed worlds in utilisation of agricultural science. IP management involves practicing responsible IP stewardship in order to ensure that technology license terms are respected and adhered to. The AATF approach to IP management forms the backbone on which all negotiations for access to technologies that enhance the productivity of agriculture in Africa are made.

In all its technology negotiations, AATF acts as an honest broker by identifying (with project partners) and licensing-in technologies and know-how from technology owners, such as technology companies and universities, in different parts of the world. Most of these technology licenses are usually royalty free with a few being royalty based. Once the technologies are identified and accessed, AATF issues non-exclusive royalty free research licenses (licensing-out) to project research partners such as national and international research institutes.

An IP negotiation is a process which involves ascertaining the rights technology owners have and the rights that they can rightfully grant to the technology seekers. The discussions also involve ascertaining which party will carry what responsibility and at what time during the technology transfer. This assists in ascertaining from the start the various rights and obligations of the parties prior to the signing of the license agreements. Negotiations also cover discussions on where the technology will be used and in what manner. Most technology owners shy away from using their technologies in countries which lack intellectual property protection mechanisms as they would be unable to enforce their rights in such countries.

Critical elements for IP management include IP awareness and identification; ownership and protection of IP; and commercialisation and continuous monitoring of the application of IP which includes enforcement.

AATF often conducts technology scouting to identify any relevant technology that can be used to enhance agricultural productivity in Sub-Saharan Africa. For instance AATF identified use of mechanised farming as one of the ways of improving cassava productivity in Africa and proceeded to access cassava production and agro-processing technologies from Brazil to assist farmers in

Nigeria, Uganda and Zambia in increasing their productivity.

Through an elaborate licensing framework, AATF ensures IP management and enforcement through the existing IP laws of the project countries. The continuous monitoring done through the stewardship process ensures that the project partners adhere to the license terms including the IP clauses.. For instance with access of protected technologies owned by companies such as Monsanto and Universities such as University of California, AATF negotiates the right to issue sub-licenses to its partners for further research, development and commercialization while ensuring IP protection for resulting IP material. In instances where a technology owner has not taken up IP protection, AATF undertakes, with their consent, to take up such protection on their behalf.

When technologies are ready for deployment or commercialisation, AATF enters into commercialisation licence and seed production and distribution agreements with various public and private partners. This enables AATF to create a large distribution network through which the technologies can reach the small holder farmers. For instance, through the Water Efficient Maize for Africa (WEMA) Project, AATF has engaged private seed companies to assist in the production and distribution of conventional drought tolerant maize seeds in four countries. It has also registered trademarks such as DroughtTego which is used to commercialise the drought tolerant maize in these countries. Under the Cassava Mechanisation and Agro-processing

Project (CAMAP), AATF has engaged farmers to implement cassava production and agro-processing technologies in three countries as one way of improving cassava productivity in these countries.

One of the conditions for AATF on licensing out the technologies it negotiates is that it would monitor the use and application of the technologies so provided. To ensure compliance with the license agreements issued by the technology owners AATF requires project partners to produce period reports to document their use or application of the technologies and it also physically monitors use of the said technologies.

AATF has created a strong network of public-private partnerships by engaging both the public and private sectors in order to tap into their expertise. The public sector offers the most needed resources in research through their national agricultural research systems. These systems assist in the adaptation and delivery of technologies to farmers. They also provide channels through which the governments support the research as well as improve public acceptance. The private sector provides a pool of expertise on the exploitation and delivery of the technologies. To achieve sustainability of the delivery of the technologies the private sector brings in the needed business expertise which the projects can tap into. In many cases, the technology owners are private companies or the research is not publicly funded. To access these technologies, AATF has to negotiate with such private companies.



*Men harvesting dates in Tunisia.*  
Copyright: kpzfoto / Alamy Stock Photo



## Hybrid Rice: Breeding by Design Project

### Promising yields from hybrid rice trials

The Breeding by Design: Hybrid Rice Project made good progress in developing high yielding hybrid rice varieties. Results from the trials indicate that 30 hybrids developed using the 2-line rice hybrid technology had a yield advantage of more than 1 tonne/ha over the best check – the target set in the proof of concept. The 2-line rice hybrids were tested in eight locations by partners from private companies and the public sector in Kenya and Tanzania.

Accessibility to weather data to support breeding was improved with aWhere, the information technology partner in the project, developing a robust application program interface (API) that will enable partners to access weather data directly. This database enhances users' ability to assess their locations, understand hybrid seed creation, and determine suitable locations for seed multiplication and development of hybrid, based on daily temperature data.

### Product development

The project recorded good progress in developing parental lines to be used in developing the 2-line rice hybrids. The project developed 124 female parental lines (S-lines), which it availed to 10 seed companies for development of own hybrids.

The project is currently developing new sets of S-lines and male parental lines (P-lines) with emphasis on aroma. Crosses have been made to develop these lines (S- and P-lines) with over 4,000 selections made at  $F_2$ . These materials were moved to Kisumu from Malindi, Kenya for replanting, and will be advanced to  $F_3$  and  $F_4$  in the coming year.

Two new sets of S-lines were developed focusing on three traits: standard long grain types, aromatic S-lines, and S-lines resistant to imidazolinone herbicides. A broad set of germplasm was used in these crosses, including basmati, japonica, and indica types. The  $F_5$  seeds of the selected 32



*The first hybrid rice trial was harvested in February 2015 in Busia County, Kenya*

P-lines were harvested and will be further advanced in 2016. The seeds will be available for distribution to any partner that requests them for their breeding programme.

## Project overview

The project aims to develop 2-line rice hybrids and parental lines in selected African countries and ensure that, through private companies and public institutions in Africa, the technology reaches farmers and increases their rice yields and income streams.

The 2-line hybrid system relies on temperature to switch from fertile plant to females with male sterility making understanding of breeding and seed production environments critical. The project is also developing an IT tool with

interpolated weather data to predict temperature regimes to assist in the choice of production environment for 2-line hybrid rice.

Thermo-sensitive Genic Male Sterility (TGMS) lines or 2-line rice hybrid system (only 2- breeding lines) are being used to develop rice hybrids. This is based on a single gene recessive mutation which causes TGMS recessive plants to become sterile in high temperatures, but remain fertile in cool temperatures. The female line uses the temperature modulated single gene system which is easy to breed, but requires significant skill and experience to get to the level of hybrid seed production. The male in this system can be any other line and this opens up significant opportunities to develop better plants than using both parents (heterosis) through genetic diversity.



*Participants to a seed production training organised in June 2015 by the Project at the seed production field in Malindi*

The Project partnership is composed of AATF that is charged with the project management and technical backstopping, Hybrid East Africa Ltd who

is responsible for germplasm development and training, aWhere who is developing the necessary IT tools to support germplasm development, and the national agricultural research systems (NARS) of Kenya and Tanzania who are providing technical backstopping services in testing and developing germplasm.

## Looking forward

'In 2016, breeding will focus on developing disease resistance in S-lines and P-lines, with emphasis on Bacteria Leaf Blight, Blast and Yellow Mottle Virus. At the same time, efforts will continue towards stabilizing the parental lines, Kayode Sanni, Hybrid Rice Project Manager, AATF.

BILL & MELINDA  
GATES foundation



aWhere





*Harvesting Packhams Pears in the Overberg near  
Elgin Western Cape, South Africa.  
Copyright: Peter Titmuss / Alamy Stock Photo*



## Seeds2B AFRICA



### 2015 a defining year for Seeds2B variety evaluation trials in Malawi and Zimbabwe

**T**he Seeds2B Project commenced its first adaptation trials for 20 candidate improved cultivars of tomato, potato and soybean across four sites in Malawi and Zimbabwe. These small scale, pre-commercial trials were implemented in collaboration with Zimbabwe's Department of Research and Specialist Services (DR&SS) and Malawi's Department of Agricultural Research Services (DARS). The cultivars under trial were accessed from seven technology owners based in India, China, Ghana and Nigeria. A number of the test cultivars outperformed commercial varieties available in Malawi and Zimbabwe.

In Malawi, the project evaluated 14 tomato hybrids for yield and post-harvest qualities amongst other key market traits over one season. A total of 12 test hybrids yielded 1–6 tonnes per hectare above the best commercial check, which yielded 3 tonnes per hectare while 7 registered a

shelf life similar to the available commercial checks.

The project also evaluated six candidate improved soybean varieties for maturity and yield in Malawi over one season. The results were equally encouraging, with one variety yielding 3.4 tonnes per hectare, 0.4 tonnes above the available commercial checks which recorded a yield of 3 tonnes per hectare. However, all the varieties under evaluation matured later than the commercial checks.

It was the same narrative in Zimbabwe where the project evaluated 13 tomato hybrids and 4 potato varieties for yield over two seasons. The yield of 4 test tomato varieties was 1–5 tonnes per hectare above the best commercial check, which yielded 8 tonnes per hectare. On the other hand, the test potato varieties recorded lower yields compared to the commercial checks.



*Esnart Nyirenda, a legume breeder at Malawi's Department of Agricultural Research Services, walks members of the Seeds2B Operations Committee through the Project's soybean variety evaluation trial site in Kasinthula, Malawi on 25 September 2015*

A marketing trial was initiated where 13 test tomato hybrids were evaluated alongside 4 elite varieties submitted by two local seed companies. This trial was aimed at showcasing the performance of the test hybrids so as to stimulate uptake by the participating local seed companies. The trial was conducted in collaboration with the Agricultural Research Trust Farm in Harare, Zimbabwe.

In the fourth quarter of 2015, the project also advanced plans for the evaluation of 13 sorghum and 10 pearl millet hybrids in three sites in Zimbabwe's lowveldt region. These

hybrids were accessed from 5 technology owners based in India.

The project held workshops with seed sector stakeholders in Zimbabwe and Malawi to review regulations for evaluation, registration and trade in new crop varieties. Over 40 partners and collaborators, including representatives from local seed companies, local NGOs and research organisations, were trained on policies, regulations and requirements for development, testing, transfer, trade and use of seed and plant material in Malawi and Zimbabwe as well as the Common Market for Eastern and

Southern Africa and the Southern African Development Community regions. (Picture)

## Project overview

The Seeds2B Project fosters the development of 'seed bridges' that link crop breeding initiatives to Sub-Saharan Africa's (SSA) seed systems. The project facilitates the transfer of better-performing, locally adapted and market-appropriate crop varieties developed by public and private breeders based in and outside Africa to smallholders in SSA through local seed producers and distributors. By adding new commercially viable products to the portfolios of local seed enterprises, the Seeds2B Project helps

smallholders in the region sustainably serve new and existing markets with the best of locally grown produce. The ultimate goal of the Seeds2B Project is to contribute towards building the capacity of SSA's commercial seed sector and advancing food security in Africa.

AATF and the Syngenta Foundation for sustainable Agriculture (SFSA), comprising experienced plant breeders, intellectual property rights experts, business strategists, product deployment professionals and seed policy specialists work alongside local partners to implement Seeds2B initiatives in SSA. Local partners involved include national agricultural research systems; farmer groups, processors and technical



*Tomato trials in Zambia*

organisations specialised in variety screening; organisations that have capacity to demonstrate new improved crop varieties with large numbers of farmers; organisations that link credit or savings to seed purchase; and seed producers and distributors.

AATF is implementing a pilot of the Seeds2B initiative in Malawi and Zimbabwe and leads the scaling of Seeds2B initiatives across SSA.

## Way Forward

'Additional trials are necessary to validate initial results. Promising cultivars will be progressed to medium scale evaluation trials in research and farmer fields to gather data on performance against farmer and commercial check varieties to justify varietal release and registration,' Edgar Wavomba, Seeds2B Project Coordinator, AATF.



*How we do it...!*

## **Africa's seed systems central to profitable farming for smallholder farmers**

The seed system is the pipeline through which quality seed moves from research and development to seed production and processing by seed companies to agro-dealers and ultimately to the farmers. An effective seed system will ensure that quality seed is developed, produced and distributed in time and that it is available, accessible and affordable to agro-dealers and farmers. For profitable farming to occur among smallholder farmers, adoption and repeated use of improved seed is critical. Grain yields have been known to triple through use of certified hybrid seed under good crop management practices.

Africa's seed system is dynamic, and currently consists of the informal system, characterised by farmers' saved seed, and the formal systems, which promotes breeding of improved varieties, and production and cultivation of certified seed.

However, in many Sub-Saharan Africa countries, farmers have not been able to fully benefit from the advantages of using improved quality seed due to a combination of factors, including inefficient seed production, distribution and quality assurance systems, as well as

bottlenecks caused by diverse seed policies and regulations in Africa.

AATF has adopted a multi-partner approach, working with seed research institutions, seed producers, distributors, agro-dealers, extension service providers and farmers. AATF works with and compliments the efforts of others to strengthen the capacity of seed system partners, including training and provision of facilities, fostering linkages within the value chain and advising on policy and regulations to facilitate production and movement of quality seed to reach its intended users. The on-going efforts on harmonisation of seed regulations by the Common Market for Eastern and Southern Africa, the Southern African Development Community and the West and Central African Council for Agricultural Research and Development will greatly improve trans-boundary movement of seed across countries, and avail more improved seed across countries.

The seed system is critical in providing quality product choices, strengthening the seed industry and enhancing agricultural productivity, leading to food security and better livelihoods.



*Tarsier (Tarsius) eating fruit in Madagascar.*  
Copyright: imageBROKER / Alamy Stock Photo



OPEN FORUM ON AGRICULTURAL  
BIOTECHNOLOGY IN AFRICA

## OFAB welcomes new phase, redefines biotech advocacy

The Open Forum on Agricultural Biotechnology in Africa (OFAB) Project received US\$ 5.6 million from the Bill & Melinda Gates Foundation to support its programmes in seven countries. The three-year (2015-18) grant enabled the project to redefine its focus and embrace wider conversations with stakeholders on agricultural biotechnology, especially at community levels.

The decision to devolve OFAB activities to the grassroots was in response to feedback from various stakeholders across Africa: farmers, religious leaders, policy makers, legislators and the civil society, among others. Most complained of inadequate public awareness and education on the benefits and safety of genetically modified organisms (GMOs). Additionally, policy makers and advisors constantly sought factual information to guide policy

formulation for the emerging biotech sector.

OFAB's flexible nature enabled it to respond positively to these comments and needs in a decisive and definitive manner. It shifted towards widened biotech knowledge and information sharing to support understanding and evidence-based policy decisions that would enable the environment for development and uptake of biotech products.

A key development during the year was the improvement of biosafety legal environments in some in project countries. For example, Nigeria succeeded in putting into place a science-based biosafety law that now legally allows the country to adopt modern biotechnology for economic development. Tanzania partially removed strict liability clauses from its regulations to allow for confined field trials of transgenic crops. Ethiopia, on its part, amended

the Biosafety Proclamation to create the necessary regulatory framework that will allow the Government to move forward with its plan of allowing the cultivation of *Bt* cotton.

In collaboration with partners such as AfricaBio and the International Service for the Acquisition of Agri-biotech Applications (ISAAA), OFAB organised an exchange visit to South Africa for 35 representatives of various stakeholder groups from Kenya for first hand interactions with farmers and regulators handling GM crops. The enlightened participants helped demystify the technology to others back home.

The other key activity was in advocacy skills sharpening. Teaming up with the newfound Cornel Alliance for Science, OFAB organised two capacity strengthening

sessions for its biotech advocates from across Africa. The first was a short course in Nairobi to train 20 partners on effective grassroots campaigns and networking. The second was a more robust three-month Global Leadership Fellows Program at Cornell University, Ithaca, USA. The purpose of the training was to equip biotech advocates and leaders from around the globe with practical tools they need to run successful advocacy campaigns in their local contexts.

In addition, OFAB, ISAAA and Cornel Alliance for Science organised an international conference on biotechnology and biosafety communication in Nairobi in April 2015. The outputs of the event, which attracted about 150 participants, are being organised into a manual that will be used to guide thought and action for posterity.



*Oumar Traore (left), Roger Zangre of OFAB Burkina and Bogani Maseko of AfricaBio during the training*

## Project overview

While science plays an important role in reversing wrong perceptions, misinformation often thrives in an environment where the evidence is poorly understood, leading to weak political and public support for science. That is why, in September 2006, AATF established OFAB, now a full-fledged project, to facilitate free-flow of credible biotech information from the scientific community to policy makers and the general public and vice versa.

The aim of the project is to share knowledge and facilitate constructive conversations among stakeholders, such as farmers, scientists, journalists, the civil society, industrialists, lawmakers and policy makers, among others, to create a better enabling environment for the deployment of biotech crops in Sub-Saharan Africa.

OFAB partners include AATF that provides coordination across Africa and the National Chapters that are coordinated by partner institutions in the eight countries of operation: Institute for Environmental and Agricultural Research (INERA), Burkina Faso; Ethiopian Institute for Agricultural Research; Council for Scientific and Industrial Research, Ghana;

ISAAA, Kenya; National Biotechnology Development Agency of Nigeria; Tanzania Commission for Science and Technology; Uganda National Council of Science and Technology; and National Biotechnology Authority, Zimbabwe.

## Looking forward

‘We will position OFAB as an open, interactive policy advocacy and communication platform that encourages sharing of ideas for common understanding of the potential benefits and limitations of agricultural biotechnology. We believe that the future of Africa lies in thriving agricultural sector, that is capable of producing enough food, feed and fibre for its people, livestock and industry. That future is untenable without embracing contributions of modern crop breeding technologies, including genetic engineering. Thus, OFAB will continue with its relentless quest to midwife constructive conversations among stakeholders to help steer the biotech debate away from risks and danger to that of critical examination of how best the continent can harness potential benefits of biotech products for food security and wealth creation.’ Daniel Otunge, OFAB Project Manager, AATF.





*Olive baboons eating fruit of doum palm,  
Samburu, Kenya.  
Copyright: Michele Burgess / Alamy Stock Photo*



## Bacterial Wilt-Resistant **BANANA**

### Developing transgenic bananas resistant to BXW disease

The second confined field trial of the Bacteria Wilt-Resistant Banana produced promising results. All the 10 transgenic lines under trial showed good resistance to Banana *Xanthomonas* Wilt (BXW) disease.

The trial, which was conducted at Kawanda National Research Laboratories in Uganda, had 12 replicates of 10 promising lines: 7 transgenic lines of Sukali Ndiizi with *Hrap* gene, 2 lines of Sukali Ndiizi with *Pflp* gene and 1 line of Nakyinika with *Pflp* gene, along with non-transgenic control plants of Sukali Ndiizi and Nakyinika.

None of the plants of any transgenic line except for INU12212-02 showed any symptoms of BXW disease after artificial inoculation. However, with 83.3 and 66.7 percent resistance in mother and ratoon crop respectively, INU12212-02 still outperformed all the control non-transgenic plants that were wiped out by the disease during the trial. All the replicates of the

remaining nine transgenic lines showed 100% resistance to BXW in both mother and ratoon crops.

The promising transgenic banana lines of cultivar Cavendish Williams and Gros Michel, having either single or stacked *Pflp* and *Hrap* genes, and showing 100 percent resistance to BXW, were multiplied for the planned confined field trials in Kenya.

In Uganda, the National Agricultural Research Organisation (NARO) has generated transgenic lines of banana matoke cultivar 'Nakitembe' and hybrid variety 'M9' using single gene and stacked gene constructs provided by the International Institute of Tropical Agriculture (IITA). These lines are currently under screen house evaluation for resistance to BXW.

In a bid to develop bananas that are resistant to both BXW and *Fusarium* wilt diseases, the project identified 10 lines of *Gros Michel* with *ES-Pflp* gene and 6 lines



*Transgenic banana in a lab at Kawanda National Research Laboratories in Uganda*

of Sukali Ndiizi containing *ES-Pflp* gene that had shown 100 percent resistance to BXW and potential resistance to Fusarium wilt disease. These were potted in glasshouse for further screening against Fusarium wilt disease.

## Project overview

East Africa produces and consumes the highest amount of bananas in Africa and Uganda is the world's second largest banana producer after India. Banana farmers in Uganda are currently battling with BXW disease caused by *Xanthomonas campestris* pv. *musacearum* (Xcm). The disease costs farmers millions of dollars in damages every year in East and Central Africa. The rapid spread of the disease has endangered the livelihoods of millions of

farmers for whom banana is a staple and also a cash crop. The project is using the plant ferredoxin like protein (*Pflp*) and the hypersensitivity response assisting protein (*Hrap*) genes that were isolated from sweet pepper (*Capsicum annum*) to develop a transgenic banana that is resistant to BXW.

The project is led by IITA in partnership with NARO, Uganda, and AATF which brokered access to *Pflp* and *Hrap* genes from Academia Sinica. IITA is leading product development and biosafety research and developing transgenic lines using varieties preferred in Kenya; NARO is developing transgenic lines using varieties preferred in Uganda; and NARO and IITA are conducting confined field trials in Uganda. The Kenya Agricultural and Livestock Research Organisation (KALRO) will conduct confined field trials in collaboration with IITA. Other



*A banana trial farm in Uganda*

stakeholders include public and private tissue-culture laboratories in Burundi, Democratic Republic of Congo, Kenya, Rwanda, Tanzania and Uganda.

## Looking forward

'We are optimistic our application to the Institute Biosafety Committee (IBC) of KALRO for confined field trial, and the subsequent one to Kenya's National Biosafety Authority will be approved, paving way for CFT planting planned for August 2016 at KALRO-Alupe,' Leena Tripathi, Project Principal Investigator, IITA.





*A farmer harvesting grapes in his vineyard in South Africa. Copyright: Ammentorp Photography / Alamy Stock Photo*

## Special Projects

# Overcoming regulatory challenges in commercialisation and adoption of biofertilisers and biopesticides in Africa

**C**OMPRO II Project made good progress in addressing the regulatory challenges which hamper commercialisation and adoption of biofertilisers and biopesticides in the target countries. The project published manuals for biofertiliser inspectors and registration guidelines for biofertilisers for the target six countries: Ethiopia, Ghana, Kenya, Nigeria, Tanzania and Uganda. Biofertiliser inspectors from each of the six countries were trained on the use of the manuals. In Kenya and Ethiopia, the project prepared the standards for biofertilisers document to be adopted by policy makers. Along with this, policy briefs for Ghana, Kenya, Nigeria and Tanzania were prepared and published.

### Overview

The COMPRO II Project was launched in 2012 to ensure effectiveness, safety and quality assurance of bio-based products on the market due to the current insufficiency in evaluating these products for quality and efficacy. The project works towards creating an enabling policy environment for testing, registration and dissemination of promising candidate biofertilisers, biopesticides and chemical agro-inputs to increase crop yields.

The International Institute for Tropical Agriculture (IITA) coordinates the project that is being implemented in six Sub-Saharan African countries – Kenya, Uganda, Tanzania, Ethiopia, Ghana and Nigeria.

Based on the AATF experience in managing regulatory affairs including compliance, the Foundation was tasked with facilitating establishment and institutionalisation of quality control and regulatory mechanisms for biofertilisers and biopesticides in the six project countries. This entails engaging regulators and policy makers to catalyse processes leading to emergence of a conducive regulatory environment for testing and registration of bio-fertilisers and bio-pesticides in Sub-Saharan Africa.

## Looking forward

'Development of manuals for biofertiliser inspectors, registration guidelines for biofertilisers and related policy briefs need to be extended to other countries in SSA considering the cross border trade in biofertilisers and biopesticides,' Francis Nang'ayo, Senior Manager, Regulatory Affairs, AATF.

## Sampling and testing protocol: Ensuring accuracy in determining aflatoxin contamination in maize and peanuts

Imagine rejecting a product because it was falsely tested positive for aflatoxins, or worse, consuming a product because it was falsely tested negative for aflatoxins and consequently approved for human consumption. Unfortunately, these have not been imaginations, but the stark reality for millions of people in Sub-Saharan Africa (SSA) who have suffered or even lost lives because they consumed aflatoxin contaminated products which had been falsely tested negative.

Working closely with the Common Market for Eastern and Southern Africa (COMESA), the United States Department of Agriculture's Foreign Agricultural Service (USDA-FAS) and national partners in SSA,

AATF through the Aflatoxin Control in Maize and Peanuts Project moved closer to eliminating these false results in testing for aflatoxins with the development of a Sampling and Testing Protocol. Besides ensuring the validity, confidence, and acceptance of aflatoxin testing results, the protocol will also be critical in monitoring of aflatoxins in traded commodities in the region.

The protocol, which has been validated by North Carolina State University, was a major resource material during a regional trainer of trainer's workshop that was held in Kampala, Uganda in December 2015. The purpose of the training was to build the capacity of the national competent

laboratories and private grain handling and milling companies on practical use of the sampling, grading and testing protocol.

The project also developed the Guidance Document on registration of bio-pesticides in Sub-Saharan Africa, a contributor towards development of a regionally targeted biopesticide regulatory framework for Africa that will guide registration processes.

## Looking forward

'AATF will continue working with COMESA, USDA-FAS and national partners to ensure that both the Sampling and Testing Protocol and the Guidance Document are adopted and put to use by all governments in Sub-Saharan Africa,' Francis Nang'ayo, Senior Manager, Regulatory Affairs, AATF.

## Financial Report 2015

These audited financial statements cover the period from January 2015 through December 2015 and provide comparative data for 2014 – the previous accounting period.

### Funding overview

AATF investors for the year 2015 were:

- Bill & Melinda Gates Foundation
- Howard G. Buffett Foundation
- United Kingdom's Department for International Development (DFID)
- United States Agency for International Development (USAID)
- Syngenta Foundation for Sustainable Agriculture (SFSA)
- Fintrac

AATF has continued to use sub-grants received earlier from:

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

The funds from IITA are from the Bill & Melinda Gates Foundation grants for the Commercial Projects (COMPRO) II for the execution of specific tasks.

AATF is grateful to all its investors for their continued support that ensures that its commitment towards assisting resource-constrained farmers in accessing affordable agricultural technology to improve their lives is achievable.

## Statement of financial position as at 31 December 2015 (US\$)

	2015	2014
<b>ASSETS</b>		
<b>Non-current assets</b>		
Equipment and motor vehicles	104,292	140,419
Intangible assets	2,746	1,333
	<b>107,038</b>	<b>141,752</b>
<b>Current assets</b>		
Grants receivable	5,281,019	4,974,996
Other receivables	2,066,536	889,518
Bank and cash balances	310,152	3,672,644
	<b>7,657,707</b>	<b>9,537,158</b>
<b>Total assets</b>	<b>7,764,745</b>	<b>9,678,910</b>
<b>FUND BALANCES AND LIABILITIES</b>		
<b>Current liabilities</b>		
Unexpended grant payable	1,491,186	2,156,187
Deferred income	-49,021	4,120
Payables and accruals	551,645	1,273,681
	<b>1,993,810</b>	<b>3,433,988</b>
<b>Fund balances</b>	<b>5,770,935</b>	<b>6,244,922</b>
Total liabilities and fund balances	7,764,745	9,678,910

## Statement of comprehensive income (abridged version in US\$) for the year ended 31 December 2015

	2015	2014
<b>INCOME</b>		
Grant income	20,092,519	24,584,723
Other income	1,181,478	1,262,422
Deferred income	53,141	46,916
<b>TOTAL INCOME</b>	<b>21,327,138</b>	<b>25,894,061</b>
<b>EXPENDITURE</b>		
Project related expenses	19,896,108	22,725,374
Management and general expenses	1,905,017	1,995,763
<b>TOTAL EXPENDITURE</b>	<b>21,801,125</b>	<b>24,721,137</b>
<b>SURPLUS FOR THE PERIOD</b>	<b>-473,987</b>	<b>1,172,924</b>
Percentage of management and general expenses to the total operating expenses	8.74%	8.07%
Percentage of project related expenses to the total operating expenses	91.26%	91.93%
	<b>100%</b>	<b>100%</b>

### Financial status

The funding received/available income as at 31 December 2015 was adequate for the Foundation's needs for the year as all expenditures were fully catered for. The Foundation's finance is healthy both in terms of expenditures/income and project expenditures/general operating expenses ratio.

The Foundation continues to receive unqualified audit opinion from external auditors. The independent auditors' opinion for the year was that the financial statements presented fairly, in all material aspects,

the financial position of the Foundation as at 31 December 2015 and its financial performance and cash flows for the year then ended in accordance with International Financial Reporting Standards and the requirements of Kenya's Companies Act.

The future is promising with AATF's main donors continuing to support the Foundation. DFID renewed its support to the Foundation for another five years with a larger commitment of US\$ 14.4 million. The Open Forum for Agricultural Biotechnology (OFAB) Project received US\$ 5.6 million from the Bill & Melinda Gates Foundation to support its programmes for the next 3 years.

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**Simeon Eze**, *Driver, Abuja Office*

# Acronyms

AATF	African Agricultural Technology Foundation	IIAM	Institute of Agricultural Research
AFS	Cornell Alliance for Science	INERA	Environmental Institute for Agricultural Research, Burkina Faso
ARC	Agricultural Research Council	ISAAA	International Service for the Acquisition of Agri-biotech Applications
AUC	African Union Commission	IITA	International Institute of Tropical Agriculture
AWARD	African Women in Agricultural Research and Development	IR	Imazapyr resistance
BMGF	Bill & Melinda Gates Foundation	KALRO	Kenya Agricultural and Livestock Research Organisation
BXW	Banana Xanthomonas Wilt	MAFS	Modernizing African Food System Consortium
CAMAP	Cassava Mechanisation and Agro-Processing Project	MLN	Maize Lethal Necrosis
CCARDESA	Centre for Coordination of Agricultural Research and Development for Southern Africa	MoU	Memorandum of understanding
CFTs	Confined field trials	NABDA	National Biotechnology Development Agency
CGIAR	Consultative Group on International Agricultural Research	NARO	National Agricultural Research Organisation, Uganda
CIAT	International Center for Tropical Agriculture	NASECO	Nalweyo Seed Company
CIMMYT	International Maize and Wheat Improvement Center	NBC	National Biosafety Committee
COMESA	Common Markets for Eastern and Southern Africa	NBMA	National Biosafety Management Agency, Nigeria
COMPRO	Commercial Products Project	NCAM	National Centre for Agricultural Mechanisation, Nigeria
CSIRO	Commonwealth Scientific and Industrial Research Organisation, Australia	NCRI	National Cereal Research Institute, Nigeria
DARS	Department of Agricultural Research Services, Malawi	NCRRI	National Crops Resources Research Institute, Uganda
DFID	Department for International Development	NERICA	New Rice for Africa
DH	Doubled Haploids	NEWEST	Nitrogen Use Efficient, Water Use Efficient and Salt-Tolerant
DR&SS	Department of Research and Specialist Services, Zimbabwe	NPT	National Performance Trials
DUS	Distinctness, uniformity and stability	NRCRI	National Root Crops Research Institute, Nigeria
EIAR	Ethiopian Institute of Agricultural Research	NTOs	Non-target organisms
FARA	Forum on Agricultural Research in Africa	NUE	Nitrogen use efficient
GMOs	Genetically modified organisms	OFAB	Open Forum on Agricultural Biotechnology in Africa
HEAL	Hybrid East Africa Ltd	PBR	Pod-bearer resistance
ICRAF	World Agroforestry Centre	PCPB	Pest Control Products Board
		PIPRA	Public Intellectual Property Resource for Agriculture

## Acronyms

RECs	Regional economic communities	USDA-ARS	United States Department of Agriculture's Agricultural Research Service
SADC	Southern African Development Cooperation	USDA-FAS	United States Agency for International Development – Foreign Agricultural Service
SFSA	Syngenta Foundation for Sustainable Agriculture	VCU	Value for cultivation and use
SSA	Sub-Saharan Africa	WEMA	Water Efficient Maize for Africa
STAK	Seed Trade Association of Kenya	WWT	WEMA-wide trials
TGMS	Thermo-sensitive Genetic Male Sterility	ZARI	Zambia Agricultural Research Institute
USAID	United States Agency for International Development		



AFRICAN AGRICULTURAL TECHNOLOGY FOUNDATION  
FONDATION AFRICAINE POUR LES TECHNOLOGIES AGRICOLES

**African Agricultural Technology Foundation**

P O Box 30709 - 00100, Nairobi, Kenya

Tel: +254 – (0) 20-4223700 | Fax: +254 – (0) 20-4223701

Email: [aatf@aatf-africa.org](mailto:aatf@aatf-africa.org) | Website: [www.aatf-africa.org](http://www.aatf-africa.org)