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## **Programme Activity Report: Online Training Course on Hydroponics for African, Caribbean and Latin American Countries on 24<sup>th</sup> of September to 4<sup>th</sup> of October, 2021**

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

#### **Abd. Rohim, S.P., M.P.**

Abd. Rohim has received several training sessions on the field of quality management system for training facilities and seeding. He is an Associate Expert Lecture 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.	Belize	6
2.	Burundi	4
3.	Colombia	4
4.	Costa Rica	1
5.	Ecuador	2
6.	Gambia	2
7.	Guatemala	4
8.	Guyana	1
9.	Kenya	4
10.	Madagascar	8
11.	Mauritius	3
12.	Nigeria	1
13.	Panama	10
14.	Rwanda	11
15.	Senegal	1
16.	Suriname	4
17.	Tanzania and Zanzibar	1
	<b>Total</b>	<b>67</b>

**Distribution of Participants' Background**

No	Background	Percentage
1.	Government	55.22%
2.	Higher education institution	17.91%
3.	Private sector	26.87%

**Programme Activity Report**  
**Online Training Course on Hydroponics for African, Caribbean and Latin**  
**American Countries**  
**24<sup>th</sup> of September to 4<sup>th</sup> of October, 2021**

**Background**

Hydroponics is a technology often employed in the cultivation of soilless plants, stressing the need to cater to plant nutrition. It is frequently used to support big farming systems and to give significant environmental, economic and social relevance. The agriculture of the future is now seen as hydroponics. However, it is not easy to manage most hydroponics.

As a result, a virtual training programme entitled “Online Training Course on Hydroponics for African, Caribbean and Latin American Countries” was organised by the Non-Aligned Movement Centre for South-South Technical Cooperation and the Ministry of Foreign Affairs in cooperation with the Ministry of Agriculture of the Republic of Indonesia. The training is separated into two regional batches given the time zone difference. The trainings took place, for Africa, 27<sup>th</sup> to 28<sup>th</sup> of September, 2021; for Caribbean and Latin American countries from 29<sup>th</sup> to 30<sup>th</sup> of September, 2021.

The courses focused on management and maintenance of hydroponics. Experts from the ICAT in Lembang were present for the virtual training session to offer training materials and to discuss the Q&A session with participants. Besides actual engagement with trainers, e-learning and video resources had been used.

Many government officers, academics and private sectors from Belize, Burundi, Colombia, Costa Rica, Ecuador, Gambia, Guatemala, Guyana, Kenya, Madagascar, Mauritius, Nigeria, Panama, Rwanda, Senegal, Suriname, Tanzania and Zanzibar received training.

On topics such as: i) the installation of hydroponic system; ii) the nutrition for hydroponic plants; iii) seedling of hydroponic plants; and iv) hydroponic planting and maintenance the key areas for discussion were improved understanding and experience.

**Discussion**

Hydroponic Systems

The plant type to be cultivated shall dictate hydroponic installation. Various systems may be utilised for hydroponic systems, i.e.: 1) wick system; 2) deep flow technique (DFT) system; 3) nutrient film technique (NFT) system; 4) aeroponic system; and 5) drip irrigation system. Each system has its own strengths and weaknesses and must thus be adapted to the context and conditions when selecting hydroponic systems.

Wick system is a hydroponic system that distributes a nutrient solution to plants using a wick with capillary system. DFT system is a hydroponic system that places roots in a circulating nutrient solution with a depth of about 4 cm, while NFT system is technique by flowing and circulating nutrient solution to the roots of the plant. Drip irrigation system is a technique that provides a supply of nutrient solution droplets to the roots of the plant at a very low speed (2-20 litres per hour). Aeroponic is a hydroponic system that provides a supply of nutrient solution to the hanging parts of the plant roots without planting media by misting. Of the various hydroponic systems, wick system is the simplest and does not require electrical energy, but it is prone to making plants underdeveloped because the root does not get oxygen intake. Regarding the optimal use of water and nutrients, drip irrigation system is more efficient. Meanwhile, in order to minimize pest and disease attacks, the suitable hydroponic installation to be applied is the aeroponic system.

One of the participants in the discussion from Gambia wondered whether a hydroponic system may be implemented in the open space. The expert says that hydroponic technology may also be used in open areas, but must take into account plant humidity, temperature and type. The drip irrigation system is recommended. However, it will be more efficient to put the hydroponic plants in the greenhouse in conjunction with plant and disease care and any other considerations.

Other Belize participants asked about the hydroponics advantages over traditional farming. The hydroponic system is known to be better than conventional farming since fertilizer concentrations can be measured. In the control of plant pests and diseases, the hydroponic system is also better.

### Nutritional Mechanisms

Hydroponic has various benefits and it can up to 3-10 times enhance productivity. It needs 20 times less water and less pesticide than soil-based farming. However, certain hydroponics are not cheap and require continuous surveillance. The development of a hydroponic garden requires technical competence, for the plant death occurs quickly if the system fails.

Hydroponic nutrient solution has the same function as soil fertilizers. Adequate concentration of all nutrients throughout the life cycle of the crop is the key to the successful management of the fertiliser programme. Electrical conductivity (EC) and hydrogen potential (pH) are two things which strongly affect hydroponics. Hydroponic plants need certain parameters for critical nutrients. First, without the plant the lifecycle cannot be completed. Secondly, the function of the elements cannot be substituted for another. Finally, the element participates in the growth and reproduction of the plant directly.

In addition, hydroponic nutrients, namely macro and micro nutrients, are categorised into two main components. In order to achieve best results, the composition of nutrients is needed for the hydroponics system.

It is well recognised in the discussion that the pH and EC of the nutrition solution must be regularly monitored. From the beginning of planting to harvest the nutrient solution volume must be maintained.

In response to Kenyan question about the management of aquaponic pests and diseases, drawing on the experience of ICAT, the pH balance is critical in aquaponic plants, fish and bacteria.

Additionally, in response to the Burundi participants who was interested in antagonistic nutritional mechanisms, antagonistic nutrient is a plant-not absorbing component if other components, such as salt and potassium, exist.

#### Consideration in Cultivating Plant Hydroponically

Seedling, transplantation, cultivation and harvesting are the hydroponic cultivation process. Before plants are cultivated hydroponically, several things must be considered: 1) plants according to geographical conditions; 2) climatic conditions; 3) plants with economic value; and 4) selection of quality seeds.

Seed selection is the first thing to perform in hydroponic cultivation. Good seed quality is vital to optimum production. Seeds of good grade look lively, fresh and nice physically. The age of the plant to be cultivated must also be taken into consideration. E.g. lettuce, and *pakchoy* seeds should be seeded for 14-21 days, while chilli and tomato for 21-30 days. Hydroponics media also play a significant role in the process of plant growth. The medium needs a loose, fertile structure and water can be absorbed well.

The medium should also be able to store water content in order for plants to obtain sufficient nutrients from the water content stored in the media. In addition, the process of harvesting should be gently carried out. The harvest season of each plant must therefore be varied according to plant type. In order to limit the risk of wilting and harm to plants, harvesting at night is recommended.

In response to the one of the Nigerian participants question about a specific, fruit and vegetable hydroponic system, NFT, DFT and wick system should be used for vegetables. Drip irrigation technique for fruit plants is the most appropriate. It is also well-known to cut out the plantlet to release it from viruses as a mother plant before planting. This is also done for cost efficiency apart from sterilising.

## **Evaluation**

By the end of the event, 46 participants attended a survey by the organisers. Survey results are as follows:

- 91% of respondents said the topic and content of training comply with participant's country policies;
- 93% of respondents said the contents of training were relevant to participant's country;
- 90% of respondents said the training contributed to their education, professional and personal growth;
- 74% of respondents said the agenda was clearly specified;
- 74% of respondents said the contents were well arranged and easy to follow;
- 93% of respondents said the training kept them engaged and interested;
- 94% of respondents said the activities related to the goals of training;
- 85% of respondents said the training time allocation was enough;
- 90% of respondents said the management of the Zoom Webinar was convenient;
- 93% of respondents said the trainers were well prepared;
- 94% of respondents said the trainers were familiar with the topics of training;
- 92% of respondents said the trainers have mastery of teaching methods;
- 92% of respondents said the trainers have ability to use of training facilities;
- 88% of respondents said the guideline to operate Learning Management System (LMS) was easy to understand;
- 89% of respondents said LMS was easy to operate;
- 92% of respondents said the availability of LMS makes the learning process easier;
- 88% of respondents said computer equipment in their workplace compatible with LMS; and
- 85% of respondents said the internet access in their workplace is available and can be used to access LMS.

Based on the above results, 88% respondents found that the training was very impressive.

## **Conclusion**

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

- Participants obtained knowledge and skills on hydroponics, particularly on type of hydroponics installation, nutritional aspects required for hydroponics, calculation of hydroponics nutrient solution and maintenance of hydroponics.
- Participants will execute and share knowledge of the training in their projects and professions.
- The training encourages participants to install hydroponic system in their respective countries for social empowerment.

# PHOTO DOCUMENTATION

