



**Asia-Pacific  
Economic Cooperation**

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# **Capacity Building on Management Technologies for Climate Smart Rice Cultivation in the Southeast Asian and Latin American Rice Sector**

Bangkok, Thailand | 10-12 October 2018  
Parral, Chile | 15-16 November 2018

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## Executive Summary

Rice cultivation is a major source of atmospheric methane (CH<sub>4</sub>), which is a potent greenhouse gas (GHG) and the second largest contributor to historical global warming after CO<sub>2</sub>. Due to the importance of mitigating CH<sub>4</sub> from rice cultivation, much research has been conducted to find practical ways of reducing emissions while sustaining or improving overall production efficiency. One promising option is improving water management in irrigation systems, such as alternate wetting and drying (AWD) management. This water-saving technology enables rice producers to reduce the consumption of irrigation water in rice fields and has been demonstrated to mitigate GHG emissions without decreasing rice yield.

However, a more practical approach, such as the integration of AWD with other rice cultivation management techniques (such as management of fertilizer application and organic matter on the ground) could attract more rice producers by potentially increasing their productivity and incomes.

Against this background, the project “Capacity Building on Management Technologies for Climate Smart Rice Cultivation in the South-East Asian and Latin American Rice Sector” was proposed by the Ministry of Agriculture, Forestry and Fisheries (MAFF) , Japan and funded by the APEC Agricultural Technical Cooperation Working Group as ATC 01 2017A, with the aim of providing the opportunity to rice producers, researchers, and experts associated with rice cultivation in APEC economies to:

- 1) share knowledge and best practices of new management technologies for adapting to and mitigating climate change in the rice sector (hereafter “management technologies”);
- 2) exchange views on management technologies; and
- 3) develop networks among rice producers, researchers and experts, by organizing an international workshop and mutual visits of experts,

To achieve this aim, the project held a workshop and capacity building trainings with participants from APEC economies under management of MAFF.

The workshop on “Rice Landscapes and Climate Change” including capacity-building training was held on 10-12 October 2018 at Viengtai Hotel in Bangkok, Thailand. It was organized by the FAO Regional Office for Asia and the Pacific (FAORAP) as the local organizer with other institutes such as the Joint Graduate School of Energy and Environment at King Mongkut’s University of Technology Thonburi (JGSEE/KMUTT), the ASEAN Climate Resilience Network (ASEAN-CRN), the National Agriculture and Food Research Organization (NARO), and the Global Research Alliance on Agricultural

Greenhouse Gases (GRA). More than 100 people attended the workshop in total, among which 9 speakers from 5 APEC economies made presentations or gave capacity-building training, and 15 participants from 6 APEC economies were funded by APEC.

In the workshop, a Knowledge Session was organized to introduce the following key topics through a series of presentations on case studies of economies. The session was entitled “Assessing the feasibility of GHG mitigation through water saving techniques (AWD) in irrigated rice fields in Southeast Asian countries (FYs 2013 – 2017 funded by MAFF of Japan)”. Also, capacity-building training was conducted in the Knowledge Session entitled “Capacity Building for Climate Smart Rice Cultivation in Asia”.

Feedback and comments on the design and content of the workshop were collected by both a pre-workshop survey and a post-workshop survey. The pre-workshop survey showed the high expectations of the participants and the post-workshop survey revealed their high satisfaction. 48% of the participants answered they “strongly agreed” that the workshop achieved its intended objectives, followed by 23% who answered “somewhat agreed” and 27% who “agreed”, whereas only 2% “disagreed”.

The capacity-building training on “Management Technologies for Climate Smart Rice Cultivation in the South-East Asian and Latin American Rice Sector” was implemented on 15-16 November 2018 in Parral, Chile. It was organized by the Regional Centre Quilamapu, the National Institute for Agricultural Research (INIA Quilamapu) as the local organizer. More than 30 people including researchers, extension workers, rice milling companies and rice farmers participated in the capacity-building training. Two speakers from APEC economies were funded by APEC.

On the first day, the representative of INIA Quilamapu welcomed the experts and participants, then the Japan Association for Techno-innovation in Agriculture, Forestry and Fisheries (JATAFF), Japan introduced the APEC project.

At the beginning of the scientific session, experts from the INIA, Japan, and Brazil made presentations entitled “GHG emission and its relevance in Latin America”, “Outcomes of Mitigation in Irrigated Rice Systems in Asia (MIRSA) project and recent topics on soil C sequestration” and “Experience in Brazil on management technologies on rice cultivation, water management and its implications for GHG emissions” respectively. After that, experts of the INIA made a presentation entitled “Studies on sustainability of rice production in Chile” in terms of cold temperature and water management, weed control, metalloids studies and preliminary studies on GHG emissions in Chile.

Field training was conducted on the second day in the Francisco Jiménez Experimental Plot in Parral. Experts of the INIA explained the main aims of its projects financially support

by the Regional Fund for Agriculture Technology (FONTAGRO) and Foundation for Agricultural Innovation (FIA), the future plan for evaluations of farmers' fields, and the field activities of the experimental trials. They also instructed participants on sampling, types of chambers, and analyses to evaluate GHG emissions in paddy fields. In addition, new irrigation techniques for rice production used in a project by FIA were shown.

The Participants Evaluation Survey was conducted at the end of the scientific session and 23 participants responded. The results showed high satisfaction with the capacity-building training and increased knowledge and skills in the topic after participating in the capacity-building training.

## **Introduction**

Alternate wetting and drying (AWD) is a management practice for irrigated rice that saves water and reduces greenhouse gas (GHG) emissions. Research on AWD is underway to identify suitable areas through biophysical and social analyses and the results are being disseminated and introduced to farmers as a smart and responsible form of water management in South-East Asian and Latin American economies. For this purpose, the workshop and capacity-building training were held on 10-12 October 2018 in Bangkok, Thailand, and also capacity-building training was held on 15-16 November 2018 in Parral, Chile. This workshop and capacity-building training provided rice producers and researchers in the APEC economies with the skills and a better understanding of the merits of adopting an integrated management technology that combines fertilizer and organic matter management with AWD. This publication is intended to share the contents and the fruits of these efforts.

## **Objectives**

The project provides the opportunity to rice producers, researchers, and experts associated with rice cultivation in APEC economies to:

- 1) share knowledge and best practices of new management technologies for adapting to and mitigating climate change in the rice sector (hereafter “management technologies”);
- 2) exchange views on management technologies; and
- 3) develop networks among rice producers, researchers and experts, by organizing an international workshop and mutual visits of experts.

Rice producers and researchers learn about the points to be improved and benefits of the management technologies for adapting to and mitigating climate change. Furthermore, the relationships built during the project will enable them to help each other when necessary after the project is completed.

# Key Achievements

## 1. Workshop on “Rice Landscapes and Climate Change” in Thailand

The workshop, held in Bangkok, Thailand on 10-12 October 2018, consisted of a two-day meeting and one-day field training. Twenty-two participants from APEC economies were invited to take part in the workshop, particularly technical officials of governments and agricultural researchers of NPOs and academia in developing economies in South-East Asia and Latin America. Knowledge and experience of management technologies were shared, and the participants also exchanged views on the development of management technologies. Although they could not visit paddy fields to learn more about the importance of management, they gained a concrete understanding of management technologies through excellent presentations and interactive discussions. Participants shared the summary of results and evaluation of capacity-building training, current situation and challenges of management technologies, the development of management technologies in developed economies, and new management technologies and facilities including cost-effective GHG mitigation technologies.

### 1.1 APEC Session

In the workshop, a Knowledge Session was organized to introduce the following key topics through a series of presentations on case studies of economies. The session was entitled “Assessing the feasibility of GHG mitigation through water saving techniques (AWD) in irrigated rice fields in Southeast Asian countries (FYs 2013 – 2017 funded by MAFF of Japan)”. The speakers were Dr. Kazunori Minamikawa from Japan, Mr. Ali Pramono from Indonesia, Mr. Nghia Trong Hoang from Viet Nam, Dr. Amnat Chidthaisong from Thailand and Ms. Kristine Samoy-Pascual from the Philippines.

**Dr. Kazunori Minamikawa** presented an outline of the “Greenhouse Gas Mitigation in Irrigated Rice Paddies in Southeast Asia: Field Demonstration and Consolidation of Procedures (MIRSA-2)” project in Viet Nam, Thailand, the Philippines and Indonesia. **Mr. Ali Pramono** gave a presentation on assessing the feasibility of GHG mitigation through AWD in Indonesia. **Mr. Nghia Trong Hoang** gave a presentation on assessing the feasibility of GHG mitigation through AWD in irrigated rice fields in Central Viet Nam, and concluded that AWD could boost rice productivity and that it is important to spread AWD to local farmers. **Dr. Amnat Chidthaisong** gave a presentation on evaluating the effects of AWD on methane and nitrous oxide emissions from a paddy field in Thailand. **Ms. Kristine Samoy-Pascual** gave a presentation on assessing the feasibility of GHG mitigation through AWD in the Philippines.

## 1.2 Interactive session

A series of interactive sessions was implemented as “Country experiences in reducing emissions and increasing resilience in rice landscapes”, “Challenges and opportunities: Tackling climate change in rice landscapes”, “Solution matching”, and “Sustainable rice landscapes – developing a regional initiative”.

Delegates of economies first presented prepared posters identifying current initiatives, needs and gaps in reducing GHG emissions and increasing resilience in rice landscapes with a particular focus on water and soil management. Second, they worked in groups to identify key challenges and opportunities for scaling-up adaptation and mitigation practices in rice landscapes and possible solutions, and identified specific technologies and strategies for reducing GHG emissions and increasing resilience in rice landscapes at the national and regional levels. Third, a structured discussion session was held to help elaborate on the regional initiative for the Sustainable Rice Platform.

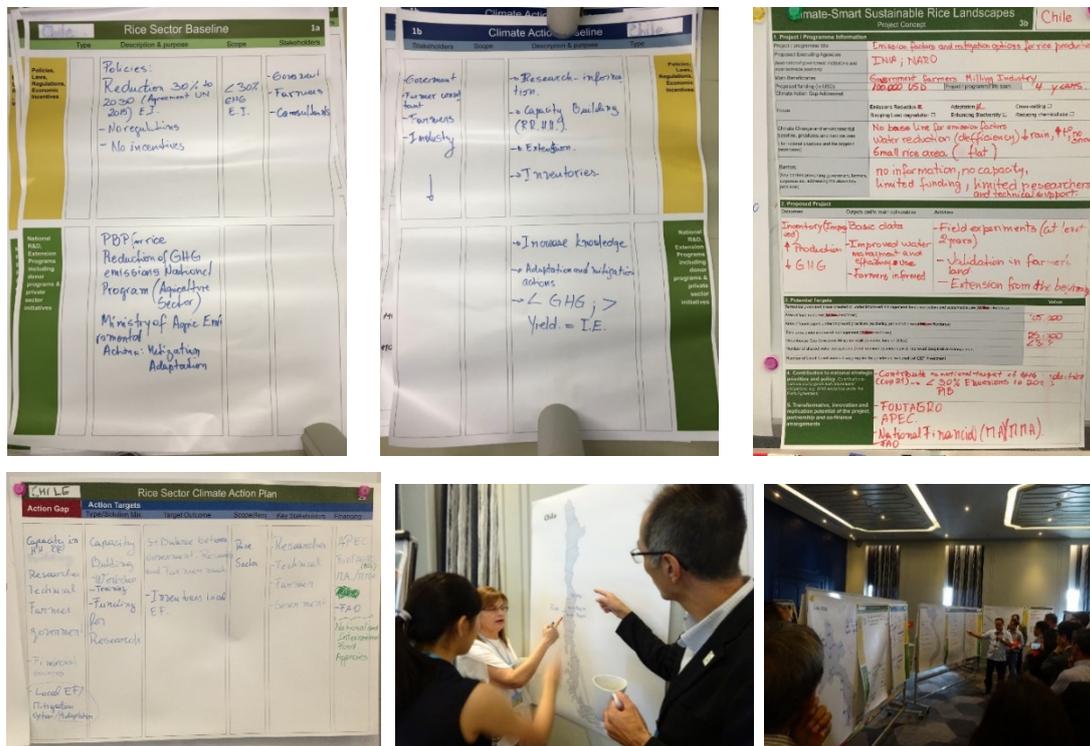


Fig.1 Interactive session

## 1.3 Other sessions

In the workshop on the first day, a Briefing Session entitled “Significance of the Paris Agreement for Agriculture and measures for mitigation and adaptation in the agriculture sectors with a focus on rice landscapes” was led by ASEAN CRN.

Then, a Knowledge Session entitled “Current initiatives and activities in the region on reducing emissions and increasing resilience in rice landscapes” was led by WBCSD

(World Business Council for Sustainable Development) to introduce the following key topics through a series of presentations including the FAO Asia Regional Rice Initiative, Asia Soil Partnership (ASP) framework in Thailand, Climate & Clean Air Coalition, planned research initiatives by AEGIS, and the Sustainable Rice Platform.

In the workshop on the morning of the third day, a Briefing Session entitled “Sustainable Rice Landscapes – An Introduction” was led by the FAO, UNEP, IRRI, WBCSD and GIZ, and a Wrap-up session entitled “Summary and way forward” was led by the FAO.

In the afternoon, Follow-up Afternoon Meetings organized for selected participants were implemented as “Session I SRL Meeting” by the Sustainable Rice Landscapes (SRL) partners, “Session II GRA Paddy Rice Research Group Meeting” by the GRA and “Session III Rice/Fish Systems” by the FAO.

## **2. Capacity-building Training on “Climate Smart Rice Cultivation in the South-East Asian and Latin American Rice Sector”**

Two capacity-building training programs on management technologies were conducted, one in Bangkok, Thailand mainly for researchers in South-East Asian countries in English, and the other one in Parral, Chile in Spanish mainly for farmers and researchers in Chile in Latin America to share knowledge and technical skills of management technologies for adaptation and mitigation of climate change in the rice sector.

The two capacity-building training programs were led by trainers who are researching AWD technology and crop management of rice fields. The results of the capacity-building training were evaluated and are summarized in Annex 1 and 2.

### **2.1 Capacity-building training in Thailand**

The capacity-building training was conducted as a Knowledge Session “Capacity Building for Climate Smart Rice Cultivation in Asia” on Day 2 of the workshop in Bangkok. The speakers were Dr. Bjoern Ole Sander from IRRI, Dr. Yasukazu Hosen from Japan, Dr. Kazunori Minamikawa from Japan, Dr. Chitnucha Buddhagoon from Thailand and Dr. Yasuhito Shirato from Japan.

**Dr. Bjoern Ole Sander** presented an analysis of suitable environments for the implementation of low-emissions technologies in rice production in Viet Nam and proposed GHG mitigation options in rice production besides AWD. **Dr. Yasukazu Hosen** gave a presentation entitled “What kind of environment should be targeted for AWD introduction? – Through experience in the Mekong Delta –”, and explained the environment that is favorable for introducing a reduced-water environment to rice paddies. **Dr. Kazunori Minamikawa** gave a presentation on MRV for a GHG mitigation project with water management in irrigated rice paddies and introduced “Guidebooks for GHG measurement

and MRV” which explained the measurement, reporting and verification of GHG. **Dr. Chitnucha Buddhagoon** presented an overview and plan of the Thai rice NAMA project and emphasized that the scaling-up of climate-smart rice cultivation technologies in Thailand should be extended and implemented along with rice policies such as consolidating rice farming (big farms). **Dr. Yasuhito Shirato** gave a presentation on soil C sequestration for sustainable food production and climate change mitigation and introduced “The 4 per 1000 initiative” which was launched in 2015 at COP21. A copy of each presenter’s slides is attached in Annex 1.

In addition, another Knowledge Session entitled “Capacity Building for Climate Smart Rice Cultivation in Asia” was led by the FAO on Day 2 of the workshop in Bangkok to provide a series of presentations on topics including “Trees in rice landscape”, “High nitrous oxide fluxes from rice indicate the need to manage water for both long- and short-term climate impacts – research paper”, “Water and integrated rice-fish system”, “Multipurpose irrigation mechanisms”, “Water resources management”, “Save and grow: Capacity-building for sustainable intensification of rice production through farmers field schools”.

## **2.2 Capacity-building training in Chile**

### **(1) Scientific session**

The scientific session was held on the first day of the capacity-building training. Mr. Rodrigo Aviles, Regional Director of INIA Quilamapu, welcomed the experts and the participants, and emphasized the significance of the capacity-building training.

**Mr. Akira Nagata**, General Manager of JATAFF and the contractor of the APEC project, introduced the APEC project “Capacity Building on Management Technologies for Climate Smart Rice Cultivation in the South-East Asian and Latin American Rice Sector”. **Dr. Marta Alfaro**, Deputy Director of Research and Development, INIA, made a presentation entitled “GHG emissions and its relevance in Latin America” and outlined the world context for GHG emissions and its influence on climate change. She also emphasized that capacity-building in Chile to reduce GHG emissions from rice cultivation can be disseminated to the rest of Latin America. **Dr. Yasuhito Shirato**, Research Manager for Climate Change of the Institute for Agro-Environmental Sciences, National Agriculture and Food Research Organization, presented an outline of the MIRSA-2 (Greenhouse Gas Mitigation in Irrigated Rice Paddies in Southeast Asia: Field Demonstration and Consolidation of Procedures) project funded by MAFF, Japan, which took place in Viet Nam, Thailand, the Philippines and Indonesia. **Dr. Walkyria Bueno S.**, EMBRAPA, Brazil, made a presentation entitled “Experience in Brazil on management technologies on rice cultivation, water management and its implications for GHG emissions” and proposed a sectorial plan for mitigation and adaptation to climate change for consolidation of low carbon emission economies in agriculture, including management practices concerning water, soil and straw for irrigated rice. **Dr. Gabriel Donoso**, INIA Quilamapu, made a presentation entitled “Studies on sustainability of rice production in Chile: Cold temperature and water management”. He

explained the characteristics of rice production in Chile and emphasized the importance of cold tolerance and water stress tolerance of rice. **Ms. Viviana Becerra**, Agricultural Engineer of INIA Quilamapu, made a presentation entitled “Studies on sustainability of rice production in Chile: Weed control, metalloids studies and GHG” and emphasized the importance of weed control as well as controlling heavy metals such as arsenic. **Ms. Sara Hube**, INIA Remehue, made a presentation entitled “Studies on sustainability of rice production in Chile: Preliminary studies on GHG emissions in Chile”. She explained the preliminary evaluation for determining the emissions of CH<sub>4</sub> and N<sub>2</sub>O from irrigated rice fields including methodologies of measuring GHG and research challenges in this area.

A copy of each presenter’s slides is attached in Annex 2.

## **(2) Field training**

The field training was conducted in the Francisco Jiménez Experimental Plot in Parral on the second day of the capacity-building training.

**Ms. Becerra**, Responsible Researcher of the FONTAGRO Project “More rice with less emissions and less water consumption” 2018–2021, led by Colombia, Peru and Chile, explained the main aims of the project and the future validation of AWD techniques on farmers’ fields. **Dr. Gabriel Donoso**, INIA Quilamapu, explained the field activities of the experimental trials, **Ms. Sara Hube**, INIA Remehue, explained the sampling, types of chambers, and analyses to evaluate GHG emissions in paddy fields, and **Dr. Gabriel Donoso**, INIA Quilamapu, explained the field research activities of the FIA project “Development of an efficient and sustainable irrigation system for rice cultivation in Chile”.

The participants actively engaged in the field training and asked the INIA experts many questions, resulting in an enthusiastic question-and-answer session.

Notes:

The general objective of the FONTAGRO Project is to validate locally the benefits of efficient, competitive production with lower environmental impact by implementing AWD moderate and intensive rice cultivation in farms of small producers in Colombia, Peru and Chile. The specific objectives are: 1) To evaluate the efficiency of water resources, yields and GHG emissions with different water management strategies, 2) To quantify the cost-benefit ratio of different water resource management treatments, 3) To model the GHG emissions of the different treatments evaluated under different climate and soil condition scenarios; and 4) To carry out extension activities on the recommendations arising from the project, aimed at rice producers.

The FIA project “Development of an efficient and sustainable irrigation system for rice cultivation in Chile”, in conjunction with the company Tucapel SA, Carozzi SA, and supported by guild organizations and peasant farmer rice committees in the regions of

Maule and Ñuble, is evaluating a rice germplasm that has greater water efficiency, and is also evaluating different irrigation methods and technologies for rice, such as the use of irrigation sleeves and sprinkler irrigation associated with different technologies (sensors with data logging, Parshall gutters, water meters and gates for irrigation by hoses), which allow the water used by this crop in its different stages of growth to be quantified in real time.

### **3. Feedback from the Participants**

Regarding the workshop and the capacity-building training held in Bangkok, Thailand on 10-12 October 2018, feedback and comments on the design and content of the workshop were collected by both a pre-workshop survey and a post-workshop survey. The pre-workshop survey showed the high expectations of the participants and the post-workshop survey revealed their high satisfaction.

According to the post-workshop survey, 71% of the participants answered that the workshop met all their expectations. Regarding the respondents' level of satisfaction in the post-workshop survey, most participants responded positively as follows.

The highest number of the total of "Strongly Agree" and "Somewhat Agree" (90% in total) was for "The organizers were very accessible and helpful", reflecting the participants' high satisfaction with the local organizer.

The second highest total of "Strongly Agree" and "Somewhat Agree" (87% in total) was for "The instructions for the interactive sessions were clear and they were well moderated".

"The agenda items and topics were relevant" (total of "Strongly Agree" and "Somewhat Agree" was 84%), "The moderators and the presenters were well-prepared and knowledgeable about the topic" (82%), "The workshop materials and other resources are useful" (77%) and "The sessions were well-structured and easy to follow" (77%) also showed high percentages.

"The workshop achieved its intended objectives" (71%), "The objective of the workshop is clearly defined" (70%) and "The time allotted for each session was sufficient" (63%) showed comparatively low percentages and the participants were not fully satisfied with these aspects. This might have been because the workshop covered a wide range of topics regarding rice landscapes.

Detailed results of the participants' survey for the events in Thailand are included in Annex 1.

Regarding the capacity-building training held in Parral, Chile on 15-16 November 2018, the Participants Evaluation Survey was conducted at the end of the scientific session and 23 participants responded. The results showed high satisfaction with the capacity-building training and increased knowledge and skills in the topic after participating in the training.

Almost all participants answered “Strongly Agree” and “Agree” to the questions regarding objectives, agenda items and topics, contents, dealing with gender issues, preparation of trainers/experts or facilitators, distributed materials and time allocation of the training. Among these, preparation of trainers/experts or facilitators (78%) and agenda items and topics (61%) showed a high percentage of “Strongly Agree”, while distributed materials (22%), dealing with gender issues (30%) and time allocation (30%) showed lower percentages.

There was a high percentage of the positive answers “very” and “mostly” (74% in total) to the question asking about the relevance of the project to participants’ countries. Regarding the level of knowledge and skills in the topic prior to and after participating in the event, the survey results showed increased understanding: “very” (4%→13%), “mostly” (9%→ 22%), and “somewhat” (26%→61%), whereas answers showing a low level of understanding decreased: “a little” (57%→4%) and “not much” (4%→0%).

The free descriptions in the participants’ evaluation survey revealed that most of the participants had lacked information about GHG emissions before the scientific session and that rice was one of the “source crops” of GHG emissions. Also, before the scientific session they were not aware of their responsibility as rice farmers to try new techniques in order to look after the environment.

The discussions on science sessions and the field day showed that the participants agreed that it is good to know that environmental changes are caused by many factors in many areas, and that rice cultivation is one of them. They understood that using water more efficiently helps mitigate GHG emissions. This includes using new techniques to irrigate rice. The participants also realized that direct seeding, which uses less water at the early stages of the rice, decreases GHG emissions.

Before the scientific session, farmers did not know the real damage that GHG can cause to the environment but they said they would share the information with other farmers. On the other hand, extension workers already knew about the environmental issues before the scientific session to some extent, and after the session, they agreed with the idea that it is necessary to inform all the rice producers about the subject. In addition, they said that the authorities should be working on this along with the farmers, new policies should be set up and new research projects should be prioritized.

Detailed results of the participants’ survey for the events in Chile are included in Annex 2.

## **Conclusion**

The workshop and the capacity-building training held in Bangkok, Thailand on 10-12 October 2018 and the capacity-building training held in Parral, Chile on 15-16 November 2018 provided rice producers and researchers in APEC economies with skills and a better understanding of the merits of adopting an integrated management technology that combines fertilizer and organic matter management with AWD.

Through this workshop and training, the participants were able to obtain the latest knowledge on AWD and much related information.

For the next step, it is recommended that each participant in the workshop and the training put AWD into actual practice upon returning to their workplace or farm. It is equally important that, based on acquaintances and friendships built during the workshop and training, the participants form a network among themselves to carry out further research and development, to keep accumulating new knowledge on AWD. Furthermore, APEC projects with similar purposes should also be extended to other locations such as in Africa, Europe, and the USA, to spread the practice of AWD globally.