

## **Maruca-Resistant Cowpea Progress Report 2012**





## The Project

The *Maruca*-resistant Cowpea project is a public-private partnership coordinated by the African Agricultural Technology Foundation (AATF) to develop improved varieties of cowpea that can withstand the pod borer (*Maruca vitrata*), and enhance farmers' grain and fodder production. *Maruca vitrata* is a major pest that inflicts severe damage to cowpea on farmers' fields. In severe infestations, yield losses of between 70-80% have been reported. Cowpea is considered the most important food grain legume in the dry savannas of tropical Africa, where it is grown on more than 12.8 million hectares of land. It is rich in quality protein and has energy content almost equivalent to that of cereal grains, is a good source of quality fodder for livestock and also provides cash income. Nearly 200 million people in Africa consume the crop.

The project, which started in 2008, is accessing and inserting the *cry1Ab* gene (*Bt* gene) into selected cowpea varieties to protect the crop against the *Maruca* pod borer. The partnership promotes technological interventions that will optimise cowpea productivity and utilisation in Sub-Saharan Africa through a combination of conventional breeding and genetic enhancement.

The developers expect to have the first *Maruca*-resistant cowpea (*Bt* cowpea) seed available to farmers around 2017 subject to approvals from regulatory agencies; the identification of effective and stable *Maruca*-resistant lines; and efficient transfer of the resistance to traditional varieties through conventional breeding.

This report presents progress made by the project in 2012.



Left-Right-Lawan Umar-trial manager, Dr Thomas Higgins-technology developer, Prof Stephen Misari-Project entomologist at the Confined Field Trial site in Zaria, Nigeria



## Message from the Project Manager

**T**he Maruca resistant cowpea project made significant progress during 2012 towards its goal of developing Maruca resistant cowpeas for use by our smallholder farmers. For the second year running, the confined field trials in Nigeria and Burkina Faso were successful with strong indication that the project may have identified promising varieties that are resistant to the *Maruca* pod borer.

Identifying resistant plants is a significant milestone in product development of agricultural biotechnology because these plants will be used to incorporate the traits into farmers preferred varieties through breeding.

Evaluation of the *Maruca*-resistant cowpea varieties progressed well in Nigeria and Burkina Faso as Ghana was granted approval by the country's National Biosafety Committee (NBC), the regulatory authority for development of biotechnology in Ghana, to conduct Confined Field Trial's in the country.



Dr. Prince Addae

The Project was also granted approval by the NBC of Nigeria and Agence Nationale De Biosecurite (ANB) of Burkina Faso to import seed to conduct the fourth and second CFTs respectively. The seed was produced and characterised by Dr. T. J. Higgins at Commonwealth Scientific and Industrial Organization (CSIRO) in Australia. The laboratories in Nigeria and Burkina Faso were also equipped to facilitate the rearing of *Maruca* for successful infestation of the plants to determine their efficacy.

I wish therefore to extend my appreciation to the Principal Investigators, the project teams and their institutions in the partner countries for their dedication and commitment to the success of the project. I take this opportunity to thank the technology providers, the investment partners, the partner country governments and especially the National Biosafety Committees for their sustained contribution to development and deployment of *Maruca* resistant varieties for smallholder farmers in Sub-Saharan Africa. I wish to reiterate the commitment of the African Agricultural Technology Foundation (AATF), the coordinating partner, to ensuring success of the *Project*.

It is my fervent hope that the project will be permitted to extend its field testing programme from one CFT site to multi-locations in each implementing country to accelerate the product development phase of the *Project* in the coming years to enable timely deployment of *Maruca*-resistant varieties to our





## Project Review and Planning Meeting Held



Group Photo of the Project Advisory Committee and Implementing partners during the meeting in Ghana in March 2012

The Project Advisory Committee and project implementing partners held a two-day meeting in March 2012 in Ghana that brought together partners from Nigeria, Burkina Faso and Ghana. The meeting reviewed progress made in 2011 especially on the CFT performance, discussed challenges encountered and planned 2012 activities. Data from the CFT's conducted at the Institute for Agricultural Research (IAR), Ahmadu Bello University, Zaria and the Institut de l'environnement et de Recherches Agricoles (INERA), Farako Ba, Burkina Faso was also reviewed where participants concluded that the 2011 CFT results from Nigeria and Burkina Faso were promising and provided a strong proof of concept.

In October 2012, the Cowpea Project Manager, Dr Prince Addae, and the AATF Seed Systems Manager, Dr Gospel Omanyia attended a Cowpea Consortium Meeting for West Africa in Niamey, Niger where discussions on dissemination strategies for improved cowpea varieties in West Africa were held.



Key activities during 2012 included product development and compliance management.

### 1. Product Development

Product development activities hinged on transformation and characterization to generate more events for selection of elite lines; conduct of confined field trials (CFT) for efficacy and agronomic potentials; and trait introgression into farmer preferred varieties.

**Event transformation and characterization:** More than 100 independent transgenic events were generated during the year out of which fourteen (14) were selected for further evaluation. The 14 events were further evaluated on the basis of seed yield per plant, level of expression of the gene of interest (*Cry 1Ab*) in the flowers and days to first flowering, among other criteria used at CSIRO lab in Australia. Four (4) new events were then selected as candidate events for field testing in 2012.

**Confined field trials (CFT):** Seed of the four new events together with lines 709A and 252D (which had been outstanding from previous CFTs ) were dispatched from CSIRO Australia for 2012 CFTs in Nigeria and Burkina Faso respectively. Prior to the seed shipment, import permits were received from these countries and export permit from Australian Quarantine Inspection Services (AQIS). Two CFTs were planted in Nigeria (one for efficacy testing and another for agronomic potentials) and one in Burkina Faso. The three CFTs at both locations were harvested in November 2012, seeds were processed

and data collected. Full data analyses are in progress. However, preliminary results indicate that two events 709A and 252D are efficacious against *Maruca* pod boarer and this is consistent with the CFT results of previous years.

**Trait introgression into farmer preferred variety:** The second backcross(BC) involving 709A and the commercial cowpea varieties IT97K-499-35 and IT93K-693-2 were planted in Zaria, Nigeria to generate the third backcross, as well as generate additional crosses involving Kanannado (a popular local cowpea variety). Screening for genetic studies was completed and analysis conducted.

In Burkina Faso, incorporating the *Cry1Ab* gene by using 709A and 252D as donor lines into farmer preferred



The transgenics have produced pods (left) compared to the control (IT86D-10-10) at the CFT in Nigeria in 2012





## Key Project Activities and Milestones

selected varieties include those that are also striga resistant.

### 2. Compliance Management

A post-harvest land management programme (PHLM) to monitor, remove and destroy volunteers from 2011 CFT in Nigeria was successfully completed and a report compiled in April 2012. In order for the project to advance to CFT IV, an Initial Environmental Examination (IEE) report was prepared.

In Burkina Faso, a new CFT application was prepared and submitted to l' Agence Nationale de Biosecuriter (ANB) in April 2012. Approval for the second CFT was granted. Prior to establishing the CFT, an IEE Report was prepared and submitted to USAID and a clearance was obtained.

**CFT Compliance Management Training:** In anticipation of conducting CFTs in Nigeria, Ghana and Burkina Faso in 2012, a two-day Regional CFT Compliance Management Training Course was organized and conducted by AATF in Ghana in July 2012 to refresh the principal investigators and CFT staff on the theory and practice of CFT management. This was aimed at ensuring that personnel handling CFT activities in the three countries are familiar with regulatory compliance requirements throughout the duration of the CFT. The trainees were also encouraged to hold additional training at the CFT sites to infuse the knowledge of CFT compliance to all their staff including security and casual employees. The Project will continue to carry out regular compliance audits to ensure the CFT's comply with country regulations.



A. Shows wild type cowpea destroyed by Maruca pod borer.  
B. Shows clear resistance to Maruca pod borer by transgenic cowpea.



## Dr T.J. Higgins visits Nigeria and Burkina Faso CFT sites

Dr T. J Higgins visited the IAR and INERA CFT sites in Nigeria and Burkina Faso respectively in October 2012 to monitor the performance of the cowpea transgenic seeds imported from CSIRO lab in Australia. Dr Higgins, who is instrumental in the development and production of cowpea events tested in the two countries was impressed with the performance of the 2012 trials in both countries particularly as it concerns the ability of the transgenic events to withstand attack by the *Maruca* pod borer.



Dr's Jean Baptiste Tignegre and T J Higgins with some project staff counts the seeds after the CFT harvest

## Ghana approves CFT for Cowpea

The Project in Ghana received approval to conduct its first CFT for the *Maruca*-resistant cowpea in November 2012. The decision by Ghana's NBC was a boost to the Project as it will enable it to carry out evaluation of the *Maruca*-Cowpea at the Savannah Agricultural Research Institute (SARI) at Tamale in 2013.

In preparation for the Ghana trials, the Principal Investigator and the Entomologist for the *Maruca*-resistant Cowpea Project in Ghana, Dr Ibrahim Atokple and Mr Jerry Imboynie were trained on CFT implementation and *Maruca* rearing for field infestation at IAR Zaria, Nigeria between October and November 2012.

The training was facilitated by Mr Mohammed Lawan Umar, the CFT Manager and Prof Stephen Misari, the Entomologist.



The completed CFT site at SARI, Tamale, Ghana.





## Regional Regulatory compliance training carried out in Ghana

A regional regulatory and compliance training workshop for the *Maruca*-resistant Cowpea project implementing partners was carried out in July, 2012 in Accra Ghana to enhance the capacity of the personnel involved in managing CFT's in Nigeria, Burkina Faso and Ghana.

Nigeria and Burkina Faso shared their experiences on managing CFTs including the challenges and lessons with the Ghana project team. The training was organised by the AATF Regulatory Affairs office, led by Dr. Francis Nang'ayo.



Group photo of participants who attended the training in Ghana in July 2012

## Nigeria holds stakeholder sensitisation workshop and Workshop for Journalists on biotechnology Reporting



Group photo of some of the journalists and AATF staff who participated in the media training held in Abuja in Dec. 2012

The IAR, Nigeria held a one day stakeholder sensitisation workshop on the *Maruca*-resistant Bt Cowpea project in November 2012 to update them on Project Progress. The workshop was attended by over 200 participants that included academicians, research scientists, legislators, students, farmer cooperatives,

agro allied companies and NGOs/CBOs and the media. This was the second sensitisation workshop to be organised by the project. The workshop also aimed at informing the stakeholders about the anticipated release and commercialisation of cowpea varieties with





increased productivity and resistance to the *Maruca* pod borer.

Presentations were made on: 'Prospects for the release and commercialisation of *Maruca*-Resistant Cowpea' by Prof Mohamed Ishiyaku, the Principal Investigator of the Project; 'IAR's insect rearing capacity: The Bt Cowpea Project experience' by Prof Stephen Misari and 'Regulating agricultural biotechnology: The role of institutional biosafety committee by Prof Shehu Ado, the Chairperson of the Institutional Biosafety Committee (IBC).

All presenters emphasised the need to embrace biotechnology applications.

The Project also organised a one-day media workshop on biotechnology reporting in December 2012 that

aimed at strengthening the journalists understanding of biotechnology and science reporting. The workshop was a follow-up to a similar one held in October 2010 and it focused on plant breeding and agriculture, gene modification, and the role of media in biotechnology communication. The highlight of the workshop was the interaction between scientists and journalists on prevailing issues around biotechnology in general which was quite informative as testified by most of the participants. The workshop discussions received good coverage in most national newspapers, television, and radio networks. A major outcome of the training was the request by participants for a monthly or quarterly café to update the media on science innovations and biotechnology in particular, a request that AATF will consider under its Open Forum on Agricultural Biotechnology in Africa (OFAB) initiative.

### Engaging with the seed industry

The *Maruca*-resistant cowpea project in collaboration with OFAB Nigeria chapter held a special Awareness seminar, dedicated to the National Agricultural Seeds Council (NASC) of Nigeria and seed companies on 6 August 2012 in Abuja. The meeting focused on four critical areas; research on seeds of improved crop varieties, the prospects for domestication of such seeds, regulatory structures affecting biotechnology development as well as the creation of a framework for the production and distribution of genetically modified (GM) seeds.



The emergence of private seed companies was identified as the key driver for the domestication and commercialisation of GM seeds based on their capacity and existing network. There are about 40 registered private seed companies in the country.

Some of the participants at the special OFAB for the seed industry in August 2012 in Abuja, Nigeria



## Dr. Prince Addae recruited as Cowpea Project Manager

A new project manager was recruited for the Maruca Resistant Cowpea Project. Dr Prince Addae, is an Agronomist with a PhD from University of Sydney, Australia, an MSc from University of Guelph, Ontario, Canada and a BSc (Hons) from University of Science & Technology, Ghana. Prince began his career working for Ghana Grains and Legumes Board at Kumasi on Ghana/Canada Grains Development Project as a Senior Development Officer (agronomist) where he was a major contributor towards maize and cowpea production in Ghana from 1979 to 1986.

He managed Fiji's vegetables, cereals and tropical fruits research program as Principal Research Officer, Horticulture, for the Ministry of Food and Agriculture, Fiji, and was a consultant for the Sigatoka Valley Development Project (SVRDP) that was funded by the Asian Development Bank and the Fiji Government. Prince joined Monsanto Company at St Louis, USA as Geneticist/Breeder from 1998 to 2006 where he incorporated insect-resistant and Roundup Ready flex traits into cotton varieties from Burkina Faso leading to Bt cotton commercialisation. As Regulatory Agronomy Manager he managed many regulatory field tests on insect-resistant maize and herbicide tolerant soybean across the midwest of USA for submission of reports to global regulatory authorities from 2007 to 2010.

He worked on biotech cotton as Trait Testing Manager for Bayer Crop Science in Lubbock, Texas. Afterwards, Prince volunteered to participate in the USAID/CLUSA farmer to farmer programme and trained over 200 farmers on best farming practices including methods of triple containment for millet storage in Senegal. Prior to



joining AATF as Project Manager for Cowpea, he was an International Consultant for United Nations Industrial Organization (UNIDO), Vienna on biotech cotton for Ghana to revitalise Ghana's cotton industry. Prince was born in Ghana.





## The Partnership

The *Maruca*-resistant Cowpea Project involves various partners:

- AATF
- Network for the Genetic Improvement of Cowpea for Africa (NGICA)
- Commonwealth Scientific and Industrial Research Organisation (CSIRO), Australia
- International Institute of Tropical Agriculture (IITA)
- Monsanto Company
- The Kirkhouse Trust
- National Agricultural Research Systems in target countries of west Africa
- Institut de l'Environnement et de Recherches Agricoles (INERA), Burkina Faso
- Institute of Agricultural Research (IAR), Zaria, Nigeria
- Council for Scientific and Industrial Research (CSIR) Ghana
- Funding support to the AATF for development of the *Maruca*-resistant Cowpea has come from the
- Rockefeller Foundation, United States Agency for International Development (USAID) and
- The UK Department for International Development (DFID)



Group Photo of the Project Advisory Committee and Implementing partners during the meeting in Ghana in March 2012

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