Participatory development of scaling plan as a part of low emission roadmap in rice production of Mekong River Delta

Working paper no. 302

CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS)

Bui Tan Yen
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Contact:
CCAFS Program Management Unit, Wageningen University & Research, Lumen building, Droevendaalsesteeg 3a, 6708 PB Wageningen, the Netherlands. Email: ccafs@cgiar.org

Abstract

Rice production in Vietnam emits approximately 13% of total GHGs of the country. It is a significant source of methane, but also fine-particulate matter emission. The International Rice Research Institute (IRRI) has been working in Vietnam for many years, with support from national partners, to conduct research aimed at reducing the environmental impact of rice production. The alternate wetting and drying (AWD) technology, and sustainable straw management options have been introduced by IRRI as low-emission technologies (LET) for the rice sector. As the result of IRRI's contribution, the government of Vietnam has prioritized AWD as a key option in Vietnam's Nationally Determined Contribution (NDC). The Ministry of Agriculture and Rural Development (MARD) also developed a circular on collecting and processing crop residues, including rice straw. In some provinces, both, AWD and low-emission straw management practices have gradually been adopted by rice farmers but the adoption rate is still low. The constraints that obstruct adoption of LET need to be tackled with close participation of local stakeholders. The participatory approach in studies on adoption has been a focus of IRRI. Regarding low emission technologies, IRRI conducted several stakeholder analyses to define the main factors that influence farmer adoption. A participatory approach is also used to identify problems and solutions in low emissions technologies implementation taking into consideration the local conditions.

This paper presents an engagement study that focuses on a provincial low emission roadmap in rice production. Results obtained in the study of An Giang province show that AWD adoption is strongly influenced by biophysical conditions and technical guidance, while adoption of environmentally friendly straw management is mainly driven by market, rainfall distribution and quality of transportation network. In An Giang's districts, adoption of LET can be improved in the next 5-year plan. The implementation targets and required collective actions are in relation to improvement of infrastructure, policy and communication, and vary from district to district. With engagement of local stakeholders, this workshop has identified challenges for the implementation of LET and highlighted the locally proposed solutions as the way to overcome current constraints and connect the last mile from research to field implementation. This paper provides insights of LET adoption and implementation potential in An Giang, which also have implications for LET scaling in other provinces in the Mekong River Delta.

Keywords

participatory approaches; mitigation; Vietnam; rice.

About the authors

Dr. Bui Tan Yen is currently working at IRRI-Vietnam office as a Senior Associate Scientist. Email: y.bui@irri.org

Dr. Bjoern Ole Sander is the IRRI representative for Vietnam. Email: b.sander@irri.org

Dr. Katherine Nelson is a postdoctoral fellow of the IRRI, working on scaling approaches for low emission technologies in rice production. Email: k.nelson@irri.org

Dr. Vu Duong Quynh is a researcher of the National Institute for Agricultural Environment, Ministry of Agriculture and Rural Development of Vietnam. Email: vuduongquynh2006@yahoo.com

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CLIMATE & CLEAN AIR COALITION
TO REDUCE SHORT-LIVED CLIMATE POLLUTANTS

Contents

Acronyms

AWD	alternate wetting and drying
CCAC	Climate and Clean Air Coalition
CCAFS SEA	CGIAR Research Program on Climate Change, Agriculture and Food Security Southeast Asia
CF	Continuous flooding
DARD	Department of Agriculture and Rural Development
IRRI	International Rice Research Institute
GHG	Greenhouse gasses
LET	low emission technology
MRD	Mekong River Delta
MSD	Mid-season drainage
RMU	rice land management unit
RRD	Red River Delta
WSP	Water saving practices

Introduction

Low emission options in the rice sector of Vietnam

It is known that irrigated rice is a major source of greenhouse gas (GHG) emissions. In Vietnam, rice fields emit approximately 13% of the total GHG emissions of the country. In rice production, while decomposition of crop residues under anaerobic condition is the main source of methane emission, burning rice straw after harvest is the considerable source of carbon dioxide and fine-particulate matter (PM2.5) emission. Inappropriate straw treatment and management practices will potentially lead to many environmental and human health problems. For instance, straw incorporated in the soil could increase up to 4500 kg CO2eq ha−1 in comparison with straw removal (Romasanta et al. 2017). Straw burning not only causes carbon dioxide emission and limits vision of transport vehicles but also increases the risk of asthma and respiratory illness (Nhung et al. 2017). A study shows that straw burning in Vietnam strongly contributes to concentrations of PM2.5 in urban areas. Straw burning could generate 8.8 g kg−1 (±3.5) to 16.9 g kg−1(±6.9) of PM2.5 and account for 14-18% of Vietnam's total PM2.5 (Lasko K, Vadrevu K 2018). The high concentration of PM2.5 is seriously detrimental to human health (Khan et al., 2016), causing Tuberculosis and premature death (You et al. 2016).

In intensive rice production regions such as the Mekong River Delta (MRD), rice is planted in two or even three cropping seasons. This intensive land use type leads to a high amount of GHG emission. Annually, 4.1 million ha of planted rice in the delta emit around 25 million tons of CH4 and produce about 23 million tons of rice straw, 80% of which is burnt on the field (Gummert et al. 2019). Thus, reducing GHG emission and improving air quality in highly populated areas becomes a big issue and requires urgent collective action.

IRRI, under the projects initiated by partnerships and funding from the Climate and Clean Air Coalition (CCAC) and the CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS), has been working in Vietnam for many years with support from national partners to conduct research aimed at reducing the environmental impact of rice cultivation. Since 2014, IRRI has implemented a project titled *Climate and Clean Air Coalition to Reduce Short-Lived Climate Pollutants: Mitigation Options to Reduce Methane Emissions in Paddy Rice*. This project aims at providing technical and policy guidance for

implementing scalable mitigation options in paddy rice in Vietnam and Bangladesh. In Vietnam, a number of activities have been implemented in collaboration with national research institutes and local government in order to provide support for the implementation of alternate wetting and drying (AWD) (Richards M. and Sander B.O. 2014) and straw management practices. Also from 2016 to 2018, under a BMZ-funded project on scalable straw management options for improved farmer livelihoods, sustainability, and low environmental footprint in rice-based production systems, IRRI has developed and verified technologies and business models for sustainable rice straw management (RSM) in MRD (Martin G et. al 2019).

Recently, the Ministry of Agriculture and Rural Development (MARD) has prioritized AWD as a key option in Vietnam's NDC implementation plan. MARD also developed a circular on collecting and processing crop residues, including rice straw. However, scaling potential and limitation of those low emission technologies have not been properly explored.

With the aim specifically to develop the business case for low emission technology (LET) implementation and strategies, a team of IRRI experts and national partners are building on opportunities from previous engagement with strategically identified high influence groups. This is for laying the foundation in the form of a roadmap that describes the next steps needed to create the enabling environment necessary for wide scale adoption.

Stakeholder engagement

A stakeholder analysis was conducted in 2014 to define the main actors in terms of implementation of environmental policies on a provincial level and in terms of rice farm management with the emphasis on irrigation in the Red River Delta (RRD) and MRD, the two main rice growing regions of Vietnam (Joven 2016). The research identified the People's Committee (PC), the district's Department of Agriculture and Rural Development (DARD), the National Agricultural Extension Center (NAEC), irrigation cooperatives, and farmer groups as the most influential stakeholders. The PPC and DARD are included in all engagement processes given their authority and oversight related to agricultural research activities. Further follow-ups have been conducted to engage directly with these high influence groups that were identified during the initial workshops.

Stakeholder mapping was conducted using the "NetMap" tool (see Figure 1). Mapping the networks of irrigation management in An Giang province included farmers and value chain actors. The private trading company, Loc Troi Group, contracts 25,000 farmers covering about 60,000 ha. All contracted farmers are provided technical advice through their "field facilitator". According to the NetMapping exercise, the actors that have the most influence on the field-level irrigation practices are the water users themselves (#18), irrigation collaborative groups that provide water to the field (#15), new style cooperatives managed by contracting companies (#14), and farmer advisory services that are managed by contracting companies (#12).

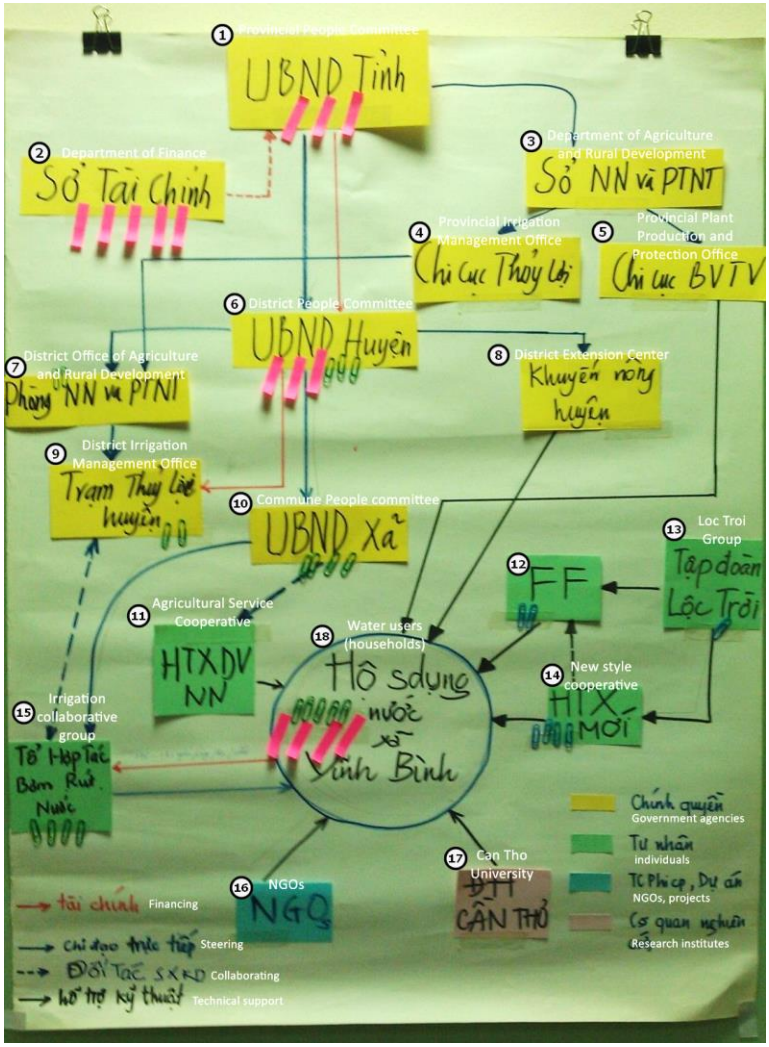


Figure 1. Map of irrigation management stakeholders in Vinh Binh commune, Chau Thanh district, An Giang province.

Based on insights of stakeholder roles in implementing LETs, IRRI collaborated with key organizations to integrate its LET initiatives in rice production. In 2018, IRRI together with

NAEC developed training materials, which provide guidance for climate resilient and low emission rice production in Vietnam. These training materials have been disseminated to provincial extension centres and will be used as a key guideline document for rice production starting in the spring season 2020.

The influence of irrigation management on AWD adoption has been explored in An Giang province, with engagement of stakeholders from departments of crop production and irrigation management at three administrative levels: province, district and commune. Figure 2 shows a diagram of the irrigation management infrastructure as it is organized in An Giang Province.

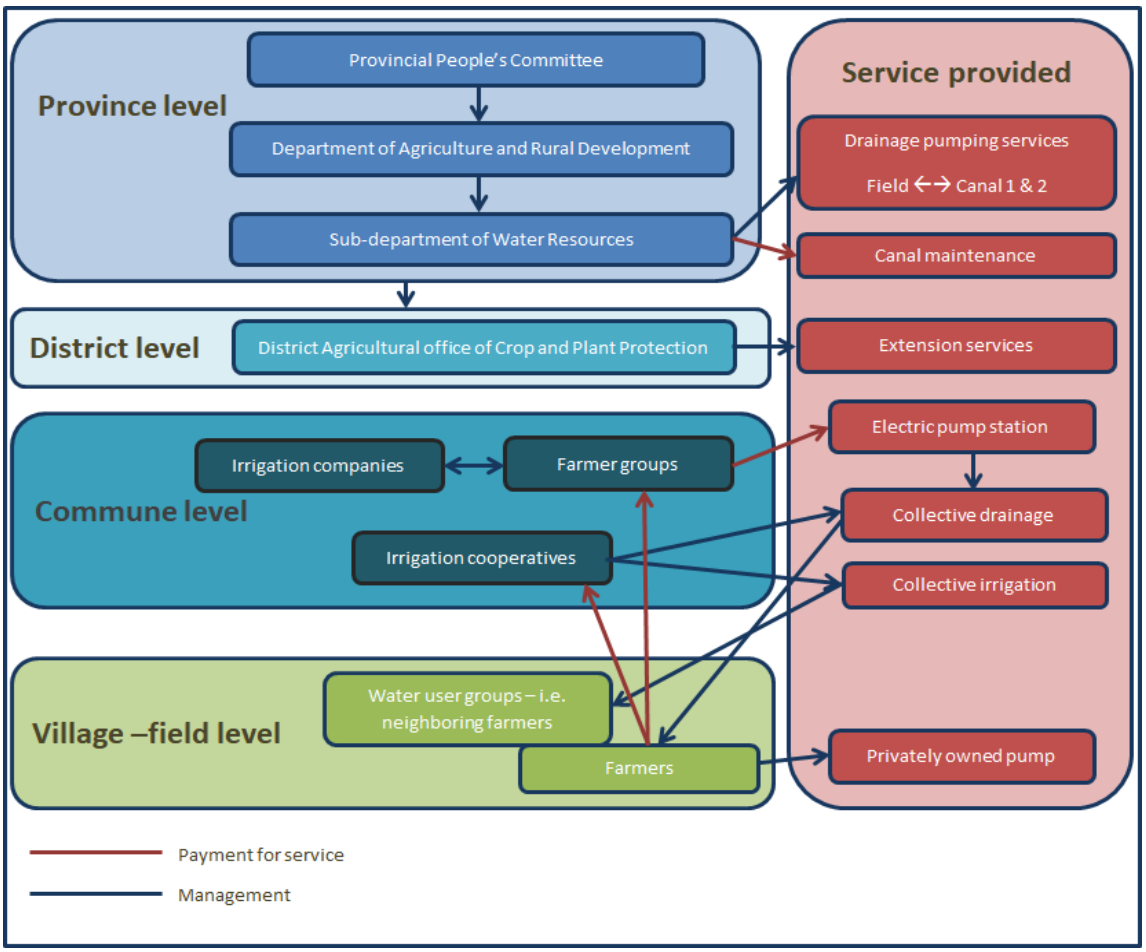


Figure 2. Diagram of the irrigation management infrastructure in An Giang Province

Upon more detailed investigation, An Giang reports relatively high levels of compliance of reduced water usage despite the lack of resources to measure (and price) water usage by volume from individual users. It has been widely cited in the literature that without the ability to account for - and charge by - water volume, the adoption of water-saving agricultural

technologies will remain low. Given that the conditions in An Giang seem to contradict this, we intended to investigate the drivers that influence such practices to provide some insight into the potential for disseminating these technologies across other regions that may also currently lack the ability to measure individual water use by volume. Therefore, we organized meetings with stakeholders at multiple levels of government from provincial down to the commune level to get a detailed, albeit narrow, picture of the institutional environment for irrigation governance.

Provincial level

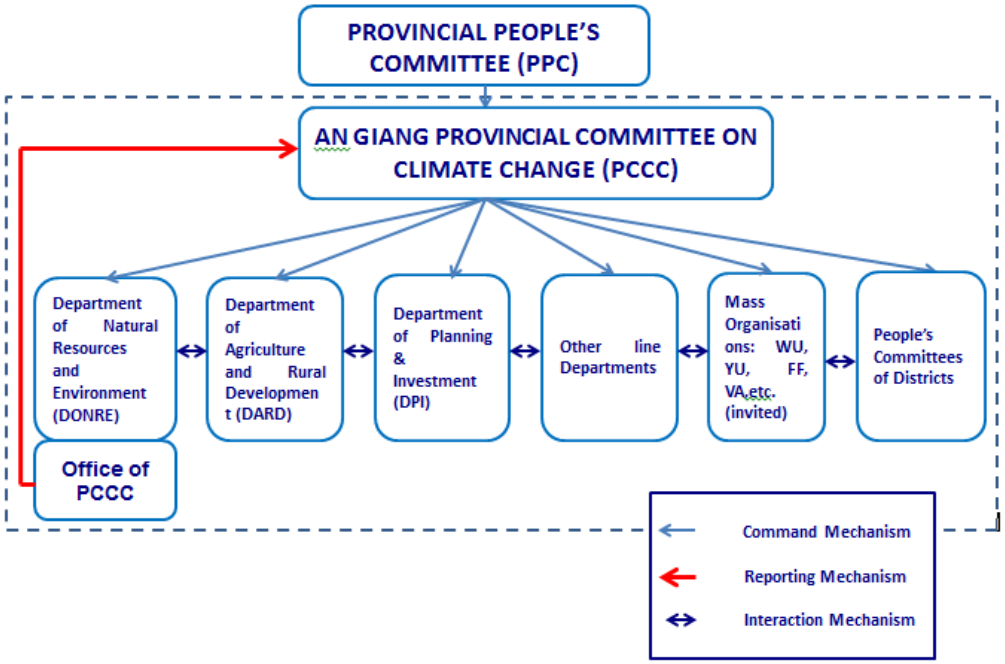


Figure 3. Main stakeholders responsible for climate change response and actions in An Giang province

All farmers in An Giang use surface water sources for irrigation. Surface water extraction, as opposed to groundwater extraction, may lend itself better to collective management (and also to over-exploitation) based on the ability to easily access the resource. Rice farmers in An Giang are relatively homogenous and well-coordinated and often plan farming activities with neighbouring farmers. Together, this coordination along with strong government intervention has led to changes in farming practices on a large scale over a relatively short time. For example, huge investments in irrigation infrastructure over the last two decades have resulted in moving from double rice cropping as the norm to triple rice cropping. The complex factors that lead to farmers' acceptance and adoption of new practices are only minimally understood

and are heavily context-dependent. In An Giang, extensive and in-depth research with key stakeholders has shown that some of the enabling factors for the uptake of AWD include: 1) farmer coordination; 2) training; 3) institutional structure of irrigation governance; 4) contract farming programs; and 5) financial benefits from individual extraction. The main barriers for the uptake of AWD have been identified by stakeholders as: 1) lack of knowledge by farmers and policy makers on AWD and GHG mitigation potential; 2) existing conflicts between water users and suppliers; and (3) current infrastructure is not appropriate to apply AWD.

Thus, the following solutions were proposed by stakeholders: improving irrigation infrastructure (pump and canal) to maximize water use efficiency; adjust the cropping calendar to ensure fields within a sub-region have the same farming schedule; and change the contract mode between farmers and irrigation service providers based on number of pumping times per year.

Besides irrigation management, there are still many other reasons that limit outscaling of AWD and other LETs. The problem-solution relations in LET implementation need to be described clearer under the local specific context with participation of local stakeholder. This paper presents a successive engagement study that focuses on low emission roadmap in rice production of An Giang province.

District and commune level

The irrigation structure across districts of An Giang are mainly characterized by irrigation service providers (including cooperatives, farmer groups, private companies), and some areas are dominated by individually-owned pumps. A strong argument explaining high adoption of water saving practices (WSP) despite the lack of volume control could be made for the high percentage of individual ownership of pumps given the direct financial benefit from reduced pumping.

Interviews conducted with the President of Farmer's Union and strategic members of the People's Committee at Commune Level in Binh Hoa Commune of Chao Thanh District, An Giang province demonstrate the scale of rice farming and method of irrigation (and drainage) used by farmers as outlined in Figure 4. Such in-depth analyses of irrigation management structure should continue to be conducted in the other districts to gain a comprehensive

understanding of the institutional structure for irrigation. This will in turn determine the appropriate scaling strategies for each district.

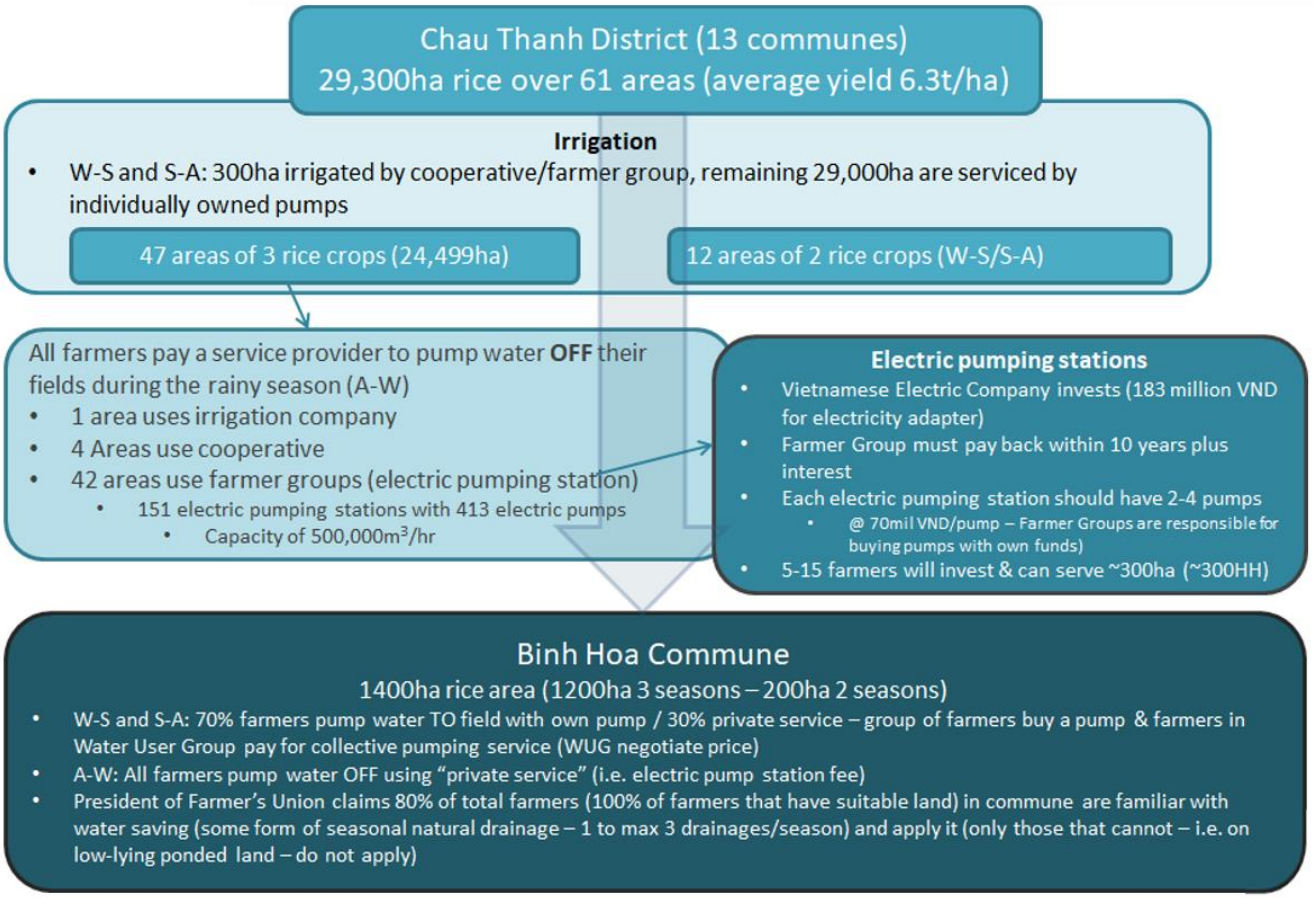


Figure 4. Stakeholder analysis at district and commune levels in An Giang province

Case study for roadmap development: An Giang

An Giang, an advanced rice production province in MRD (Figure 5) was selected as a case study. In An Giang, water saving technique such as mid-season drainage (MSD) has been widely adopted by rice farmers through various national and provincial programs. Under IRRI's projects, AWD practice was also introduced in An Giang. The practice has been tested and highly appreciated by local government as well as by rice farmers. During 2018, suitability maps for AWD practice have been developed for An Giang in order to identify scaling potentials of the practice. The maps are considered as scientific reference for low emission development strategy in rice production (Rice-LED) of the province.

In practice, there are still a number of challenges in large-scale implementation of AWD and other low emission practices in rice production. According to DARD of An Giang, physical condition and farmers' perception and gaps in current policies are the main factors that limit a wide adoption of the practices. However, the level of influence of those limitation factors varies from place to place due to difference in local specific conditions.

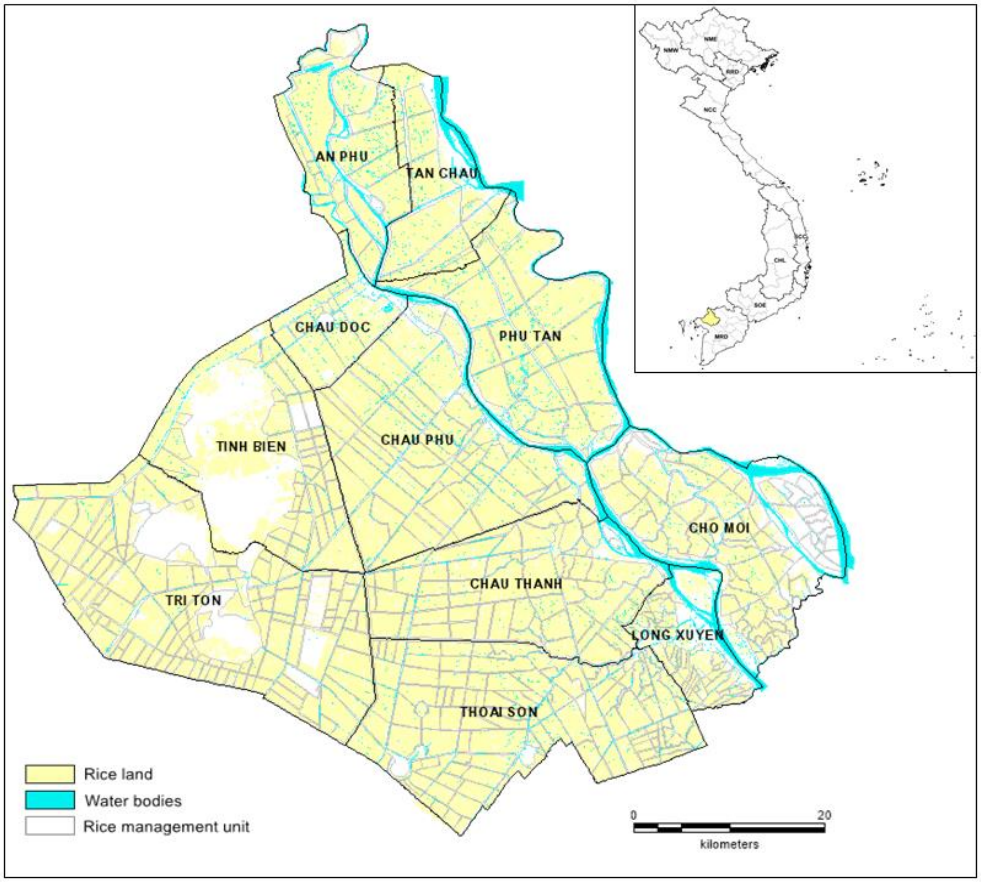


Figure 5. Location of An Giang province on the map of Vietnam

The stakeholder analysis done by IRRI since 2015 (Figure 2) showed that the Department of Agriculture and Rural Department (DARD) is one of key agencies responsible for climate change actions. Therefore, we selected DARD as a strategic partner for scaling LETs in An Giang.

In order to create enabling environments for uptake of the low emission practices, IRRI has organized and consultation workshop in An Giang on 3 December 2019 with participation of local stakeholders including An Giang's DARD and agricultural officials from its eleven districts. Main objectives of this workshop are to: 1) review the current adoption of low emission technologies in rice production of An Giang province; 2) identify barriers that obstruct large scale adoption of low emission technologies at district level; and 3) develop recommendations for scaling of the low emission technologies.

During the workshop, local specific problems and proposed solutions have been identified and analysed by stakeholders following the participatory approach. This paper summarizes process and highlights of the consultation workshop. Based on obtained results of the workshop, this paper also provides some recommendations for low emission development in MRD.

Consultation workshop setup

The consultation workshop titled *Roadmap for scaling low mitigation practices in rice production* has been organized on 3-4 December 2019 in An Giang. There were 35 participants from An Giang DARD, agricultural officials of eleven districts, IRR, and the Institute for Agricultural Environment. In each district, at least two officials responsible for crop management and one official responsible for hydrological management were invited. List of participants was shown in Appendix 1.

The workshop focused on analysing the impact pathway of LET implementation in An Giang province. The two low emission practices, such as AWD and rice straw management, were selected for analysis. Because we aimed to capture problems, solutions and implementation plan taking local specifics into consideration, analyses were done by individual districts. For each district, a detailed paper map describing extent of rice areas, topographic features, irrigation infrastructure (road, canal, river, pumping station and dike system) and administrative information was pre-prepared. This map was used as a spatial reference for discussion sections.

The workshop was divided into three sections: 1) refining rice management unit, 2) analysing adoption and impact pathway of LETs, and 3) general discussion.

Section 1. Refining rice management unit

An Giang is located in the flood-prone region of MRD. Rice production in the province is frequently affected by seasonal floods. Annually, high flow of the Mekong River causes large scale flooding in the delta from August to November. Therefore, as the results of successive government responsive actions [1,2,3] during the period 1996-2010, a massive dike system was built to protect rice land. This system divided rice land of An Giang into 642 rice-land management unit (RMU). Fields in each RMU is surrounded by a flood protection dyke. Area of a RMU ranges from 15 to 3,400 ha, characterized by biophysical conditions (soil type and

[1] Decision 99/QD-TTg dated on 9 February 1996

[2] Decision 144/QD-TTg dated on 21 June 1999

[3] Decision 84/2006/QD-TTg dated on 19 April 2006

irrigation scheme). District officials reported that farming practices, such as planting calendar, irrigation, fertilization, and harvesting schedule, among others, in each RMU are generally similar, corresponding to homogenous conditions within the RMU. The RMU is currently used as the basic reporting unit of rice production progress by An Giang DARD. Thus, we also consider the RMU as the unit for LETs implementation plan.

Figure 6. Agricultural officials of Chau Doc city is matching RMUs

However, there is the fact that delineations of RMU defined by provincial and district management levels are mismatched, especially for large RMU. There is the case that a large RMU may cross several communes. This leads to duplicate counting of rice planted areas as well as LET adoption areas. This section aimed at getting common understanding and definition of RMU between provincial and district management levels. The finalized RMU will be then used in other sections for LET impact pathway analysis.

In this section, participants were divided into 11 groups, corresponding to 11 districts of the province. Each group consisted of three members from a district, of which, two responsible for crop management and one responsible for hydrological management. A district paper map with all detailed information gathered from DARD was provided to each group (Figure 6). They were asked to match locally-defined RMUs with RMUs on the map. RMUs can be refined or re-delineated by participants as long as the RMUs boundary and name are clear and easy for identification. Changes in the RMU maps were recorded by workshop moderators for further discussion.

Section 2. Analysing LET adoption and impact pathway

Section 2 focused on the analysis of scaling potential of WSP, such as AWD, MSD, and RSM. It should be noted that we did not use technical terminologies (i.e., AWD, MSD) during this consultation workshop because participants are working in management fields and more familiar with practical explanation of the practices. Therefore we used “single natural drainage in the middle of the season” for MSD and “multiple natural drainages during the season” for AWD.

The section includes three parts. The first part aims to capture an overview of current WSP’s adoption in each district. The second part focuses on exploring technical, infrastructure, financial, perception, and political constraints that limit WSP’s adoption. From the identified constraints, participants from each district provide suggestions for WSP scaling and future impact pathway in the third part.

In this section, participants also worked in groups. Division of groups was the same as in Section 1. A set of questions together with discussion guidance was provided to each group. Based on local knowledge, members of each group discussed on the given topics and provided their estimation, evaluation and recommendations.

Section 3. General discussion

The general discussion was for participants to describe further their feedback and exchange their analysis and recommendations with other districts.

Workshop outputs

Mapping rice land management units

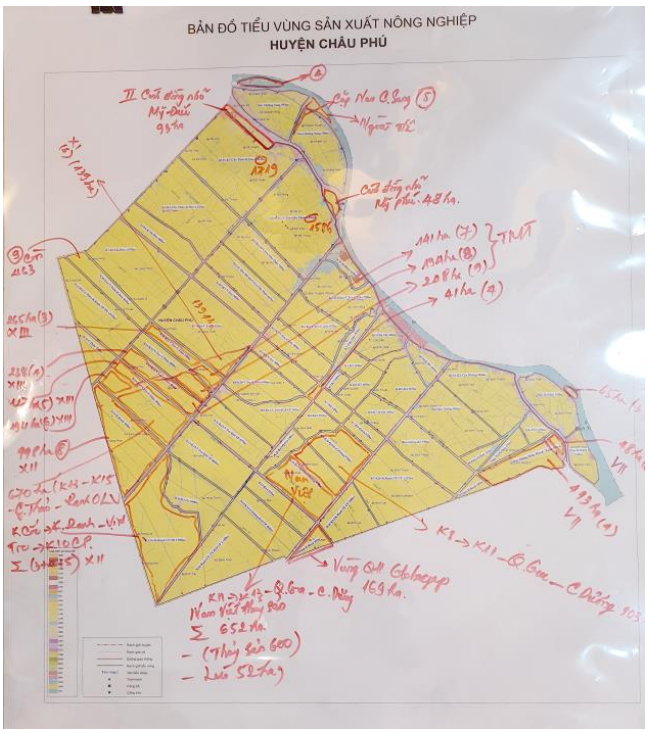


Figure 7. Rice land and RMUs of Chau Phu district

As the result of Section 1, RMU maps of 11 districts have been confirmed and matched by participants. Figure 7 shows the RMU map of An Phu district. Yellow regions on the map are rice lands, which were divided into 62 RMUs. Depending on topographic and irrigation conditions, the size of RMUs varies largely, ranging from 50 to 1,700 ha.

RMUs with blue boundary are originally matched with the list of An Giang DARD and RMUs with red boundary are newly updated. Changes in cropping systems in the districts such as shifting mono rice cropping to rice-based cropping or permanently converting rice land to other land use purposes were also updated on the map. Furthermore, the name, description, and area of each RMU were also corrected.

Although the RMU map is currently used for monitoring and reporting rice production progress, it shows a high potential in planning LET implementation and rice monitoring, reporting, and verification system. In this consultation workshop, the updated RMU map was used as a visual reference for LET adoption analysis in the next sections.

Water saving practices

Current adoption of water saving practices

Inventory data of An Giang DARD in 2017 showed that WSP, including MSD and AWD, were implemented on above 50% of total planted areas. There was not much difference in adoption rate between winter-spring (WS), summer-autumn (SA), and autumn-winter (AW) seasons. The adoption rate in AW season (56.3%) was slightly lower than in WS season (57.4%) and in SA season (59.6%). However, the data reported by An Giang DARD is not detailed enough to know the separate adoption rates of MSD and AWD. It is also not clear how WSP is defined. In An Giang, draining water off in the mid-season (after maximum tillering and before panicle formation) is technically encouraged in rice farming to limit the number of ineffective tillers and encourage development of the root system. This practice is popularly applied during the low rainfall period in WS and SA seasons but rarely done in AW season due to inundation conditions caused by high rainfall and river flow level. Draining water off in AW season is rather to protect rice crops from floods than saving water. However, it seems that local officials counted all draining events to estimated adoption rate of WSP. The adoption rate of WSP needs to be further substantiated and, in addition, separate estimations of MSD and AWD also need to be done properly.

Challenges in field implementation

The results of AWD suitability analysis identified a large area of high AWD suitability in WS and SA seasons, and medium and not suitability in AW season. Participants of the workshop evaluated that the current adoption rate of AWD is much lower than the identified potential presented on the suitability maps. Table 1 summarizes challenges in implementation of water saving practice reported by participants.

Biophysical conditions

Unsuitable biophysical condition seems to be the biggest challenge as it was mentioned by eight out of the 11 districts in An Giang. The change in adoption rates of WSP over cropping seasons is closely related to temporal rainfall distribution in a year. Whereby, no or low rainfall in WS and SA seasons, create physical conditions for naturally draining off the water in the rice fields. High rainfall together with the high water level of Mekong River in AW

season often causes flooding, which limits implementation of WSPs and leads to a large scale application of continuous flooding (CF).

Aside from seasonal rainfall, unequal field elevation was also reported by participants. Within a RMU, the elevation difference of rice fields ranges from 5 to 20 cm. Therefore, time for draining water off and length of drying period may be different from field to field. Participants of Chau Doc and Phu Tan districts shared that there are several small sunken areas that cause submergence conditions all year round. These areas may not be shown on the map but they actually mixed up with high AWD suitable regions.

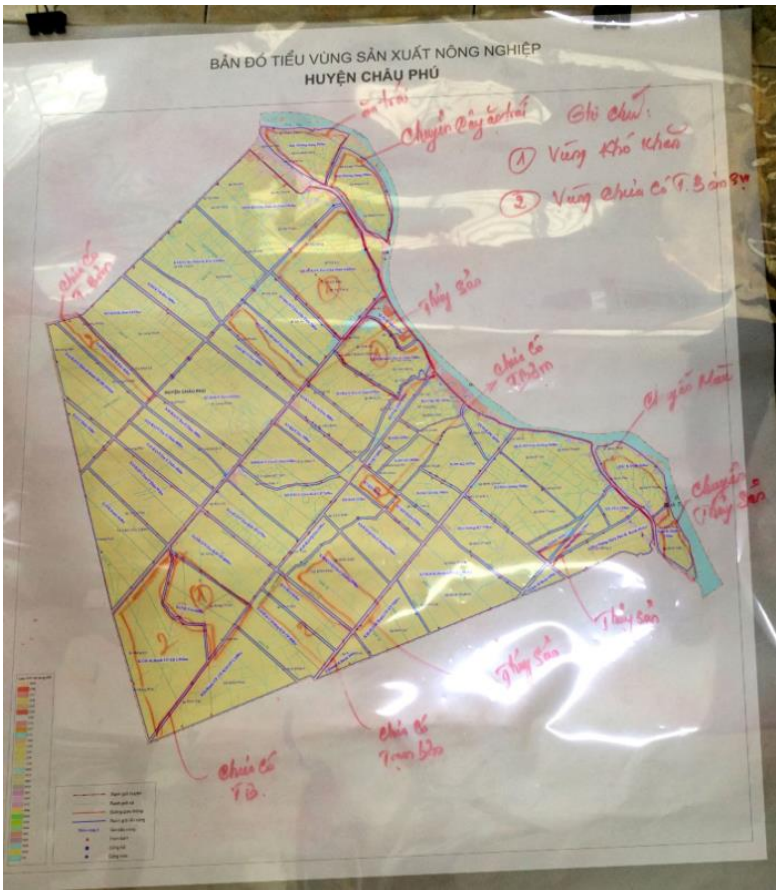


Figure 8. Mapping constraints in AWD implementation in Chau Phu district

Infrastructure

Uncompleted infrastructure was mentioned by more than 50% of participants as a major constraint, particularly the lack of in-field canals. Accordingly, fields that are far from irrigation sources (canal level 1 and 2) often have limited access to water and cannot get irrigation water on time. For these fields, increasing the number of drainage when implementing AWD also increases risk of water stress for rice. In several districts, although

in-field canals exist, they do not fully function due to the deposition of sediments for several years. These canals need special care for deepening and widening in order to scale out WSP. Participants from Tinh Bien district added that the lack of pumping machines is also associated with constraints for AWD adoption. There are several RMUs located in elevated parts of the district that do not have irrigation water in time for planting. Single rice cropping in these RMUs currently depends very much on rain water, which is only available in the rainy season. Having reservoirs and canals equipped with pumps will help these RMU to have more rice seasons and ease in AWD implementation.

Constraints on biophysical and infrastructure associated with RMUs were mapped by participants using the RMU map verified in Section 1. Figure 8 shows an example of constraints mapped by Chau Phu's participants. Regions with red borders are RMUs that currently have constraints, which are associated with biophysical condition (marked as 1) and infrastructure (marked as 2).

Technique and perception

Although participants reported that most farmers in An Giang have attended several trainings and well perceived WSP, it seems that technical and perception-related issues were still remarkable challenges as they were reported by seven out of the 11 districts. As mentioned by participants from Thoai Son, Chau Phu, Tinh Bien, Chau Thanh, Chau Doc, and Phu Tan, although WSP was widely introduced to farmers through various innovative farming packages (e.g., 1 Must Do, 5 Reductions [1M5R], VnSAT), single drainage in the mid-season was mainly recommended and the benefits of multiple drainages were not well introduced in the technical guidance. Furthermore, technical documents mainly focused on saving irrigation water but not on mitigating GHG emission.

Another issue mentioned by several districts (Tri Ton, Chau Doc, and Chau Phu) was the irrigation management scheme. Accordingly, irrigation schedules are managed by irrigation groups or cooperatives - the farming organizations that are common in An Giang. Each group/cooperative includes several rice farmers who have adjacent fields in the same RMU. Every member of the group/cooperative has to follow a fixed irrigation schedule and changes in time for frequency of irrigation need to be agreed by all members. Thus, implementation of new practice like AWD needs to be decided by all members rather than by individual

household. For AWD scaling, this suggests a new mobilization approach that strongly targets irrigation management organizations.

In case of Chau Doc, conventional CF practice that still maintains good harvest was preferred by many rice farmers. They are afraid that introduced WSP may lead to yield reduction, lower rice quality, or damages caused by rats. This implies that more demonstration of AWD practice needs to be conducted to enhance the perception of rice farmers.

Table 1. Challenges in the implementation of water saving practices reported by participants

District	Biophysical condition	Infrastructure	Technique/Perception	Policy
Cho Moi	x	x		x
Thoai Son			x	x
An Phu	x	x		
Chau Phu	x	x	x	x
Tri Ton	x		x	
Tan Chau	x	x		x
Tinh Bien		x	x	
Chau Thanh		x	x	x
Chau Doc	x		x	x
Phu Tan	x		x	
Long Xuyen	x			

Policy

Many issues related to local policy for AWD implementation and scaling were mentioned and discussed by participants in the consultation workshop. First of all, An Giang province and its districts do not have incentive mechanisms to encourage AWD adopted farmers. Many farmers are currently applying MSD following 1M5R package. They often pay irrigation fees to service providers or cooperatives to have timely irrigation water during the season. More draining time in AWD implementation means more operation and service cost that farmers need to pay. Thus, under the current irrigation management, production input for AWD is indeed higher than for MSD. Although multiple benefits of AWD have been proved in many researches, the evidence likely was not well demonstrated to farmers in An Giang. Therefore, this creates a large gap between AWD recommendation and implementation. As recommended by participants, an appropriate incentive policy needs to be developed to first promote AWD practice and then duplicate the success cases at a large scale.

On one hand, financial supports for improving irrigation infrastructure, such as deepening and widening canals, enhancing access to irrigation water, and strengthening propaganda and communication should be considered by the local government. On the other hand, developing policies that promote low emission rice products is obviously required. As being suggested by participants from Chau Thanh district, the incentive policy can influence AWD adoption through market price. Because rice production in An Giang is commercial oriented, certified and labeled low emission rice products with higher market price than others will potentially promote AWD adoption.

Scaling potential and required actions

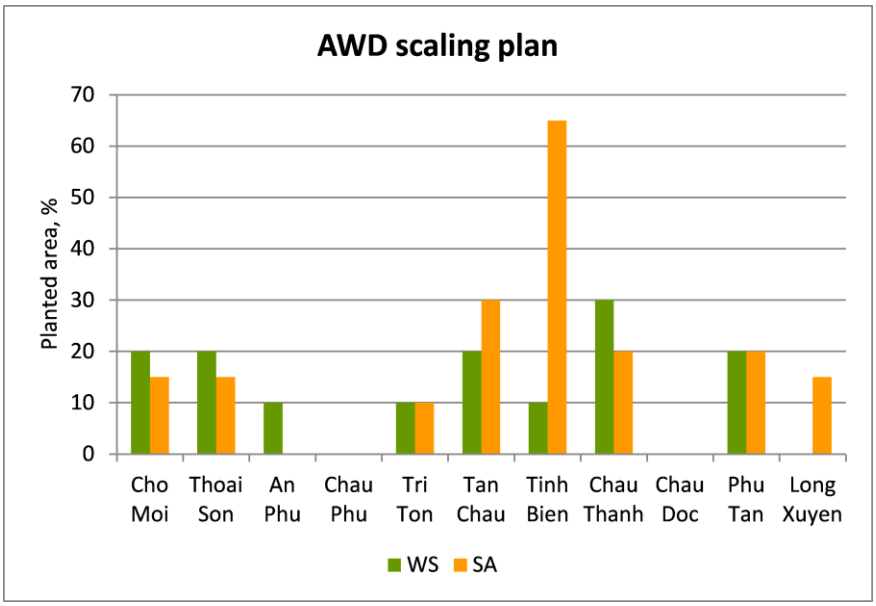


Figure 9. AWD scaling plan (% of planted area per season) by district in the WS and SA seasons

The implementation plan for AWD scaling by district was discussed by participants in Section 3. Figure 9shows AWD scaling plans by district for the period 2020-2025 in WS and SA seasons. Currently, all areas of planned AWD are under MSD practice. In the next five years, most districts expected to gradually replace MSD with AWD in all cropping seasons. Eight districts planned to expand AWD practice by at least 10% of the total planned area, and correspondingly, MSD will be reduced by at least 10% in WS season. The increase of AWD rate in SA season will be higher than in WS season, especially in Tinh Bien and Tan Chau districts with the expected increase is 65% and 30%, respectively. There will be no improvement in CF rate for both seasons as the given bio-physical constraints (e.g. elevation and soil type).

To be able to reach the AWD scaling targets, participants proposed various solutions and required actions. The district specific plan for AWD scaling by district is summarized in Table 2 below.

Table 2. District specific plan for future AWD scaling in the period 2020-2025

District	Proposed action
Cho Moi	- Mobilize farmers by strengthening communication channels - Invest in leveling machine - Deepen in-field canals - Invest more pumping station for cooperatives
Thoai Son	- Improve the perception of farmers through trainings on AWD and GHG mitigation - Build sluice gates and invest in pumps for low elevation RMU - Establish irrigation management groups/regions. Prioritize scaling AWD in RMUs that have relatively equal elevation. - More budget for demonstration
An Phu	- Improve irrigation/drainage infrastructure (i.e., in-field canal, pumping station) - Conduct trainings on AWD instead of general WSP
Tri Ton	- Deepen in-field canals - Establish demonstration fields on AWD
Tan Chau	- Split RMU into smaller units to better manage irrigation - Invest in pumps and draining canals for sunken areas - Policies to support AWD adoption in regions that are affected by water from residential areas
Tinh Bien	- Apply field leveling - Invest in in-field canals for irrigation and drainage - conduct trainings for AWD promotion
Chau Thanh	- Expand AWD adopted area gradually - Focus on policy and structural measures
Phu Tan	- Deepen in-field canals - Strengthen the capacity of irrigation management groups and cooperatives

Rice straw management

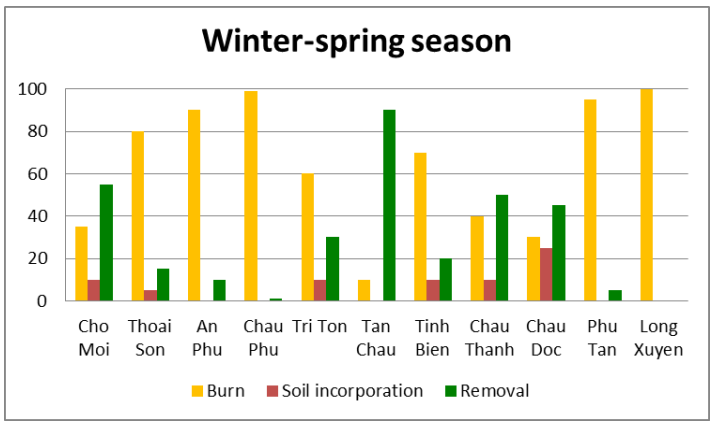
Current adoption of sustainable straw management practices

Three straw management measures that are popularly applied in An Giang, including burning, incorporation in soil, and removal, were selected for discussion in this workshop. For each measure, the percentage of total households that are practicing was estimated by participants, based on their knowledge. Figure 10 shows estimation of three measures by district and by cropping season.

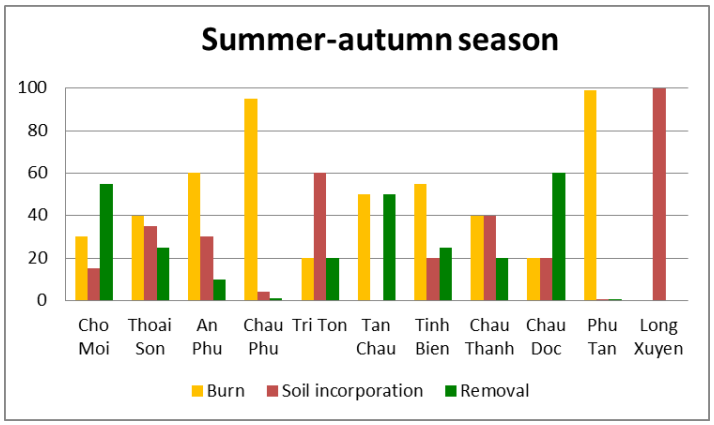
Overall, burning rice straw is still very popular in all districts of An Giang. Percentage of households that burn rice straw after harvest is often highest in WS, lower in SA, and lowest in AW season. In some districts like Chau Phu, Phu Tan, and Long Xuyen, almost 100% of straw was burnt in two first seasons of the year. According to participants, farmers prefer burning straw to other measures because it allows them to quickly clean the field, eliminate remaining pests and diseases, and also return minerals from biomass to the soil. The reduction of straw burning percentage over the year is mainly influenced by the increase of rain frequency and intensity, which leads to increase of straw moisture and thus, prevent farmers from burning straw. In order to clean the field for the next rice season, farmers have to apply another measure, particularly incorporate straw in the soil.

Indeed, the percentage of soil incorporation is low in WS but increasingly higher in SA and AW season. Specially, 100% of households in Long Xuyen incorporate straw in the soil after the WS season. Application of this measure is also high in Tri Ton, An Phu, and Chau Phu. Participants further added that the share of percentage of straw burning and soil incorporation vary from season to season and from year to year. Farmers' decision on which of the two measures should be applied depends on the dry/wet condition of the field, which relates to field elevation and also raining time and intensity.

(a)



(b)



(c)

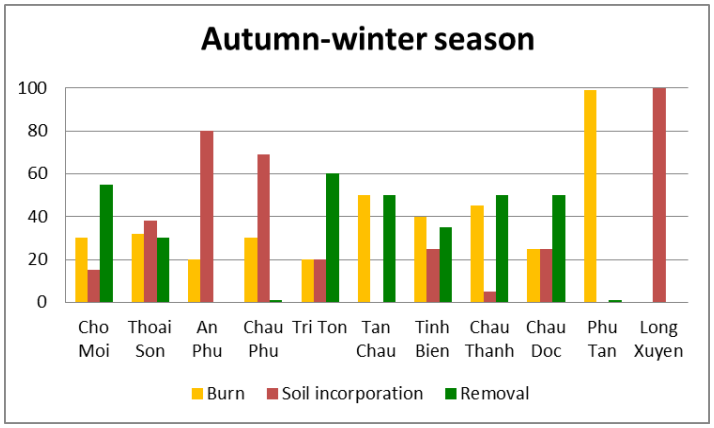


Figure 10. Current adoption rate (%) by district of straw management practices in (a) WS, (b) SA and (c) AW seasons.

Percentage of straw removal in provinces is strongly driven by the straw market. In districts that have good transportation conditions and near straw consumers (e.g. Cho Moi, Tan Chau, Chau Thanh and Chau Doc), rice straw can be collected by middlemen and removed out of the districts by tractor. Therefore, the percentage of straw removal is not equal among districts. Regarding the straw market, straw can be sold to mushroom producer in big cities or flower production regions (e.g., Sa Dec in Dong Thap province, Phuoc Dinh in Vinh Long province, Thoi Nhut in Can Tho city, and Vi Thanh in Hau Giang province), especially after the AW season, when the lunar new year is close and there is a high demand of rice straw for substrate of flower plantation.

Challenges in field implementation

Biophysical conditions

The main reason why a high percentage of farmers in An Giang still decide to burn rice straw instead of incorporation in the soil or use it in more proper ways is the extremely intensive

rice production of the province. With triple rice cropping in a year, the duration between two successive rice seasons is very short, ranging from 7-15 days. Straw burning appears to be the easiest measure to clean the field after harvest for land preparation. Participants from Thoai Son, An Phu and Phu Tan mentioned that high rainfall at the end of SA and AW seasons leads to difficulty in collecting rice straw from the field. For the case of Long Xuyen, field size is generally small that is not suitable for straw baller to operate. Therefore, farmers often burn straw in the dry season or incorporate it in the soil during wet seasons.

Infrastructure

There are two constraints associated with infrastructure that limit straw removal. The first is unavailability or low quality of transportation network that does not allow tractors to access and transport straw out of the field. The second constraint is that the number of straw ballers in the region is not enough to collect straw during a short time period between rice seasons.

Technique and perception

Participants shared that there are several constraints related to availability of straw management techniques and perception of rice farmers. For instance, farmers believe that the burning measure helps to eliminate weeds, remaining pests, and diseases on crop residue. Burning could also avoid generation of soil toxins which often take form during anaerobic decomposition of crop residues. Straw burning has been applied by farmers as a traditional practice for hundreds of years and not easy to be replaced.

Under a number of extension programs, farmers are recommended to return nutrients to the soil by incorporating rice straw after harvest. This measure has been widely adopted by farmers not only in An Giang but also in many other rice production regions of Vietnam. Nowadays, this measure can be considered as a traditional practice.

GHG emission from decomposition of organic materials in the rice field is a new story, not only for farmers but also for most agricultural officials. They do not have or have received only limited knowledge of GHG mitigation measures. In addition, the GHG mitigation component is not properly included in training or technical guidance of recommended farming practices. Furthermore, evidence of the benefits of LET is not clear enough and thus, not really attractive to farmers. This issue was reported by participants in six out of the 11 districts.

Straw removal nowadays has become more and more common in An Giang. It exists in several districts and in all three rice seasons. The rate of straw removal varies largely among districts. As noted by the participants, straw removal is strongly driven by consumers from outside of the province and not really relates to farmer perception.

Policy

Average farm size in An Giang is relatively large, around 1 ha per household. Large farms together with short season break make manual straw collection practically impossible, and thus obviously requires mechanization. However, lack of straw baler is one of the challenges mentioned by participants. Price of baller is relatively high, ranging from USD 6,000 to 15,000, and often invested by the private sector. There is no subsidy policy or mechanism that encourages farmers to invest in straw baler. Moreover, there is only a very small market of rice straw in An Giang. Most consumers are from surrounding provinces such as Dong Thap and Can Tho. In order to promote straw removal in An Giang, straw processing centres (e.g., centres for producing mushroom, organic fertilizer, fuels) need to be established in the province.

In addition, it needs to be mentioned that selling organic fertilizers produced from straw requires complicated procedures with a number of paper works because current fertilizer management policy does not allow producers to sell organic fertilizers to the market without formal verification and certification. Therefore, straw is mainly used as the input of mushroom production and flower plantation.

Scaling potential and required actions

Figure 11 presents scaling potential of straw removal (green bar) and soil incorporation by district in the next five years, from 2020 to 2025. As evaluated by the participants, there will be no significant changes in the adoption rate of straw management practices. In districts including An Phu, Chau Phu, Tri Ton, Chau Thanh, and Phu Tan, the rate of the practices in next five years will likely to be remained the same as at the present.

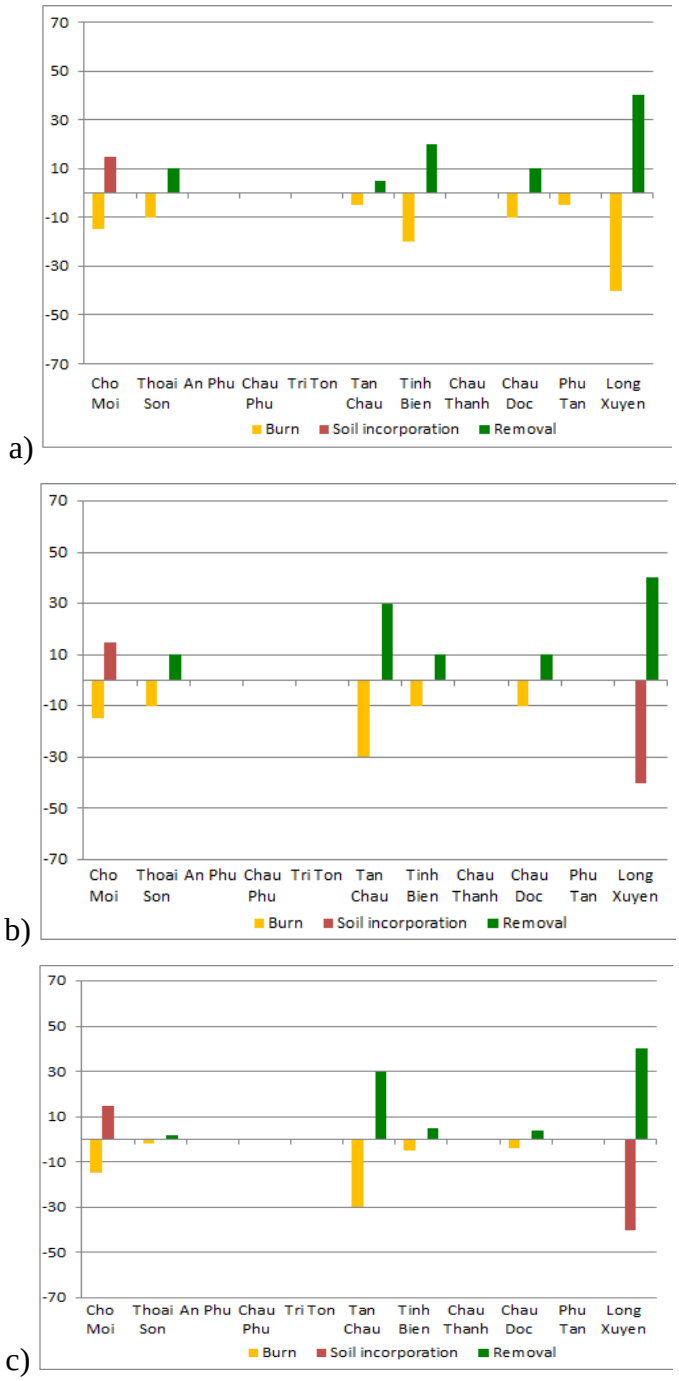


Figure 11. Scaling potential of straw management practices by district in (a) WS, (b) SA, and (c) AW for the period 2020-2025.

For Cho Moi district, straw burning can be reduced and replaced by soil incorporation in all seasons. There will be no increase in the removal rate. Required actions for the change could be promotion of in-field straw management, conducting more training, and strengthening communication channels for mobilization, while also proposing policy/mechanism that supports farmers in buying straw baller. In the case of Long Xuyen, the burning rate in WS

and soil incorporation in SA and AW seasons can reduce up to 40%. Straw burning is expected to be replaced with removal. This target can be reached by investing in straw ballers.

For other districts, straw burning rate can be reduced by 5 to 30% in the near future as a result of several collective actions. For Chau Phu, suggested collective action can be shifting low effective rice to dryland crop together with gaining farmers' perception and introducing straw processing techniques. For Tan Chau, the combination of improving in-field transportation, communication, training, and reducing planted rice area (from triple to double rice rotation) was proposed. Based on district specifics, Tinh Bien district looks at other set of actions including expanding domestic straw consumption (i.e., promote cow raising, mushroom production, and other processing that use straw as the input), strengthening communication and mobilization through public media, and supporting cooperatives to invest in straw baler.

Conclusion

Possible roadmaps for scaling of low emission practices in rice production have been discussed by participants from 11 districts of An Giang province. Current adoption, implementation constraints, and scaling potential for water saving (AWD and MSD) and straw management (straw removal and soil incorporation) practices were clearly identified with engagement of local officials taking district specifics into consideration. The adoption of WSP is rather high in An Giang compared to other MRD provinces. The practice is applied in all districts to some extent. However, separate adoption rates of MSD and AWD were not clearly reported.

Straw burning is still very popular in all districts of An Giang. In some districts, almost 100% of straw was burnt after harvest. The share of households that apply soil incorporation and straw removal is relatively low, and varies from district to district and season to season. While the rate of soil incorporation highly depends on dry/wet conditions of the field, which is related to field elevation and also to the amount and time of precipitation, the rate of straw removal is strongly driven by consumers from outside of the province and availability of transportation network.

The adoption rate of both targeted LET, namely water saving and straw management practices, can be increased in the near future with local efforts. Scaling potential of each practice was analysed by participants based on their knowledge. Planned improvement of LED can be obtained by implementing collective actions, consisting of improving existing infrastructure, enhancing perception of farmers and developing incentive policies for LET implementation. The sets of collective actions proposed by stakeholders are different among districts due to bio-physical and social-economic context of the districts.

The output of the consultation workshop provides insights of LET adoption and implementation potential in An Giang but also provides lessons learnt for LET scaling in other provinces in MRD. With engagement of local stakeholders, this workshop has built problem trees for the most concerned LET in the rice sector and highlighted the locally proposed solutions as a way to overcome current constraints and approach the last mile from LET research to field implementation

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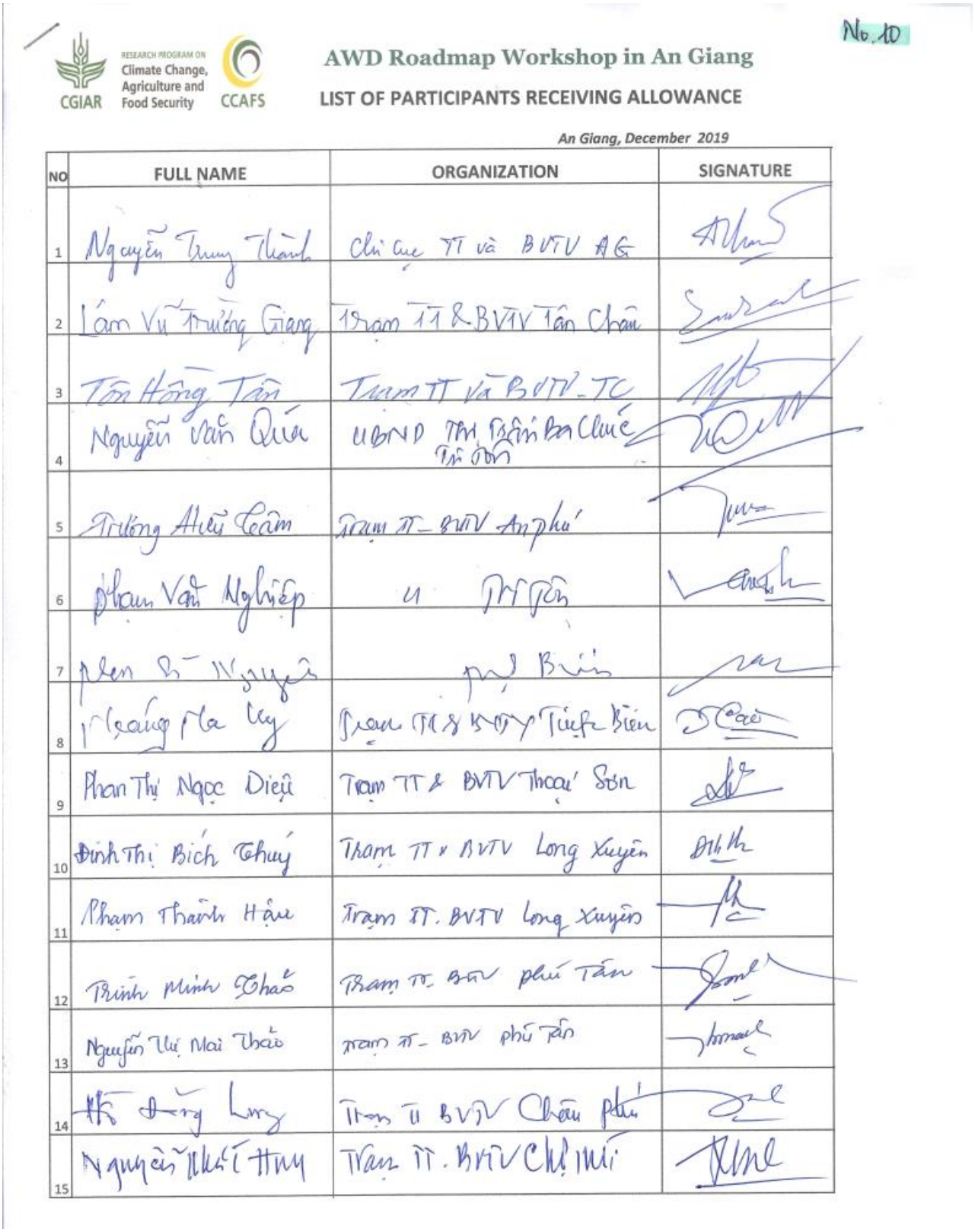
Appendices

Appendix 1. List of participants



No. 10

RESEARCH PROGRAM ON Climate Change, Agriculture and Food Security — CGIAR — CCAFS

AWD Roadmap Workshop in An Giang

LIST OF PARTICIPANTS RECEIVING ALLOWANCE

An Giang, December 2019

NO	FULL NAME	ORGANIZATION	SIGNATURE
1	Nguyễn Trung Thành	Chi cục TT và BVTV AG	
2	Lâm Vũ Trường Giang	Trạm TT & BVTV Tân Châu	
3	Tôn Hồng Tân	Trạm TT và BVTV TC	
4	Nguyễn Văn Quí	UBND TH Phân Ban Chuẩ Tri Tôn	
5	Trương Hiếu Liêm	Trạm TT- BVTV An phú	
6	Phạm Văn Nghiệp	" TP Châu	
7	Phan Bí Nguyên	phó Biên	
8	Phạm Hà Lợi	Trạm TT & BVTV Tịnh Biên	
9	Phan Thị Ngọc Diệu	Trạm TT & BVTV Thoại Sơn	
10	Đinh Thị Bích Thuý	Trạm TT & BVTV Long Xuyên	
11	Phạm Thanh Hậu	Trạm TT. BVTV Long Xuyên	
12	Trịnh Minh Thảo	Trạm TT. BVTV phú Tân	
13	Nguyễn Thị Mai Thảo	Trạm TT- BVTV phú Tân	
14	Hồ Đăng Lưu	Trạm TT BVTV Châu phú	
15	Nguyễn Thái Thuy	Trạm TT. BVTV Chợ Mới	

No.10

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CGIAR CCAFS

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An Giang, December 2019

NO	FULL NAME	ORGANIZATION	SIGNATURE
1	Đỗ Thị Bích Huệ	Trạm TT và BVTV Châu Phú	
2	Trần Quốc Giúp	Trạm TT và BVTV C.Đốc	
3	Huỳnh Ngọc Điệp	Trạm Thủy Lợi QL C.Đốc	
4	Nguyễn Thanh Long	Trạm Thủy lợi liên huyện CP-CA	
5	Phạm Thị Diễm	Trạm TT & BVTV Châu Đốc	
6	Nguyễn Thanh Tú	Trạm TT & BVTV Chợ Mới	
7	Phan Hoàng Minh	Trạm TT và BVTV Thoại Sơn	
8	Vương Mạnh Tiến	Chi cục Thủy lợi	
9	Phạm Huỳnh Duy	Trạm Thủy lợi T. Sóc	
10	TÔ Thanh Sơn	Trạm Thủy Lợi Tri Tôn - T. Biên	
11	Nguyễn Thành Tấn	Trạm TT và BVTV Châu Thành	
12	Nguyễn Hoàng Giang	Trạm TT và BVTV Châu Thành	
13			
14			
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Appendix 2. Workshop photos

Ms. Nguyen Thi Le, the deputy head of the Crop Production Office of An Giang province, is giving opening remarks for the workshop. Photo by: Bui Tan Yen/IRRI

Workshop participants form provincial DARD and district offices. Photo by: Bui Tan Yen/IRRI

Group discussion during the workshop. Photo by: Bui Tan Yen/IRRI

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