
Compiled by Dr. Mpoki Shimwela

(National Coordinator of Banana Research in Tanzania)
Executive Summary

A two day workshop on strategizing banana breeding and testing of banana hybrids for release in Tanzania was held at Nelson Mandela African Institution of Science and Technology, Arusha on 12th and 13th February 2020. It was organised by the TARI-Maruku and IITA-Arusha.

The workshop was organised with the objectives to:

i) Share highlights in Banana Improvement in East Africa (Banana breeding program in East Africa)

ii) Sharing experiences in implementing on farm trials and Releasing of Banana varieties in East Africa

iii) Discuss common standard operation procedures for NPT, DUS

iv) Building road map of releasing improved high yielding NARITAs varieties in East Africa

The participants of the meeting included scientists from Tanzania Official Seed Certification Institute (TOSCI), Tanzania Agricultural Research Institute (TARI-Maruku, TARI-Tengeru, TARI-Makutopora), National Agricultural Research Organization Uganda (NARO-Uganda), International Institute of Tropical Agriculture (IITA-Arusha), Bioversity International, and Nelson Mandela African Institution of Science and Technology, Arusha (NM – AIST).

Workshop outputs:

TOSCI agrees to use the previous evaluation trials (Lyamungo, Maruku and Mitalula) for DUS and NPT

It was suggested that TARI applies for DUS and NPT as soon as possible

AYT report writing by TARI and NARO and it should follow TOSCI format

Joint preparation of descriptors for NARITAs varieties we want to release (TARI & TOSCI)

Introduction and Agronomic Evaluation of NAROBan1-5 from Uganda
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LIST OF ABBREVIATIONS
AYT: Advance Yield Trial
DUS: Distinctness, Uniformity and Stability
EEE: Early evaluation trials
IITA: International Institute of Tropical Agriculture
NARO: National Agricultural Research Organization
NM – AIST: International, and Nelson Mandela African Institution of Science and Technology
NPT: National Performance Trial
TARI: Tanzania Agricultural Research Institute
TOSCI: Tanzania Official Seed Certification Institute
1. INTRODUCTION
1.1 Description of the report

This report presents the processing of the stakeholders workshop conducted at Nelson Mandela African Institution of Science and Technology, Arusha on 12\textsuperscript{th} and 13\textsuperscript{th} February 2020. It provides a brief workshop output and recommendations provided by the participants. The workshop provided an opportunity for the participants to discuss and build road map for releasing improved banana varieties (NARITAs) in Tanzania and suggest the way on which the project can introduce and release improved varieties (NAROBAN 1-5) from Uganda.

1.2 Objective of the workshop

The workshop was organized to enable the participants to discuss and share experience of Banana Breeding in East Africa and presents the results of the evaluation trials of NARITAs from the five sites. It was also the opportunity to sharing information on breeding, early evaluation trials (EETs), yield evaluation trial (AYT), on-farm trials, National Performance Trial (NPT) and DUS, as well as lessons learnt from releasing of the varieties of perennial and semi-perennial crops. The workshop served as an open forum for discussion.

1.3 Participants of the Workshop

The participants were scientists from Tanzania Official Seed Certification Institute (TOSCI), Tanzania Agricultural Research Institute (TARI-Maruku, TARI-Tengeru, TARI-Makutopora), National Agricultural Research Organization Uganda (NARO-Uganda), International Institute of Tropical Agriculture (IITA-Arusha), Bioversity, International, and Nelson Mandela African Institution of Science and Technology, Arusha (NM – AIST) (Annex 1).
1.4. Deliverables

The following were the workshop outputs:

- TOSCI agrees to use the previous evaluation trials (Lyamungo, Maruku and Mitalula) for DUS and NPT
- It was suggested that TARI applies for DUS and NPT as soon as possible.
- AYT report writing by TARI and NARO should follow TOSCI format
- Joint preparation of descriptors for NARITAs varieties we want to release (TARI & TOSCI)
- Complete analysis of agronomic and yield data from BBB1
- Introduction and Agronomic evaluation of NAROBAN 1-5 in at least four sites

2.0 WORKSHOP PROCEEDINGS
2.1 INTRODUCTORY REMARKS AND WORKSHOP OBJECTIVES

The workshop started with introductory remarks from Dr. Mpoki Shimwela (National Coordinator of Banana Research in Tanzania) who welcomed participants and thanked them for coming to participate in the meeting. During his presentation he introduced the organizations and people who were able to attend the workshop and mentioned that each participant will get the chance for self-introduction. He further presented the objective of the meeting and expected outputs. Also, pointed out a brief description of the accelerated breeding better banana project (ABBB project) as the second phase of BBB1. The participants were provided with various possibilities to exchange ideas and experience with each other. After his presentation the participants were given a time for self-introduction.

Objectives of the Workshop

- *Share highlights in Banana Improvement in East Africa (Banana breeding program in East Africa)*
• Sharing experiences in implementing on farm trials and Releasing of Banana varieties in East Africa

• Discuss common standard operation procedures for NPT, DUS

• Building road map of releasing improved high yielding NARITAs varieties in East Africa

Expected Outputs

• Shared understanding of the varieties releasing process in East Africa

• Priority intervention actions, roles/responsibilities, and plans of releasing improved high yielding NARITAs varieties in Tanzania

2.2 Opening Remarks

2.2.1 Remarks from NM – AIST
The remarks were presented by Dr. Kelvin Mtei (Dean School of Business and Humanities). He welcomed members and thanked TARI and IITA for organizing the workshop and wished the participants fruitful discussion. He was very pleased to see a good number of people from different organizations that have agreed to come to Nelson Mandela Arusha to share good examples of pushing forward banana research. In his opening remarks he emphasized the need of partnership and working together as a team. He briefly presented the background of NM – AIST and how the institute works to support banana research in the region. Further, he mentioned about the development of the memorandum of understanding with IIT. The following are some of the key issues presented:

• NM – AIST in the network of African institutions which mainly addresses issues of life sciences

• The aim of the institution is undertaking research intensively focus life science, business and entrepreneurship
• NM – AIST is the center of excellence – water, agriculture and nutrition and ICT which offering scholarship for students and lectures

• NM – AIST working towards establishing center of excellence for banana research in Tanzania

• NM – AIST is working closely with TARI and IITA and they are in process of signing a memorandum of understanding to implement banana research activities

Dr. Kelvin Mtei giving opening remarks

2.2.2 Remarks from TARI
The remarks were presented by Dr. Cornel Massawe (Principal Research Researcher Officer and Center Director of TARI-Makutopora, Dodoma). He feels very privileged to talk in the workshop. He was very pleased with Uganda and TOSCI team to participate in the meeting. In his remarks, he presented briefly about the TARI organization structure, where he mentioned that
TARI has 16 research centers across the country and TARI Maruku was given the mandate of coordinating banana research in the country and Dr. Mpoki Shimwela was appointed as National Coordinator of Banana Research. Further, he emphasized that TARI is working to bring together different banana stakeholders in order to improve banana research in Tanzania.

During his presentation he mentioned that banana is an important crop for the livelihoods of many farmers in Tanzania, but its productivity is declining day after day due to the increasing pressure of insect pest and diseases, poor agronomic practices etc. It is good that ABBB has come in to come up with cultivars which are high yield and improve the productivity of the crop in Tanzania.

He warmly welcomes everyone in the workshop and wished them good luck

2.2.3 Remarks from NARO-Uganda
The remarks were presented by Dr. Jerome Kubiriba (NARO-Uganda). He thanked the meeting organizers and participants. On his remarks he briefly mentioned about the economic importance of banana crop in the East Africa region. He mentioned that the research team and extension agents are much looked on how we can raise the productivity to 16 – 25 ton per year from 10 ton per year. He further mentioned that farmers are using a lot of land instead of utilizing a little with higher yielding varieties, we have the obligation to work on improve the productivity. We have being working with Tanzania since 1990s with the support from IITA and Bioversity International by sharing banana germplasm and conduct training in order to improve the research materials within the region. He mentioned that for the last twenty five years breeding have being done and there are lot of materials to be released. The partnership is stronger, Uganda has already released 7 banana hybrids and there are 21 others that are under testing. We will share experience on how releasing is progressed in Uganda.
3.0. PRESENTATION

3.1 PRESENTATION 1. Overview of the projects BBB1 and ABBB: First five years and beyond (Dr. A. Brown)

In his presentation, Dr Allan Brown informed members that the project Focus is on AAA Matooke and AA Mchare banana types. He mentioned the difference between Matooke and Mchare in Texture, Color and Flavor. He further pointed out the challenges of breeding bananas. The following were key issues mentioned about the BBB1 (See annex 2 for detail presentation):

- Multi-partner project including representatives of six continents
- Accelerating the banana breeding pipeline to address the needs of stakeholders
- Evaluating and integrating molecular techniques where they make sense
- Increasing the number of hybrids through enhanced seed set and germination
- Developing breeding pipelines for triploid and diploid bananas
- Large scale data collection, utilization and manipulation.
- Addressing genetic unknowns
- Addressing disease resistance including TR4

Also he pointed out achievement of BBB1 as follows (See annex 2 for detail presentation):

- Increased number of hybrids from 3x x 2x and 4x x 2x crosses
- Selection of advanced EAHB (NARITA) for multilocalational trials in Uganda and Tanzania
- Integration of cultivated diploids to replace previously used diploids
- Further integration of the IITA and NARO breeding programs
- Demonstration of the utility of genomic selection in banana breeding
3.2 PRESENTATION 2: Evaluation of NARITAs in 5 sites (Noel Madalla)
Mr. Noel Madalla from Bioversity International presented on the above topic with focus on how the trial was conducted in five sites, data collection and selection process for the best NARITA candidate (Sensory evaluation and Preference ranking). He started by introducing the major constraints facing banana production in East Africa, and later he move on in detail about the location of the trial (Trial sites), trial design, trial management and agronomic data collection.

He mentioned that the trial had three sites (Maruku, Moshi and Mbeya) in Tanzania and two sites in Uganda (Mbarara and Luweero). He explained the trial design and number of NARITAs evaluated and local checks used in all sites. He mentioned about management practices employed and agronomic data collection. He detailed the sensory evaluation and Preference ranking with farmers. Further, he gave the results of bunch weight, sensory evaluation and
preference ranking. The following were the general overview performances of NARITAs across the sites (See annex 3 for detail presentation);

Mr. Noel Madalla giving his presentation

3.3 PRESENTATION 3: Banana Breeding and Varieties Release in Uganda (Sharing Experience) (ARINAITWE IVAN)
In his presentation, Mr. Ivan Arinaitwe started by highlighting the economic importance of banana in East Africa and factors responsible for reduced banana yield and short plantation life. He further, presented briefly about the breeding strategies, evaluation and selection process used in Uganda. He shared his experience on how the multi-location on-farm evaluation trials have been conducted in Uganda and presented some results of the previous released varieties in Uganda. Further, he highlights the selection criteria and description of some released varieties. He also mentioned about the recently new improved varieties released in Uganda NAROBan 1-5, and he recommended for agronomic evaluation and releasing them in Tanzania (See annex 4 for detail presentation).
3.4 PRESENTATION 4; DUS, NPT and Official varieties release for perennial crops in Tanzania (Dr. Adolf Sariah TOSCI)

In his presentation, Dr. Adolf Sariah started by highlighting functional and responsibilities of Tanzania Official Seed Certification Institute (TOSCI) by citing the The Seeds Acts 2003 Section 10. He continued his presentation by highlighting the procedure for variety evaluation, release and registrations in Tanzania. During his presentation he discussed advanced yield trial (AYT) and on-farm trials and he emphasized that advanced yield trial (AYT) data from not less than three recognized testing sites (Multi-location trials) in Tanzania are highly needed. He further mentioned that:

- A new variety should be in some way better than already known varieties
- It should have an added value;
  
  Productivity
  
  Adaptability
  
  Resistance/Tolerances

He further explained about Distinctness, Uniformity and Stability (DUS) test and National Performance Trial (NPT). The following things will be required NPT application:

- AYT report
- Farmers assessment
- Application fee for NPT
- Any other supporting document

Under the law, NPT verifies the value for cultivation and use (VCU)

(See annex 5 for detail presentation);
4.0 DISCUSSION AND ROAD MAP OF RELEASE NEW BANANA CULTIVARS

The discussion was led by Dr Mpoki Shimwela, the following key issues were discussed;

Comments and recommendation from Dr. Mpoki Shimwela; All AYT data and farmers assessment report required for releasing varieties in Tanzania are available. Therefore, AYT data analysis and report need to be done as soon as possible.
Comments and recommendation from Dr. Kubiriba Jerome; Uganda already released five new varieties NAROBan 1-5. There is a room to release these banana cultivars in Tanzania using the harmonized policy of the East African Countries. However, this will need to be presented to ABBB project PI (Prof Rony Swennen)

Comments and recommendation from Dr. Mpoki Shimwela; Concurred with Dr. J. Kubiriba comments, however, we need to get permission from ABBB project PI (Prof Rony Swennen), as it will involve reallocation of the Budget.

Comments and recommendation from Dr. Adolf Sariah (TOSCI); the previous three sites will be used by TOSCI for DUS and NPT data collection. Based on the methodology used for participatory varieties selection PVS in BBB1 the NARITAs varieties already meet all criteria for releasing in Tanzania. There is no need of having on – farm trials up to this point in order to get these varieties released with the project and important dates. Therefore, TARI needs to start the application for DUS and NPT as soon as possible.

Comments and recommendation from Dr. Mpoki Shimwela; we didn’t have a plan for using the three trial sites due to high management cost, for this reason, the trials received minimum management for the past six months. Since TOSCI agrees to use the site of the same trials for DUS and NPT, therefore, we will start intensive management from now on to allow TOSCI to conduct DUS and NPT. Besides, the ABBB project PI (Prof Rony Swennen), will be informed as it will involve reallocation of the budget.

Comments from Dr. Adolf Sariah TOSCI: In the releasing committee, they are looking at the farmers’ preferences and not researchers preferences’. The strongest message to farmers is the resistance to pest and diseases, so this should be clearly messaged to farmers. Aroma and other sensory evaluation results should be supporting documents to the releasing committee rather than relying on yield (Rebranding the proposed cultivars for releasing).

He further, pointed out that the cultivars released in any other country which is in agreement for harmonization of seeds policy and regulation with Tanzania, as set out in the Seventh Schedule to these regulations.
**ACTION POINT**

**DUS**

Apply for DUS with Descriptors

Descriptors of the cultivars

Fill forms

Pay fees

Sample submission

**NPT**

Apply for NPT

Fill the forms

Pay the fees

AYT report (should follow TOSCI format)

Farmers Assessment report

The farmers’ assessment report will be assessed by TOSCI for completeness especially the methodology part.

The application of DUS and NPT should be done as soon as possible.

Introducing new released cultivar from Uganda (NAROBan 1-5)

- Apply for DUS and NPT after introduction
- Establish four trial sites ( 2 Lake Zone, 1 Southern highland, 1 Northern zone and 1 Eastern Zone)
- Target to release next year 2021

Deadline for application for DUS and NPT: August, 31 every year

- Mpoki Shimwela and Adolf Sariah have to prepare work plan for conducting DUS and NPT.
It was proposed to TARI to start procedure of introducing NAROBan 1-5 from Uganda for agronomic evaluation and on-farm trials. It was recommended to have five sites for banana trial which will include eastern zone at Sokoine University of Agriculture in Morogoro. However, this will be done after we get permission from Project PI (Prof Rony Swennen),
ANNEX
Annex 1. Workshop participants list.

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Annex 2

Allan Brown Presentation_TARI Workshop.pdf

Annex 3

Noel Madalla_TARI workshop NM-AIST Feb 2020 [Compatibility Mode].pdf

Annex 4

NARO_TOSCI-Matooke breeding 12 to 13-02-2020.pdf

Annex 5

TOSCI_NPT Presentation Mandela Univ [Compatibility Mode].pdf

TOSCI_AYT Presentation [Compatibility Mode].pdf

Annex 6

Programme 2020.pdf