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Programme Activity Report: Online Training Course on Horticulture Seed Propagation with Tissue Culture for African, Caribbean and Latin American Countries on 30th of July to 7th of August, 2021

List of Trainers/Facilitators (*alphabetically sorted*):

Abd. Rohim, S.P., M.P.

Abd. Rohim has received several training sessions in the field of quality management systems for training facilities and seeding. He is an Associate Expert Lecturer at the Ministry of Agriculture of the Republic of Indonesia (MoA)'s Indonesian Centre Agricultural Training-Lembang. In various international activities, he has been an international speaker for the training of farmer's trainers, for the tissue cultural training, for the workshop on added value and the dispatch of experts to the Philippines, Taiwan and Uzbekistan.

Fiadini Putri, M.Sc.

Fiadini Putri has more than ten years' experience in training and teaching human resources working in agriculture. She is an agronomist and horticultural specialist. She has extensive professional experience in horticulture, global trends, research, inorganic nutrients and secondary metabolites of plants. She trains in acclimatisation as part of tissue culture technology.

Sani Hanifah, SP., MP.

Sani Hanifah has over 15 years of experience in training and teaching agricultural human resources. She is an agronomist. She has extensive professional experience in horticulture and tissue culture. As part of tissue culture technology, she trains in tissue culture media.

List of Countries (*alphabetically sorted*):

No	Country	Number of Person(s)
1.	Barbados	4
2.	Belize	5
3.	Colombia	17
4.	Costa Rica	1
5.	Ecuador	6
6.	Ethiopia	1
7.	Guatemala	2
8.	Guyana	1
9.	Madagascar	3
10.	Namibia	2
11.	Panama	5
12.	Senegal	3
13.	South Africa	2
	Total	52

Distribution of Participants' Background

No	Background	Percentage
1.	Government	61.53%
2.	Higher education institution	13.47%
3.	Private sector	25%

Programme Activity Report

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Background

The demand for crop seed is increasing in the exportation of agricultural goods, while crop seeds produced by the higher variations are quite limited. In addition, the distribution of excellent plant seeds is a contributing aspect to the success of future agricultural development. The technology utilised in culture of tissue can also be used to respond to these issues.

In view of this, the Non-Aligned Movement Centre for South-South Technical Cooperation (NAM CSSTC) and the Directorate of Technical Cooperation of the Ministry of Foreign Affairs in cooperation with the Indonesian Centre for Agricultural Training (ICAT) of Lembang of the Ministry of Agriculture-Republic of Indonesia has organised an online training course entitled "Online Training Course on Horticulture Seed Propagation with Tissue Culture". The course is divided into two regional batches. The training sessions were held on 30th of July for African countries till 4th of August, 2021 and on 4th - 7th of August, 2021 for Caribbean and Latin American countries.

The course is based on the definition of tissue culture and media, and result of the management and acclimatisation of tissue culture. For the virtual training session, experts from the ICAT of Lembang were present. E-learning and video materials were employed in addition to interactive engagement with trainers.

Numerous government agencies, academia and business sectors were trained in the following countries: Barbados, Belize, Colombia, Costa Rica, Ecuador, Ethiopia, Guatemala, Guyana, Madagascar, Namibia, Panama, Senegal and South Africa.

Participants could acquire knowledge and experience as follows: i) the diversity of horticulture plant cultivation; ii) tissue culture techniques in crop production; iii) horticultural culture features.

Discussion

Tissue Culture Medium

Only an adequately artificially created nutrient medium, known as the culture medium, can grow excised tissues and organic plants in vitro. Media used in culture of plant tissue contain nutrient elements that are vital to tissue growth and development. The success of the culture of tissue depends greatly on the culture media employed.

The culture medium is composed of distilled water and macro and micro-nutrients, vitamins, sugar, agar, organic compounds regulators of plant growth. The investigator must comprehend the difference between plant hormone and plant growth regulator in the application of plant tissue culture procedures. Only compounds that exist naturally in plants that can be regarded as hormones of plants. Instead, only synthetic components with a hormonal activity, e,g, auxin, ethylene, abscisic acid, gibberellins and cytokine were indicated by plant growth regulators.

For maximum growth and development of crops, plant cells and tissues require pH 5.0 to 6.0. The storage of culture media is also discussed. Room temperature in the dark should be used and the plant tissue packed into a plastic bag to avoid drying.

One of the Madagascar participants questioned about the length of media storage during the discussion. The cooler may last up to 3 months, but if contamination occurs before 3 months the medium cannot be used. Periodic inspections are required once a week to prevent this. Other participants from Namibia also addressed the sorts of tissue culture media used to produce phenolics. For this purpose, active charcoal can be employed.

Elements for Sterilising Explants

Explant is the source of seed material utilised in tissue culture technique to reproduce plants. Explant condition, sterilisation material, steriliser concentration, and sterilisation period are four crucial elements which need to be considered for sterilising explants.

Eliminating the source of pollutants is the fundamental principles of explant sterilisation. Contaminants are usually sources from inside explants of *indophytic* microorganism. By applying antiseptic substances, pollutants can be sterilised by taking into account the features of explants.

Cultured explants contain bactericides, detergents and chloric. It was highlighted during discussion that light requirements for plants varies. LEDs still require light in the explant procedure as a dark environment leads to aberrant growth for potatoes, bananas and orchids. While it is better to cover some plants with a dark cloth or fibres that require darkness for optimal growth.

Acclimatisation

Acclimatisation is the adjustment process of plants from internal environments to external environments, so called uncontrolled environments. Acclimatisation aims at maximising the photosynthesis process, making a facility more adaptable, and enhancing the root function of soil absorption nutrients.

The acclimatised plant must have root, stem and entire leaf. The sand and compost with a ratio of 3:4 constituted the acclimatisation medium. The media have to be autoclaved for an hour. Some of the acclimatised plants are bananas, tomatoes, hot pepper and potatoes.

The plant will be transported to the polybag media after the acclimatisation process with a 4:1 ratio of the mix of soil and husk charcoal. That is what transplantation is called. Plants are very sensitive, and hence all materials and tools used must be clean and sterilised.

It is known in the discussion that supplements such as compost should not be used during the acclimatisation phase. The only suggested nutrients for usage to limit all types of contamination are hydroponics. One of the Madagascar participants was also queried about the composition of the hydroponic nutrition AB solution. AB is a micronutrient and macronutrient combination. A and B is separated because some nutrients such as calcium and phosphate cannot be blended.

Evaluation

At the end of the event, the organisers conducted a survey with 20 random participants. The results of the survey are:

- 92% of respondents said the topic and content of training comply with participant's country policies;
- 91% of respondents said the contents of training were relevant to participant's country;
- 96% of respondents said the training contributed to their education, professional and personal growth;
- 72% of respondents said the agenda was clearly specified;
- 72% of respondents said the contents were well arranged and easy to follow;
- 93% of respondents said the training kept them engaged and interested;
- 96% of respondents said the trainers were familiar with the topics of training;
- 93% of respondents said the trainers were well prepared;
- 90% of respondents said the activities related to the goals of training;
- 90% of respondents said the training time allocation was enough; and
- 76% of respondents said the management of the Zoom Webinar was convenient.

Based on the above results, 87% respondents found that the training was very impressive.

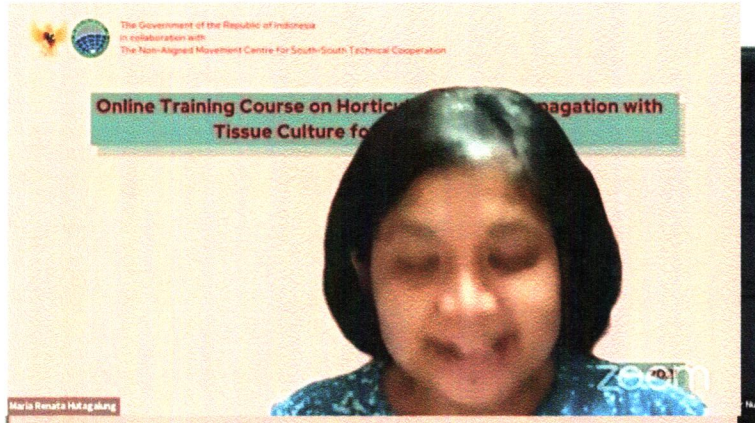
Conclusion

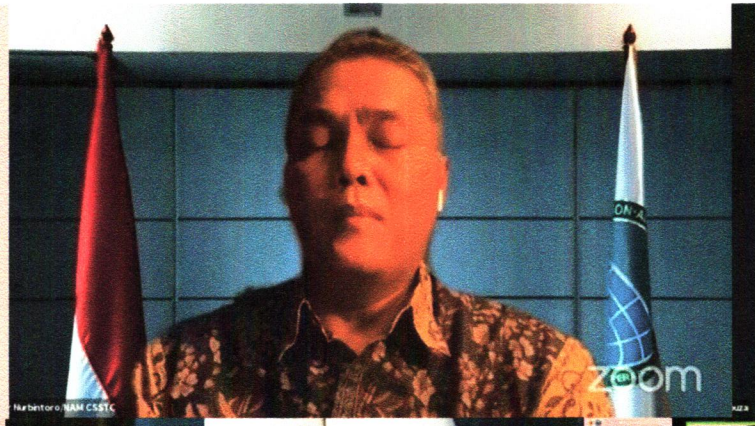
Throughout the organisation of the training, the organisers draw these conclusions:

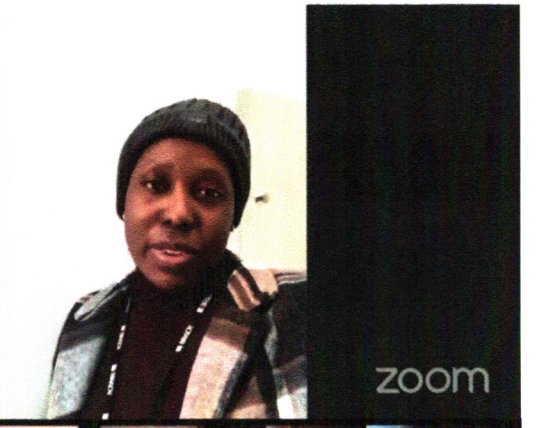
- Participants have acquired knowledge and skills on the tissue culture, in particular on the variety of the horticulture crop, the tissue culture techniques in crop growing and production and the characteristics of crop cultivation.
- The tissue culture training will be carried out by the participant in their projects and vocations;
- Two thirds of the respondents came from agricultural countries. Training enhances the quality of the seeds and increases production, therefore increasing the household's income.

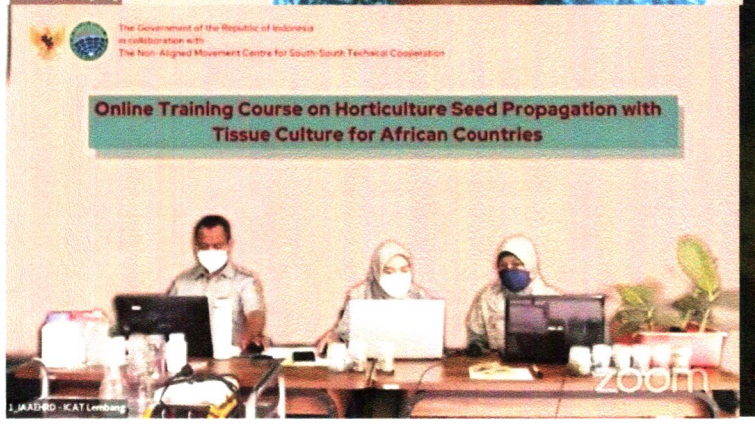
PHOTO DOCUMENTATION

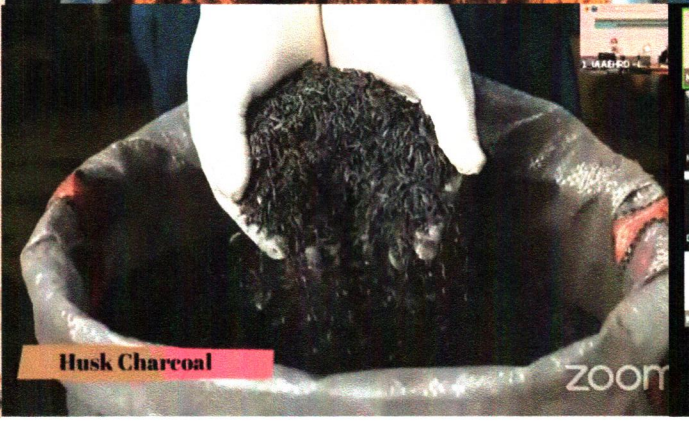
African Countries (30th of July to 4th of August, 2021)

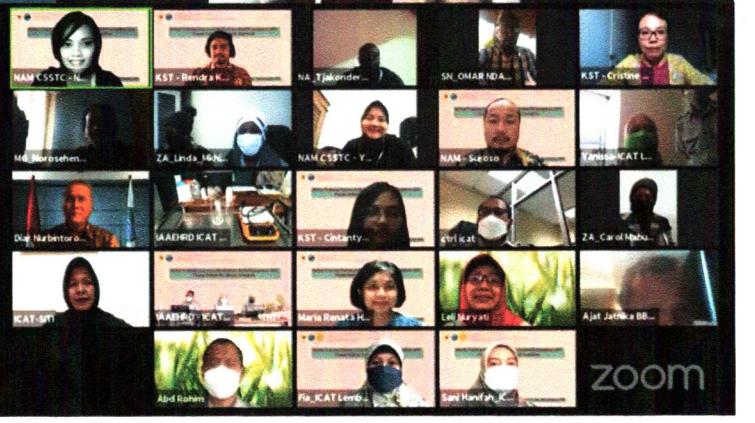












Caribbean and Latin American Countries (4th to 7th of August 2021)