

Stakeholders strategize ways to strengthen breeding pipelines in West Africa

An array of institutes and lead specialists on breeding across West Africa convened at IITA-Ibadan for a workshop on 12–15 March, to discuss and exchange ideas on how they can work together to bring best practices and tools that can help them achieve their objectives more effectively, efficiently, and within a relatively shorter time scale.

The 4-day workshop themed “West Africa Transforming Breeding,” aims to look at ways to modernize and transform breeding strategies, increase efficiencies, and develop the capacity to increase the rates of genetic gain in West Africa. Breeders and associated researchers as well as program leaders from the [International Maize and Wheat Improvement Center](#) (CIMMYT), [International Crops Research Institute for the Semi-Arid Tropics](#) (ICRISAT), [AfricaRice](#), and [IITA](#), attended the workshop with a shared vision of pulling together national, regional, and international partners to synergize efforts to increase agricultural productivity levels, farmers’ yield and income, establish a rationale of sustainable improvement, and also highlight the scientific innovations being deployed by breeders, as a starting point for building a globally unified community of practice around modern breeding techniques. The workshop was jointly sponsored by the Excellence in Breeding (EIB) platform, Genomic Open-source Breeding Informatics Initiative (GOBii), Integrated Genotyping Service and Support (IGSS), the High-Throughput Genotyping (HTPG) platform, and the Next Generation Cassava Breeding program.

The call for transformation in agriculture is now being embraced by breeders,



Ismail Rabbi, IITA Molecular Geneticist and workshop coordinator, welcomes participants to the workshop.

West Africa Transforming Breeding workshop participants receive field data collection equipment



Participating CGIAR and NARS breeding programs empowered to increase data collection throughput and accuracy through barcoding and electronic data entering equipment courtesy of the HTPG project. Photo by I. Rabbi, IITA



West Africa Transforming Breeding participants in a group photo.

who, in discussion with public and private sector investors, are working to redefine and transform breeding. This is because plant breeding is a long-time investment, which can succeed if it is sustained. African agriculture is changing, and central to this transformation is identifying the market demands and developing agricultural products that meet this demand.

In his welcome address, IITA Director General [Nteranya Sanginga](#) applauded the spirit of enthusiasm and cooperation among participants, and acknowledged their collaborative effort.

“IITA is 50, and we are proud of the tremendous impact the Institute has made globally. I am certain that with this set of experts, we can continuously transform breeding in West Africa, but we cannot transform breeding without addressing the issues of agronomy. I urge all participants to seize the opportunity to come out with new

proposals as we aim to combine the science of discovery with the science of delivery, to ensure full sustainability of improved crop varieties and their related value chains within the region,” he added.

Agreeing with DG Sanginga’s address, [Ismail Rabbi](#), IITA Molecular Geneticist, encouraged the participants to learn, interact, and discuss practical issues on how to engineer and harmonize breeding programs to make them more resourceful and sustainable.

During the plenary session, topical presentations were made by stakeholders that cut across the various breeding pipelines, ranging from breeding strategy, and process optimization, data management and systems integration, sample tracking, genomic selection and analysis pipeline, genotyping data management, and marker application tools. A way forward in subsequent years was also deliberated upon.

The session incorporated the presentations of two keynote speakers titled “*The components of a modern breeding program; sharing an industry perspective to genetic gain*” by Stella Salvo, Precision Breeder for Asia-Africa, Monsanto, and “*Entering the age of genomic breeding: Big steps for a small program*” by Clay Sneller, co-Leader of the Integrated genotyping and support platform (IGSS) platform, both directed towards redefining, strengthening, and transforming breeding with the objective of making significant impact among smallholder farmers in Africa.

This change in attitude and practice of breeders aims to increase productivity and profitability of crops in Africa, and to meet the ever-increasing food demand across the population due to changes in diets and standards of living. The breeders also emphasized that new plant varieties need to be developed and adapted to meet these varied market needs.

R4D Special

Taking stock of efforts to address *Pseudocercospora* banana pathogens of three deadly banana diseases

Black leaf streak disease or black Sigatoka, yellow Sigatoka, and eumusae leaf spot are three closely related and complex diseases that constrain banana and plantain production globally. They are caused by three fungi belonging to the genus *Pseudocercospora*: *P. fijiensis*, *P. musae*, and *P. eumusae*, that

cause black Sigatoka, yellow Sigatoka, and eumusae leaf spot, respectively.

Much effort has gone into controlling these pathogens and their related diseases since the first pathogen, *P. musae*, was identified as a banana pest in Java Islands in 1902. The other two, *P.*

fijiensis and *P. eumusae*, were reported in the Sigatoka district of the Fiji Islands in 1963 (thus the name sigatoka) and in Southeast Asia in the 1990s. Black Sigatoka has since spread and is considered the most problematic disease of banana globally.

A team of researchers from IITA have compiled these efforts in a paper [“Progress in understanding *Pseudocercospora* banana pathogens and the development of resistant *Musa* germplasm,”](#) published recently in the *Plant Pathology Journal*. They also identified areas that need further attention to save banana from these deadly diseases.

Control efforts

According to the paper, these fungi cause streaks on banana leaves that turn necrotic, significantly reducing their ability to photosynthesize. This can lead to 35–100% yield loss, due to poorly filled fruits and smaller and lighter bunches. They also cause premature ripening of the fruit.

Management of the pathogens includes the use of fungicide, but this increases the cost of production by 25–30%. In total, over \$550 million is spent annually worldwide on these chemicals, which also pose environmental risks to those working and living near banana plantations.

Non-chemical disease management approaches, such as the use of biological control agents, organic farming, cultural practices, and phytosanitary legislation exist, but they have not been widely adopted as they are often laborious and require specialized equipment that are not affordable in developing countries.

Climate change threat

Traditionally, *Pseudocercospora* banana pathogens were separated by altitudinal and climatic gradients. *P. musae* was restricted to higher altitudes with cooler temperatures while *P. fijiensis* was more prevalent in lower, warmer areas with higher rainfall. However, it appears *P. fijiensis* has been shifting upwards to higher altitudes and in some cases, has replaced *P. musae* to become the dominant *Pseudocercospora* banana pathogen.

This gradual displacement suggests an evolutionary adaptation to either a changing climate or host fitness.

While researchers have suggested that the higher temperatures will



Left: A *Sigatoka* susceptible highland cooking banana. Right: A *Sigatoka* resistant highland cooking banana developed by IITA. Photos by A. Alakonya, IITA.

increase the areas suitable for banana production by 50% by the year 2070, this may also affect *Pseudocercospora* banana pathogens and result in increased disease severity and the potential for emergence of new pathotypes. This calls for elaborate surveillance and management programs for these banana pathogens as the most cost-effective option to reduce future impacts.

Host resistance

The paper also looked at efforts to develop banana and plantain varieties with resistance to *Pseudocercospora* banana pathogens using both conventional and biotechnology methods by several breeding programs which started in 1922.

Most of the efforts have focused on *P. fijiensis* and some level of resistance or tolerance has been clearly demonstrated. Examples of successful breeding programs include IITA's improved *P. fijiensis*-resistant plantain hybrids, known as PITAs, and cooking banana hybrids called BITAs now available in several countries including Nigeria, Uganda, Cameroon, the Ivory Coast, and Ghana.

IITA, in collaboration with the National Agricultural Research Organisation (NARO)-Uganda, has also developed several East African Highland cooking banana hybrids (called NARITAs). Some

of these NARITA hybrids have been tested in Uganda by IITA and NARO and the most promising ones have already been released to farmers.

One of the factors that has led to these successes was the establishment of the International Musa Transit Center (ITC) in Belgium to support sanitization, multiplication, and distribution of genetic stocks from around the globe for breeding programs and to farmers.

These gains had also been made possible by integrating banana breeding with molecular tools due to the complexities of breeding banana, including its sterility, polyploid nature, low seed germination, and narrow genetic base.

To overcome these breeding challenges, a number of studies have been exploring transformation and have generated transgenic plants and evaluated them for resistance to *Pseudocercospora* in vitro in the greenhouse and under limited field conditions.

This has also led to the development of more efficient banana transformation protocols. However, the acceptability of genetically transformed banana still faces resistance from anti-GMO groups and banana-importing countries. Other biotechnology options include the use of marker-assisted selection (MAS) to accelerate the germplasm selection process and genome editing.

Africa RISING, SIIL, and SIMLESA hold joint learning event

If you had a once-in-a-lifetime opportunity to talk to a policymaker about systems research in agriculture/sustainable intensification (in sub-Saharan Africa), its value, and why it should be funded, what relevant case studies, high line results, and lessons learned would you share to get a positive response?

This was the question posed recently to a group of agricultural researchers at a joint learning event on sustainable intensification/farming systems research approaches. Convened by the [United States Agency for International Development \(USAID\)](#) and the [Australian Centre for International Agricultural Research \(ACIAR\)](#) on 13–15 March, in Arusha, Tanzania, the meeting sought to roll out the process for distilling common denominators in terms of impact, lessons learned, and value from [Africa RISING](#), the [Sustainable Intensification of Maize-Legume Cropping Systems for Food Security in Eastern and Southern Africa \(SIMLESA\)](#), and the Feed the Future Innovation Lab for Collaborative Research on Sustainable Intensification ([SIIL](#)) programs.

“We hope to see a common vision for systems research starting to emerge from this meeting. This does not mean that activities of the three programs have to be identical, but it would be nice to know in which areas each program is operating, geographically and the principles and strategies they are using. This information will help us improve coordination and better explain our work to the funders at USAID and ACIAR,” said USAID senior sustainable agricultural systems advisor, Jerry Glover, at the opening of the meeting.

For two and a half days, participants examined the approaches used by the three programs in implementing research-in-development activities in different countries; distilled the important common/desired elements for systems research programs; teased out lessons learned about systems research; evaluated policy, market and institutional changes for effective sustainable intensification; documented



SIMLESA–Africa RISING joint learning event. Photo credit: Jonathan Odhong/IITA.

compelling cases where systems research has made a difference; and also brainstormed on low-cost areas for joint action between SIMLESA, Africa RISING, and SIIL going forward.

To highlight the intricacies of systems research in agriculture for sustainable intensification, ACIAR principal advisor for cropping systems, John Dixon, noted that the complexity of systems research/sustainable intensification is best illustrated by the universally acclaimed success story of the Green Revolution.

“For many decades, people thought that the Green Revolution was a magnificent success without downsides. We are now recognizing that the essential successes of the Green Revolution which were absolutely needed to feed Asia [at the time], came at a huge environmental cost. In fact, in India, China, and other Asian countries there is a huge run-down of the environment, aquifers, underground water, the soils, and biodiversity. We also see a lot of other externalities, for example, the news that Beijing is the most polluted city in the world; now it seems that New Delhi has been granted that mantle. And that is connected to agriculture. So in this example, the ‘S’ part of SI (= sustainable) has been neglected at the expense of the I part (intensification). Was it neglected in research or did

researchers not pay attention to things like natural resources, to water, etc.?” he posed.

While broad consensus and common understanding/appreciation of progress in systems research/sustainable intensification developed among participants, a few sticky points also emerged that formed the basis of discussions in future joint learning events. These included: the need to establish common definitions for terms like “reach”, “use”, “adoption”, etc.; approaches to scaling as an integral part of research-in-development action; measuring risk and establishing metrics for systems resilience; data management challenges/opportunities, and integration of plot-level interventions into the landscape level.

At the close of the meeting, participants also pored over the future possibility of setting up a multi-donor platform that would bring together different donors and stakeholders involved in systems research in agriculture for sustainable intensification.

A key output from this meeting (expected to be finalized by June 2018) will be a synthesis document articulating the progress and achievements of systems research/sustainable intensification in Africa that will be shared with all key stakeholders and donor agencies.

Got a story to share?

Please email it with photos and captions every Wednesday to iita-news@cgiar.org or Katherine Lopez (k.lopez@cgiar.org) and Uzoma Agha (u.gha@cgiar.org) for headquarters and Western Africa, Jeffrey T. Oliver (j.oliver@cgiar.org) for Southern Africa, Catherine Njuguna (c.njuguna@cgiar.org) for Eastern Africa, and David Ngome (d.ngome@cgiar.org) for Central Africa.

ATTC News: Aflasafe commercialization in full swing

Thanks to more than a decade-and-a-half of dedicated research, we have Aflasafe ready to broadcast onto Africa's farms. And now, we are working on broadcasting the good news. As part of our communication strategy for the Aflasafe Technology Transfer and Commercialization (ATTC) project, we launched our newsletter, [ATTC News](#), last December. Issue 2 is coming out soon!

We have covered lots of ground already, including our [first ever Technology Transfer and Licensing Agreement \(TTLA\)](#) and the construction of an Aflasafe factory in Senegal, our [all-new website](#), and [Aflasafe registration in Burkina Faso](#). We also established some regular features, like a message from our Managing Director and country-by-country roundups on our progress on Aflasafe [commercialization](#) and availability.

Our mailing list is already over a thousand strong, and we are looking forward to reaching more and more people across Africa and beyond. If you have not yet signed up for our newsletter, you are in good time – [visit us for a double whammy](#) as you catch up on the first issue and join our subscribers in time to get Issue 2, coming soon. If you are on our list but haven't seen the newsletter yet, remember to check your spam folder and make sure to add ATTCNews@afasafe.com to your contacts list.

As part of efforts to find out how well we are doing, we've also been asking our readers for feedback on our new website via a [brief survey](#). So far, we have heard from a range of readers with interests from farming to the food industry. We're delighted to note that they have rated our written content, navigation structure, and design from good to excellent—but what we have not heard much of yet is how we can improve, and what you would like to see more of as we continue to develop the website, which is growing all the time. We also have feedback buttons at the bottom of each page; please make use of them.

With our partners, we are also working hard to reach out to the local press in the countries where we work, and so create public awareness on the dangers of aflatoxin and on the effective Aflasafe solution. One of our latest additions to the website is a [press cuttings](#) page, so come and see how Aflasafe is being talked about where you are. We are still adding more links to this page, but if you've spotted a mention of Aflasafe why not let us know?

Another exciting recent communication release for us has been [how-to guides](#) for farmers in Nigeria, the first in a series that we have planned for every country where Aflasafe is available. These straightforward [videos](#) and [leaflets](#) explain how to use Aflasafe safely and effectively, as well as give an



ATTC News Issue 1.

overview of Aflasafe and aflatoxin, in local languages—for Nigeria we have English, Pidgin, Hausa, Igbo, and Yoruba, and we have more countries in the pipeline.

We would love to hear from you, so please do check out our website, take the survey, and make sure you are signed up to our mailing list. We are always happy to hear from anyone interested in Aflasafe, so [drop us a line](#) any time with your ideas for our website or newsletter, anything you've found particularly interesting, or any question you have. We're speaking, but we're always listening too!

Previously published on [Aflasafe blog](#).

AfDB TAAT mission visits Burundi

An [African Development Bank](#) (AfDB) mission on Technologies for African Agricultural Transformation (TAAT) visited Burundi, 5-9 March, to meet and update Burundian authorities and stakeholders in agricultural research and development including donors, farmers, microfinance institutions, and the private sector on the latest on TAAT. The visit was led by Dr Jonas Chianu, AfDB/TAAT Program Director, accompanied by Mr Wissam Gallala, Mrs Maria Marealle Saguti, and Mrs Koulibaly Yameogo Rufine. The visit was in line with the approved TAAT in-country dialogue and identification mission.



Dr Jonas Chianu (2nd from left) leading the dialogue with other stakeholders.

The mission aimed at identifying Country Programs and priority agricultural commodity value chains for implementing the TAAT program and framework of science, technology, innovation and knowledge on good agricultural practices to increase productivity, wealth creation, and poverty reduction. The mission met and discussed with Minister Déo-Guide Rurema, Burundi Minister of Agriculture, Mrs Odette Kayitesi, Head of Committee for Land Issues at the Presidency, Mrs Marie Salome Ndabahariye, Permanent Secretary at the Ministry of Finance, representatives of research institutions, universities, development partners, private sector

and microfinance institutions, including senior officials at the Ministry of Agriculture.

A separate meeting was held with the staff of the [World Bank](#) led by Mr Nestor Coffi, World Bank Burundi Country Manager. The team also visited the tissue culture lab and facilities of AGROBIOTEC, National Centre for Food Technology research (CNTA), TOTAHARA composite flour processing center, and [IITA](#) offices and staff to give an update on TAAT and also gather information on IITA activities in Burundi.

The main outcome of the mission was an agreement on the place of TAAT in the

agriculture sector of Burundi, especially the need for agricultural intensification and soil conservation to improve and increase agricultural production as over 80% of the population depend on agriculture.

The government of Burundi expressed its readiness and willingness to collaborate with TAAT, especially through an integrated approach and value addition for priority value chains. Research and development partners also indicated their willingness and interest to collaborate in achieving TAAT's objectives by addressing challenges limiting agricultural development.

Leading Nigerian agricultural company explores areas of collaboration with IITA

On 14 March, a delegation from [Dizengoff Nigeria Limited](#), visited [IITA](#) Ibadan to explore, share knowledge, discuss possible commercial ideas that can emanate from IITA's research and technologies, and establish grounds for future partnership.

The team led by [Antti Ritvonen](#), Managing Director of Dizengoff, and accompanied by Damisa Enahoro, Commercial Manager Agriculture, and Oscar Wulumbe, Integrated Projects Country Manager, was welcomed by IITA Management staff. The delegates held discussions with the Institute's management, met with representatives of IITA Youth Agripreneurs (IYA), and were led on a tour of some IITA facilities, which included the [aflasafe™](#) (a biocontrol product for controlling aflatoxins) production plant, [NoduMax](#), a soybean inoculum fertilizer, vegetable screen house, and fish ponds.

Receiving the delegation, [Kenton Dashiell](#), IITA Deputy Director General, Partnerships for Delivery, introduced them to IITA and the strategic role it has played in the past 50 years, working with partners to help smallholder farmers increase agricultural productivity. He went further to explain the importance of partnership to research and development in finding solutions to the problem of food and nutrition security.

Corroborating Dashiell's statement, IITA Business Incubation Platform (BIP) CEO [Frederick Schreurs](#) stressed the importance of partnership in upscaling the IYA model and using it as a vehicle



Dizengoff delegation that visited IITA said they were impressed with IYA model.

for addressing youth unemployment in Africa while emphasizing the need for collaboration, especially in the area of screen house improvement.

In commending IITA for being the world's leading research center in transforming African agriculture, Ritvonen stated: "Today, which is my first visit, I have learned countless things from the IYA model; I am impressed at the level of professionalism and the top standards at which work is being done in IITA. The educational tour is an eye opener; it has further given credibility to our own thought process.

"Clearly, without a doubt, IITA is the right institute to partner with. We have identified areas of collaboration that we can build on to make commercial sense out of it, but we are going to start from the vegetable screen houses."

"As key players in Nigerian agriculture, we are looking forward to cooperating with IITA, and I am positive that both institutes will benefit from the collaboration," he added.

In concluding the visit, Walumbe appreciated IITA on behalf of the team and applauded IITA Management for the warm reception while expressing deep satisfaction with the work that IITA is doing especially in exploring options for attaining employment creation for youth across Africa.

Dizengoff Nigeria Ltd is one of the leading agriculture and communication technology companies in Nigeria, providing the best-in-class innovative solutions in irrigation, greenhouses, agro-consumables, communications technology solutions, tractor and implements, and turnkey projects.