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Programme Activity Report: Online Training Course on Principals and Applications of Integrated Pest and Disease Management for African, Caribbean and Latin American Countries on 25th to 27th of August and 31st of August to 2nd of September, 2021

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

Dewi Melani, S.Si, MP

Mrs. Dewi Melani has four years of experience providing training on integrated pest and disease management, sustainable agriculture, and farming entomology. She holds a BA in Biology and Master's Degree in Crop Sciences/Plant Protection. She is now teaching at the Indonesian Centre for Agricultural Training of Ketindan, Ministry of Agriculture Republic of Indonesia. She is trained to cultivate soybeans and train of trainers. She published scientific journals and books on bio-pesticides, farm entomology, pest and disease management and agricultural ecology.

Dr. Juniawan, S.P., M.Si.

Dr. Juniawan has been a staff of the Ministry of Agriculture Republic of Indonesia for more than 30 years. He holds a bachelor's degree in agriculture, a master's degree in dryland agricultural systems and a PhD in plant pest and disease. He is now teaching at the Indonesian Centre for Agricultural Training of Ketindan. He has published scientific papers on cloves leaf oils inhibition testing, biological fertilizer testing and fruit fly dynamics in horticultural areas.

Lutfi Tri Andriani, SP., MP.

Mrs. Lutfi Tri Andriani has 11 years of experience providing training on sustainable agriculture, plant disease, plant pathology, integrated pest and disease management agroecosystem. She holds a Master's Degree in Plant Sciences. She is now teaching at the Indonesian Centre for Agriculture Republic of Indonesia. She published scientific journals and books on ecological control of plant pest organisms and usage of plant growth promoting bacteria.

List of Countries (*alphabetically sorted*):

No	Country	Number of Person(s)
1	Barbados	2
2	Belize	5
3	Burundi	3
4	Colombia	4
5	Costa Rica	3
6	Ecuador	2
7	Ethiopia	1
8	Guatemala	4
9	Madagascar	4
10	Malawi	1
11	Mauritius	4
12	Panama	3
13	Rwanda	6
14	Senegal	1
15	South Africa	1
16	Suriname	8
17	Tanzania and Zanzibar	1
	Total	53

Distribution of Participants' Background

No	Background	Percentage
1.	Government	56.61%
2.	Higher education institution	16.98%
3.	Private sector	26.41%

Programme Activity Report

Online Training Course on Principals and Applications of Integrated Pest and Disease Management for African, Caribbean and Latin American Countries on 25th to 27th of August and 31st of August to 2nd of September, 2021

Background

The global population demands that the farmers grow more crops on current agricultural area. For farming returns to increase, agricultural technology needs to be constantly improved to minimise crop losses and to safeguard the environment. The method to overcome these issues is Integrated Pest Management (IPM). IPM means taking into account all existing strategies of pest control and other measures to discourage the growth of pests, while minimize the harm to health and the environment. This is crucial to the agriculture industry's long-term future.

To this end, a "Online Training Course on Principals and Applications of Integrated Pest and Disease Management for African, Caribbean and Latin American Countries" was organised by the Non-Aligned Movement Centre for South-South Technical Cooperation (NAM CSSTC), in collaboration with the Ministry of Foreign Affairs and the Ministry of Agriculture of the Republic of Indonesia. The course was split into regional lots. The training for Africa was conducted from 25th-27th of August, 2021 and for Caribbean and Latin American Countries from 31st of August to 2nd of September, 2021.

A variety of digital approaches, including e-learning and video resources, have been employed for training purposes to generate interactive engagement between trainers and participants. A wide variety of government, academia, business sector and other institutions were trained, from Barbados, Belize, Burundi, Colombia, Costa Rica, Ecuador, Ethiopia, Guatemala, Madagascar, Malawi Mauritius, Panama, Rwanda, Senegal, South Africa, Suriname and Tanzania and Zanzibar.

Furthermore, it increased participants' knowledge on: i) the urgent nature of agroecosystem ecology as the basic element of integrated pest management; ii) tactics and methods of control of IPM; and iii) the use and prevention of pest and disease by botanical pesticide.

Discussion

Soil Testing

Integrated Pest Management (IPM) is to carefully analyse all available approaches for pest control and to integrate the suitable measures to hinder the growth of pest populations and other measures. IPM stresses the growth of a healthy crop that disrupts agroecosystems as little as possible and promotes natural pest management.

The basic components of IPM are: i) the prevention of pests; ii) the monitoring of pests and mechanisms for naturally occurring control; and iii) intervention, when methods of control are required. Farmer is therefore the major decision-maker in the implementation of IPM strategies. Ecological pest management can be employed to strengthen the resistance of pest and plant diseases in two methods, namely below ground and above ground.

Compost addition and beneficial microbial (such as mycorrhizas and *trichoderma sp.*) are employed as a soil test for the underground applications, but for overground applications plant diversity and natural enemies (such as refugia) are used. IPM is economically viable and sustainable based on the environment.

The participants from Madagascar and Ethiopia delivered questions during the discussion about any alternative way for measuring soil's nutrition as soil testing and vermicomposting do not exist in their countries. Any compost freely available in every country can still be utilised as an alternative to feed the soil. The android application produced by Bumi Aji (www.BumiAji.co.id) for soil testing can be utilised, but can only be used for the particular farm. One of the Mauritius participants also questioned about controlling the fight against fruit pests. Apart from using a trapped pheromone plant, a methyl eugenol-containing botanical pesticide is also employed in order to prevent the fly attack. Methyl eugenol from the basil and *carica* papaya plants can be isolated.

Colombian participants asked about additional materials to replace fish paste for pest management. Dried fish can be replaced as resources that can be obtained more easily in American countries. Surinam participants also explored the usage of mycorrhizae in field plants that have been recently transplanted. Before using on newly transplanted plants, *mycorrhizaes* are plucked into plant roots with the addition of water.

Employment of Botanical Pesticides

IPM aims to employ all the required techniques and tactics to manage populations below economically detrimental levels and prevent bad effects on the environment, humans and wildlife. The many control strategies employed in IPM are cultural, physical, biological and chemical.

The method of cultural control is preventive measures which use agricultural practices to limit the number of pests. Physical methods of control include strategies to limit the access of pests to the croup through attack and destruction of pests. The employment of living organisms to lower the populations of pests is a bio-control strategy, often known as natural enemies. Decisions on control strategies are applied based on the type of pest and disease attacking the crop.

Botanical pesticides are organic plant pesticides, sometimes termed secondary metabolites. The attractiveness of synthetic chemical pesticides for pest management has long been reported as botanical pesticides offer little danger to the environment and human health. Many plants can be employed under two conditions for the botanical pesticides, the plant needs a bitter taste and a strong smell.

In the discussion, it is well known to be botanical pesticides for a portion of papaya (seed and leaf). It can be produced with a ratio of 1:4, 1 with plant material and 4 with water. In addition, secondary plant metabolite is covered as well. The is already a secondary metabolite in the plant, but not on all the plants. The secondary metabolite cannot therefore adequately defend the plant from pests and diseases.

Participants questioned about the biological management of potato disease bacteria. Potato diseases typically occur in soil, so a healthy soil is necessary. Participants can add some natural enemies such as pathogens to the soil to control the disease in the soil. The *piparaceae* family plant can be utilised in potato disease for the control of microorganisms. In addition, participants questioned the stage growth of pesticide application plants. The applications must be made at the early stage of the plant as a botanical pesticide is used for prevention. In three stages, which are five days after plant, 20 days after plant and 30 days after plant, the botanical pesticide is applied.

Effectiveness of the Application of Botanical Pesticides

Many forms of diseases harm crops, depending on the plant type. Each of the symptoms and causes are different. Therefore, each disease should also be treated accordingly.

Several therapy approaches, such as pharmacologic control, biological control and physical control, are available. The application of botanical pesticide is one of the recommended therapies. The use of the botanical pesticide relies, however, on the pest and disease that are eliminated. Six things must be taken into account for the effectiveness of the application of botanical pesticides in preventing pests: i) the proper target; ii) the right quality; iii) the right type of pesticide; iv) the right timing; v) right dose and concentration; and vi) right way to application. The problem of pests and diseases can be resolved.

It is recognised in the discussion that eugenol compounds are utilised as a control mechanism to prevent the bacterial and fungal growth in the plant. Antibiotics are no longer required to control the wilt of bacteria. Eugenol chemicals are composed of several plant types, in particular plants belonging to the *eugenia* and *syzygium* genus. It is also known that a pathogen is able to live on many different plant kinds, hence it is impossible to locate a truly pathogen-free plant. The various ways used to treat the pathogen are sterilisation, injection, infusion, spraying and botanical pesticides.

Evaluation

At the end of the event, the organisers conducted a survey with 48 random participants. The results of the survey are the following:

- 90% of respondents said the topic and the content of training comply with participant's country policies;
- 92% of respondents said the contents were relevant to participant country's development;
- 92% of respondents said the training contributed to their education, professional and personal growth;
- 75% of respondents said the agenda was clearly specified;
- 76% of respondents said the contents were well arranged and easy to follow;
- 92% of respondents said the activities related to the goals of training;
- 93% of respondents said the training enhance participant's knowledge;
- 95% of respondents said the training kept them engaged and interested;
- 91% of respondents said the topic and the training materials of training made them satisfied;
- 92% of respondents said the trainers were familiar with the topics of training;
- 91% of respondents said the trainers were well-prepared;
- 89% of respondents said the capacity of lecturers to discuss and answer question made them satisfied;
- 85% of respondents said the English proficiency of lecturers was enough;
- 88% of respondents said the training time allocation was enough;
- 91% of respondents said the training personnel provided adequate support with programme changes (such as schedule and Learning Management System/LMS); and
- 74% of respondents said the management of the Zoom Meeting was convenient.

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

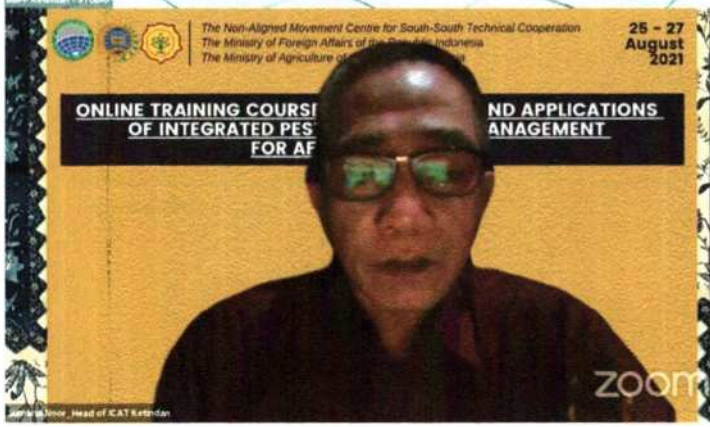
Conclusion

The organisers make the following findings throughout the training organisation:

- Knowledge has been gained by participants on environmental IPDM, integrated pest and disease control strategies, and plant and horticultural diseases.
- The participants also learnt to produce and process various fertilisers while maintaining the environment.
- IPM methods are based on the type of pests and diseases to be removed. For students and farmers, most of the approaches discussed throughout the programme are easy to apply.
- Acquired know-how enables participants with researchers and farmers and local communities to establish an effective integrated pest control programme.
- This training takes the last option of chemical pest control and supports the use of IPDM for safety of the consumer of agricultural products, beneficial organisms and the environment.

PHOTO DOCUMENTATION

African countries (25th to 27th of August, 2021)



American countries (31st of August to 2nd of September, 2021)