

Vehicles for scaling out mitigation options in rice production in Vietnam: Cooperative and contract farming systems for water management

Working Paper No.283

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

Tran Dai Nghia
Le Huy Huan



RESEARCH PROGRAM ON
**Climate Change,
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Abstract

Greenhouse gas emissions from rice production have been identified as a key mitigation focus for Vietnam to meet its Nationally Determined Contributions committed to the Paris Agreement. Shifting to a production landscape that adopts Alternate Wetting and Drying (AWD), which refer to the practice wherein fields are intermittently drained and allowed to dry before being flooded again, can reduce emissions from rice production by 50%. This practice was selected by stakeholders as a priority for scaling out. The study presented here analyzed the process of government coordination and the roles of farmer cooperative groups and private industry pertaining to contract farming as a vehicle for out-scaling AWD. Government officials at the national and provincial level, as well as representatives from private industry and farmer cooperatives, were interviewed to identify enabling factors and limitations to coordination. To further assess the scaling potential of AWD, this study determined the barriers to scaling out as perceived by different actors in the rice value chain and provided recommendations as ways forward. The end goal of this study was to collaborate with the government of Vietnam to combine its findings with data collected from parallel studies in co-designing an implementation framework. The framework, in turn, would guide Vietnam's rice-related mitigation strategy to meet the 2030 emission reductions that the country pledged to the Paris Agreement.

Keywords: *agricultural mitigation strategies; rice production; contract farming; farmer cooperatives; Small Farmers, Large Fields program; greenhouse gas emissions.*

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Acronyms and Abbreviations

1M5R	“1 Must, 5 Reductions”
3R3G	“3 Reductions, 3 Gains”
AFIEX	An Giang Agriculture and Food Import and Export Joint Stock Co. Ltd
AWD	Alternate wetting and drying
CCA	Climate change adaptation
DARD	Department of Agriculture and Rural Development
DFP	Deep fertilizer placement
FCG	Farmer cooperative group
FF	Farmers’ Friend
GHG	Greenhouse gas
GSO	General Statistics Office
IPM	Integrated Pest Management
MARD	Ministry of Agriculture and Rural Development
MONRE	Ministry of Natural Resources and Environment
MRD	Mekong River Delta
MRV	Monitoring, reporting, verification
SDV	Short duration varieties
SFLF	“Small farmer, Large Field”
SNV	Netherlands Development Organization
SSM	Sustainable straw management
SRI	Sustainable Rice Intensification
SRP	Sustainable Rice Platform

Introduction

Agriculture plays a crucial role to achieve a sustainable socioeconomic development in Vietnam. In 2018 alone, the sector accounted for 14.57% of Vietnam's Gross Domestic Product and 8.3% of its total export value (General Statistics Office [GSO], 2019). These records show that agriculture contributes to the country's national food security,

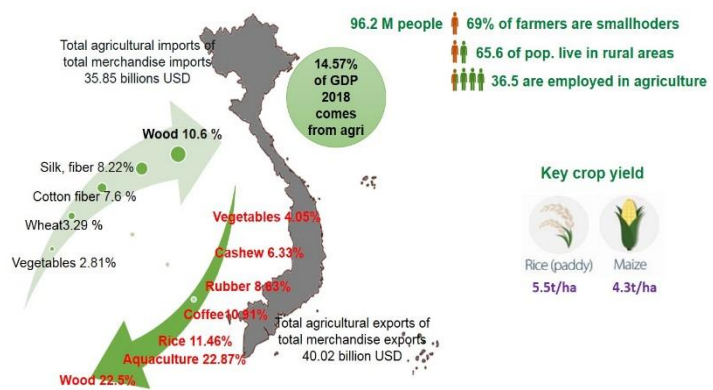


Figure 1. Status of agricultural sector in Vietnam. Source: T.D. Nghia, 2019

livelihood incomes, and poverty alleviation (Figure 1). Vietnam's agricultural growth has relied heavily on human resources, natural resources, and chemical inputs. Consequently, the overreliance on such resources led to environmental degradation exacerbated by climate change. The application of Climate Change Adaptation (CCA) measures was thought to improve the adaptive capacity of production systems and reduce their greenhouse gas (GHG) emissions, helping the country achieve its mitigation targets.

The Climate Change Vulnerability Index reported that Vietnam ranked 5th in the world in terms of their vulnerability to extreme weather events in 2016 (Eckstein, et al., 2018). The country's ranking is consistent with the records, showing that it has always been in the top ten countries most at risk from climate change impacts. In 2016, the total damage from natural disasters amounted to 39 trillion VND (1.7 billion USD) and led to 800,000-ton worth of losses in rice production (Ministry of Agriculture and Rural Development [MARD] 2017). The estimated damages in 2017 cost 60 trillion VND or about \$US2.7 billion (MARD 2018).

After ratifying the Paris Agreement on climate change, the Government of Vietnam developed an action plan for implementing the Paris Agreement with 68 priority tasks categorized in five groups: (i) Mitigation (16 tasks); (ii) Adaptation (22 tasks); (iii) Resources preparation (13 tasks); (iv) Establishment of transparency system (Monitoring, reporting, verification [MRV] with 11 tasks); and (v) Institutional and policy development (6 tasks).

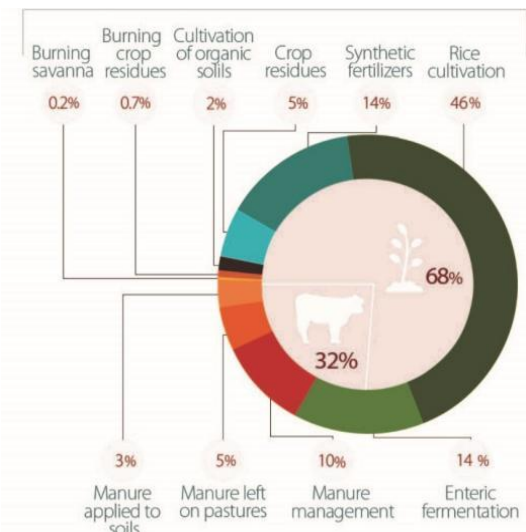


Figure 2. Emission from agriculture sector. Source: Ministry of Natural Resources and Environment (MONRE), 2017

The agriculture sector accounts for 34% of total GHG emissions in Vietnam. Among agriculture's sub-sectors, rice cultivation contributes 46% of GHG emissions (MONRE, 2017). Due to these findings, efforts were raised to reduce Vietnam's GHG emissions from rice production. The country's GHG reduction target for their Nationally Determined Contributions is 8% with domestic support, which increases to 25% with international assistance.

Creating an enabling environment for climate action in agriculture is a priority in Vietnam. However, there is a lack of synergy across tasks to meet the targets, and there are conflicts between the long-term interests of CCA and mitigation and the immediate benefits of agricultural growth.

These are the key challenges to facilitate concrete plans and strategies for scaling-out different adaptation and mitigation options in Vietnam.

Multiple climate-smart practices were already considered in rice production to reduce GHG emissions, either as a direct target or as a co-benefit. These include alternative wetting and drying (AWD), deep fertilizer placement (DFP), short duration varieties (SDV), sustainable straw management (SSM), and other integrated crop management packages (Sustainable Rice Platform [SRP], “One Must Do Five Reductions” [1M5R], “Three Reductions, Three Gains” [3R3G], System of Rice Intensification [SRI], and Integrated Pest Management [IPM]). After a substantial feasibility and suitability research was conducted, AWD was identified as the most promising technology to promote for its substantial GHG reduction potential, ease of implementation, multiple community-wide co-benefits, and cost-effectiveness, both at the individual farmer-level and at a broad scale.

This study analyzed the potential to enhance the farmers’ capacity to practice GHG mitigation strategies through discussions with farmer organizations, a private industry providing farmer contracts, and systems of farmer cooperatives. This was conducted alongside a study of different rice value chain stakeholders that examined the factors affecting farmers’ choices when selecting mitigation options.

Objective of the study

This study aimed to analyze government coordination and the roles of farmer cooperative groups and private industry in relation to the contract farming system. In turn, the study aimed to better understand the disseminating vehicles to out-scale government-supported mitigation options with a focus on AWD.

Methodological approach

Literature reviews, interviews, and focus group discussions were conducted for this study. In the literature reviews, even white papers and policy reports were covered. Interviews involved government officials at the national and provincial levels while the focus group discussions included farmers who belong in cooperatives and private industry partners that provide contracts. These contracts and systems of coordination were evaluated as a basis to structure a proposed out-scaling framework for mitigation options in rice production using AWD as an example.

The following procedures were accomplished during data collection for this study:

- Secondary data collected, reviewed, and synthesized from available published and unpublished literature sources and related documents such as reports, white papers, policy briefs, working papers, and journal articles;
- Primary data collected during one-on-one interviews and group discussions with:
 - officials from the Department of Agriculture and Rural Development (DARD);
 - stakeholders in the rice value chain on their opinions about the roles, as well as advantages and disadvantages, of cooperatives;
 - farmers’ representative organizations e.g., farmer cooperative groups (FCGs) in facilitating the out-scaling of AWD in rice production;
 - private industry (Loc Troi, AFIEX, Hung Cuc), farmer cooperative groups, and farmers in the contract farming system currently applied in Red River Delta (Thai Binh Province) and Mekong River Delta (MRD) (An Giang Province)

The insights collected from the interviews and discussions were descriptively analyzed to compare the advantages, disadvantages, and support needed to out-scale GHG mitigation options in rice production through coordinated farming contracts, including the “Small farmers, Large field” (SFLF) Program and private contracts with rice exporters.

Findings and discussion

Enabling factors for AWD out-scaling

According to the Plant Protection Department¹ of MARD and the Netherlands Development Organization² (SNV), the enabling factors for AWD to be successfully scaled out include:

- i) The **uniformity of the seed** sown and rice seedlings at transplanting time, as well as the **purity of varieties** sown;
- ii) The **cooperation of irrigation management companies**, particularly communal service providing cooperatives during irrigating and draining time on rice fields as technically required or guided;
- iii) The formation of “large scale” fields by coordinating with smallholder farmers through farmer cooperative groups and private contracts (**“Small farmers, Large field”** programs);
- iv) The flatness or **levelling of rice fields** in conjunction with the **improvement of irrigation and drainage canals**; and
- v) **Technical know-how** and **awareness** of stakeholders on the benefits of applying AWD, particularly farmers and irrigation company workers.

Most rice farmers in Vietnam are smallholders whose lands are quite fragmented. Vietnam’s roughly 14.5 million farmers manage approximately 70 million land fragments, which is equivalent to about 4.8 plots per farmer (T. G. Huyen, 2009). This fragmentation is more prominent in the North than the South and undercuts the ability to achieve economies of scale.

The concept of economies of scale means that the average cost per unit of production decreases as the size of the farm increases. This can occur because higher production is spread across the same level of fixed expenses, or when a farm is able to obtain high volume of inputs such as seed or fertilizer. This scale enables productive resources to be used efficiently and reduces the costs of production and marketing. Economies of scale is hard to achieve, though, since farmers are working independently on scattered plots, which keeps them from coordinating their efforts with their fellow farmers. Their situation is aggravated by labor scarcity especially during activities that require high labor inputs. Rice transplanting is particularly a labor-intensive activity. Still, planting is an important activity because it dictates the timing for the rest of the season, during which most activities sync with the growth stage of rice.

Improved water management, especially AWD, is highly dependent on being able to control when the crop should be irrigated, which often cannot be managed individually. Coordination is then required to manage aggregated plots. Once farmers are coordinated, services can be provided on a larger scale, decreasing costs and increasing profitability. This coordination is known as contract farming.

¹ Mr. Ngo Tien Dung, Vice Director General of the Plant Protection Department of MARD, 2014. Report on SRI.

² SNV, 2016. ‘Sowing the Seeds of Change’ project in Quang Binh and Binh Dinh provinces.

In relation to such coordination, Vietnam promoted its SFLF Program, which, as of 2015, already covered 196,000 hectares (ha) in the MRD. Major companies and farmer cooperatives have shown growing interest in advancing the Program and developing coordinated contracts. Based on an evaluation of the Program, interest in the SFLF led to an increase in technical support to farmers and their profits (Thang et al, 2017).

The findings showed that coordinated farming created a foundation to apply advanced cultivation methods and to strictly follow modern techniques such as 1M5Rs; 3R3G; AWD; SRI; and DFP. Except for DFP, all these techniques require intermittent draining for improved water management, which significantly cuts the emissions in rice production. The synchronized irrigation timing makes this possible and profitable.

The five pre-conditions for AWD can be achieved through coordinated farmer programs, whether they are through government supported programs or private contracts. When land can be aggregated in such a way, actors involved in the rice production value chain (e.g., service providers, input suppliers, rice farmers, traders, buyers, millers, exporters) are motivated to work together toward more efficient, sustainable, and market-oriented production.

Contract farming or cooperative mechanisms, which incentivize smallholders to merge their lands into “large scale” fields, facilitates ease of mechanization. One form of mechanization is land levelling, which improves AWD, input efficiency, and other mitigation options. In addition, application of agricultural technology such as seeders, rice planting machines, tractors, harvesters, and balers becomes possible on a wider scale for less cost. Consequently, rice production costs all along the value chain are reduced and profits are increased. Contract farming also leads to changes in smallholders' habits, which initially inhibited the adoption of CCAs or mitigation practices.

Modalities of contract farming

The contract farming mechanism has been existing for many years and is quite common in many parts of the world as a means of organizing the commercial agricultural production of both large-scale and small-scale farmers. This mechanism can be defined as a forward agreement between farmers and processing and/or marketing firms and product buyers for the production and supply of agricultural products (Food and Agriculture Organization of the United Nations, 2001)³. The models for AWD contract farming purely for commercial markets are scarce in Vietnam. This means that a contractual arrangement should depend on the depth and complexity of the provisions in each of the following three areas:

- **Market provision:** rice growers and buyers agree to a contract for the future sale/purchase prices and amounts based on well-defined terms for production conditions;
- **Resource provision:** beyond the marketing arrangements, buyers agree to provide selected inputs (e.g. seed, fertilizer), land preparation services, and technical advice (i.e., AWD included in the technical guides);
- **Management specifications:** the terms for production conditions that producers/buyers agree upon adherence to AWD, input regimes, and other cultivation and postharvest specifications as

³ Contract farming: Partnership for growth.

required/guided under a supported program (e.g., SRP, VietGAP) that benefits both rice farmers and product buyers/millers/exporters.

Contractor's awareness and perceptions of AWD

Aside from the potential to achieve higher yields and income for farmers, mitigation options such as AWD, SRI, or 1M5R must be justified before industry, government, and financial investors as solutions to climate shocks and means to reduce GHG emissions, allowing sustainability claims for rice industry/government. Agribusiness does not inherently value environmental sustainability; the case for value addition should be shown from consumer market demand for such requirements and/or corporate image and reputation, which can be influenced through social and environmental sustainability initiatives.

This situation calls for efforts to raise the contractor's awareness and change their perceptions on AWD and other mitigation practices. Such transformations are crucial for the successful adoption and scaling-up of AWD or any GHG mitigation options in rice production. Training and communication about the direct and indirect benefits, especially the non-market value of AWD and other identified mitigation options (i.e., corporate reputation, community social benefits, global climate benefits, resiliency and adaptation) are needed for different actors along the rice industry value chain.

Contract farming leads to fast and large-scale changes in the rice cultivation practices among smallholder farmers due to built-in incentives for behavior change. Incentives include guaranteed buyers and prices, timely provision of services and inputs, credit lending, and technical assistance. In the case of AWD, natural water resources are saved and can be allocated to areas of greater need (i.e., downstream). Being able to save water is crucial in areas where salinization is developing into a problem. More water is needed downstream to dilute the concentration of salinity in the water. Upstream rice farms practicing AWD on a large scale and simultaneously through coordinated mechanisms such as contract farming or SFLF can lead to landscape-wide improvements.

Incentives for AWD or other mitigation options out-scaled

In terms of institutional arrangements, mitigation packages such as AWD, 1M5R or SRI should be prioritized for mainstreaming in national programs (e.g. agricultural extension, restructuring of crop sector, MARD's GHGs mitigation, New Rural Development program). Subsidies and flat rates for water should be eliminated and be replaced with viable and practical incentives for reducing water consumption. A validated system for measuring water use on individual plots or across communally managed plots can also serve as an accurate and transparent MRV tool to calculate, record, and verify GHG emissions in rice production.

AWD reduces the need and cost of irrigation as less water is used. Despite this advantage, in the current institutional environment, money saving is negligible because the cost of water in agricultural production is low and charged on a flat rate or subsidized by the government. Due to these institutional impediments, farmers are often reluctant to change their behavior. An integrated financial mechanism, calculating costs and benefits of improved management at multiple levels (i.e., farm, cooperative groups, community, private industry, national, global) could be a useful decision-support tool, which creates a sustainable pathway for decision-makers, farmers, industry, and consumers to advocate the use of techniques like AWD.

As discussed in the earlier portions of the study, agricultural landscapes in general and rice cultivation land in particular are fragmented in Vietnam. Any water saving or mitigation options promoted should be relatively low-risk and easily implemented and managed. Best management practices for AWD involve a cheap tube that detects the ideal water level, determining when the field should be irrigated again (i.e., field water tube or automatic water regime regulated tool). AWD can be practiced without any additional equipment by simply draining the field at key times and irrigating again once the water drops to a certain level. In this case, training is crucial to avoid any yield loss due to improper application.

Ideally, GHG emission reductions from AWD and other practices could be monetized to translate the importance of mitigation into economic terms (e.g., carbon credits and carbon trading programs). Capitalizing on mitigation efforts is likely to encourage large-scale adoption compatible with MRV compliance regulations.

Cooperatives' roles in scaling out mitigation options in rice production

Many farmers, especially those who live in the Northern provinces and are members of either new cooperatives or farmer cooperative groups, are already familiar with AWD (previously known in Vietnamese as “Nong lo phoi”). Still, government- or industry-supported incentives are needed to encourage farmers to apply AWD and other mitigation measures given that the economic and social benefits from applying those practices are often not realized at the individual level.

Based on the 2016 data from GSO, Vietnam had more than 9.5 million agricultural households. There are 20,768 cooperatives operating in different sectors and business fields, among which 6,378 cooperatives were newly established after the 2012 Cooperative Law⁴. Agricultural cooperatives are widely acknowledged as vehicles of support for smallholders' livelihoods and economic development, especially before the reform (Doi Moi) policy took place in 1986.

Although cooperatives now play less of a role than before, the cooperative system is still an essential and appropriate organizational tool to facilitate behavior change among individual smallholder farmers. Cooperatives can promote collective action behavior manifested in conformity and uniformity on a large scale for AWD or other mitigation techniques. This advantage shows that cooperative system is one of the most influential farmer organizations needed to build and maintain a sense of community and transfer agricultural technologies across many farmers.

In recent years, newly established cooperatives are more evident in Northern provinces, especially in the Red River Delta, compared to other regions in Vietnam. According to the Cooperative Law passed in 2012, a cooperative is legally defined as a business operator and an independent business entity reliable and eligible as a partner for contract farming. It can even serve as a representative of its member households. In this regard, a cooperative could be a main contractor in the rice supply chain in different farmer-business linkage forms such as:

- (i) Input provider – **Service providing cooperative** (credit, irrigation, mechanization services) – Rice farmers – Rice buyers/millers/processors
- (ii) Contractive enterprises – **Rice farmer cooperatives** – Rice buyers/millers/processors

⁴ <http://m.nongnghiep.vn/phat-trien-htx-da-toi-giai-doan-chin-muoi-post208517.html>

- (iii) **Service providing cooperative** (credit, inputs, irrigation, mechanization services) – Rice farmers – Market agents

Operating in at least one of these forms, a cooperative can help by reducing transaction costs and actively facilitating efficient processes that help small-scale farmers acquire access to new technologies and input-output markets. The cooperatives also function as business agents in accumulating land—with member consent—for large-scale production to make the best use of the economies of scale.

According to the Vietnam Cooperative Union, by the end of 2017, Vietnam had about 18 agricultural cooperative unions with a total of 10,732 member cooperatives. Most agricultural cooperatives are in the Red River Delta region (33.5%), followed by the North Central Coast (19.7%), Northeast upland (16.9%), and Mekong Delta region (11.2%). The total household membership for all agricultural cooperatives was 5.2 million in 2017. Most agricultural cooperatives still operate as input and service providers. Only 20.5% of them accounts for those that buy and process agricultural products. Many agricultural cooperatives function as vehicles to transfer new and advanced technologies to their member farmers through incorporated enterprises in the business-farmer linkage models and to ensure the role of cooperatives in the agriculture reform process (H. V. Quang and N.T. Dinh, 2015).

Aside from the agricultural cooperative system, more than 65,000 farmer/producer-cooperation groups operate in the agriculture sector throughout Vietnam. These cooperation groups mainly work on specific types of agricultural activities such as technology transfer, dissemination of new varieties, irrigation management, and farmers' interest groups.

Current reports show that about 450,000 ha of rice cultivation area are farmed under the business-farmer linkage systems. Some models have prevailed successfully, including the Thai Binh Seed Corporation, Cuong Tan Limited Company in Nam Dinh Province, Gentraco - Can Tho Joint Stock Company, and big companies like Loc Troi Group and Southern Food Corporation. However, in other regions such as the Southeast, South Central Coast, Central Highlands, North Central Coast, and especially the Northern mountainous region, where there are mainly small-scale farmers, the development of the large-field models has been very challenging and limited (MARD, 2018).

Most of the agricultural cooperatives provide public services such as irrigation, clean water, rural environmental protection or input supply. There is strong potential here for incorporating mitigation options in rice production into the cooperative's guidelines for public services provision.

The institutional environment in Vietnam is conducive to farmer cooperative development. Decision No. 62/2013/QD-TTg⁵, with a focus mainly on rice production, encourages the development of cooperation linkage between production, trade, and consumption of agricultural products and the development of the large field production system (i.e., SFLF).

Agricultural enterprises and businesses are encouraged to cooperate with farmers to ensure sufficient input materials, quality products, and quality standards in accordance with the market requirements. Enterprises, however, cannot link with each individual small-scale farmer because this presents high transaction costs, high labor and effort needs, and loose legal contracts, among others. They prefer to cooperate with legal representative organizations of farmers (cooperatives with a legally registered status). In this context, agricultural enterprises/businesses seek to establish

⁵ 62/2013/QD-TTg dated 25/10/2013 of the Prime Minister with regards to the Policy to encourage the development of cooperation, production linkage with trade and consumption of agriculture products and the development of the Large-Field production

a link with farmer representative organizations such as cooperatives to reach a larger number of farmers or to access lands for larger scale production. Many agricultural enterprises have tried to find reliable cooperatives to work with or have provided support for the establishment of cooperatives (e.g., Vo Thi Thu Ha company in Dong Thap Province).

Cooperatives as means for out-scaling AWD or other mitigation techniques in rice production in the contract farming system

Various farmer-business linkages were formed throughout the country, the majority of which are in the MRD. In rice production, the large field model has been considered a key factor that enables this linkage in the region. In 2013, the large field model accounted for more than 10% of the total rice production area.

Apparently, regardless of the forms of farmer-business linkages, the success of a model rests on bringing mutual benefits to the involved parties and transparently communicating the rights and responsibilities of all the actors in the linkage. Farmer-business models in An Giang Province provide examples of successful contract farming. Unlike the large field model, contract farming shows a stronger horizontal linkage among farmers via the representatives of two cooperatives bridging the vertical linkages between farmers and businesses (e.g., An Giang Agriculture and Food Import and Export Joint Stock Co. Ltd. [AFIEX] or Loc Troi group).

During the 2-year period from 2016-2018, 147 cooperatives in Kien Giang Province covering an area of 32,000 ha were participating in the large-scale field model to link producers to buyers. (VOV, 2018).

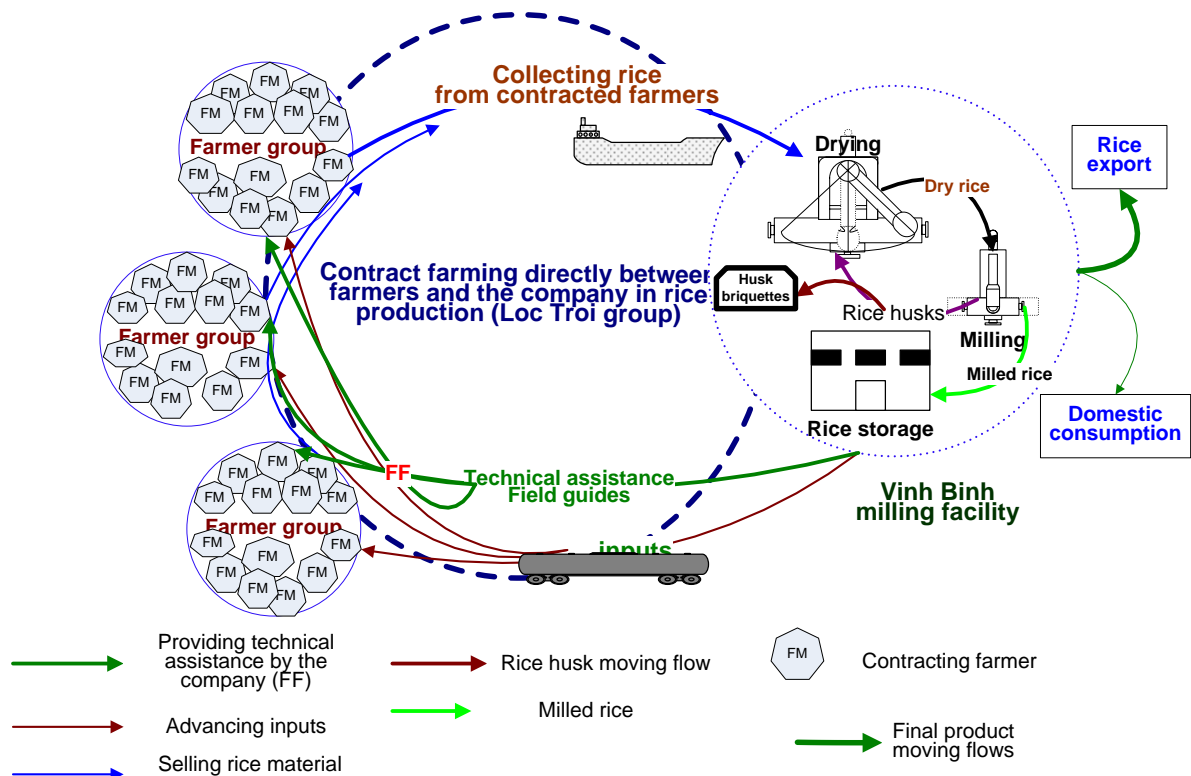


Figure 3. Model of farmer-business linkage by contract farming in Vinh Binh commune

The contract farming model between Loc Troi Group and the farmers in Vinh Binh Commune in Chau Thanh District, An Giang Province illustrated in Figure 3 is the typical contract farming

model that the Loc Troi Group applies in MRD. In this contract farming system, farmers receive free guidance and technical support through the company’s program, “Farmers’ Friends (FFs)” or “3 together with farmer engineer.” The support extends to the entire rice production process from field preparation, seed sowing, and field management (crop management, pest/disease control, fertilizer, irrigation, weeding etc.) to harvesting and transporting harvested paddy rice. This support is scheduled on a regular basis and designed to help farmers follow production protocol and save production costs through the provision of input packages, transportation, drying, and storage services for their rice product. This model of business and farmer linkage appears as a promising vehicle to promote the application of GHG mitigation options like AWD.

Limitations

Only a few companies (such as the Loc Troi Group) are capable of meaningful involvement in the many stages of the rice value chain. The **human resource costs associated with this model are quite expensive** since it pays the salaries of the company’s FFs (about 1,500 FFs now) and farmer group leaders (for each group of 400-500 ha, the group leader receives a support of 1.5 million VND monthly).

The linkage between Loc Troi Group and farmers in this model takes the form of "contracting – ordering." In such form, the company plays the dominant role, setting conditions to which the contracted farmers must comply. The conditions involve the use of varieties and inputs, standards of product quality, and production techniques.

The horizontal linkages among contracted farmers via their representative organizations—including cooperative and farmer groups—are quite weak. This forces the company to sign the contract directly with each individual farmer, incurring **high transaction, management, and enforcement costs**. In such situation where practices are dictated to farmers, they own **less autonomy** to proactively make production decisions and technical choices of their interest.

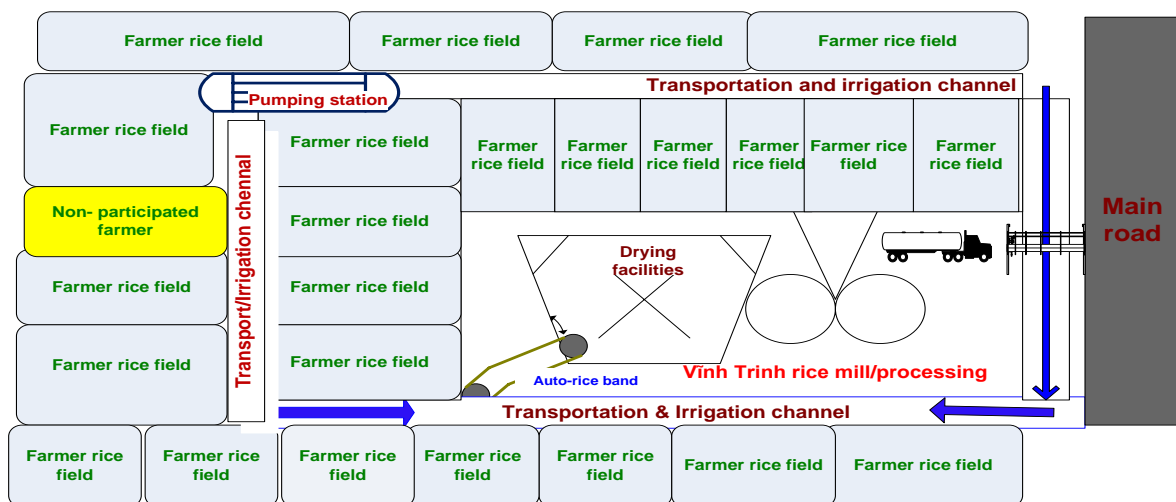


Figure 4. The layout of the rice production area of the link in Vinh Binh commune

Another issue is the layout of the production area, where **rice fields are not necessary in conjunction with one another** (See in Figure 4). Fields of non-contracted farmers break those of contracted ones. This means that farmers that cultivate rice in the same area may not apply the

same technical protocol or farming practices uniformly. This layout presents as a limitation to out-scale GHG mitigation options under the contract farming system.

A **lack of coordination between contracting companies and local authorities** is also evident during the drafting of contracts and supervising contract implementation in this model.

Cooperatives' role in the contract farming system for out-scaling mitigation options

Four types of cooperatives were identified. Among these types, only two are directly related to agricultural production.

- (i) **Integrated Agricultural Service Cooperative:** operates in the fields of producing and trading activities including public (environment management, clean water, etc.) and private goods (inputs and output services, irrigation, credit, construction, and repairing production tools, etc.)
- (ii) **Agricultural cooperative:** Also called cooperatives of agricultural producers. Agricultural cooperatives operate purely in the field of agricultural-related activities such as providing farming inputs (fertilizers, materials, processing, machinery), and buying/trading agricultural outputs (collecting, transporting, processing, storing, trading agricultural products, etc.) for their members in a specific industry such as crop production and processing, among others. (H.V. Quang and N.T. Dinh, 2015).

The model of contract farming between AFIEX and rice farmers via FCGs in Tan Lap Commune in Tinh Bien District, An Giang Province is presented in Figure 5. This is another type of business-farmer linkage in rice production quite common in MRD.

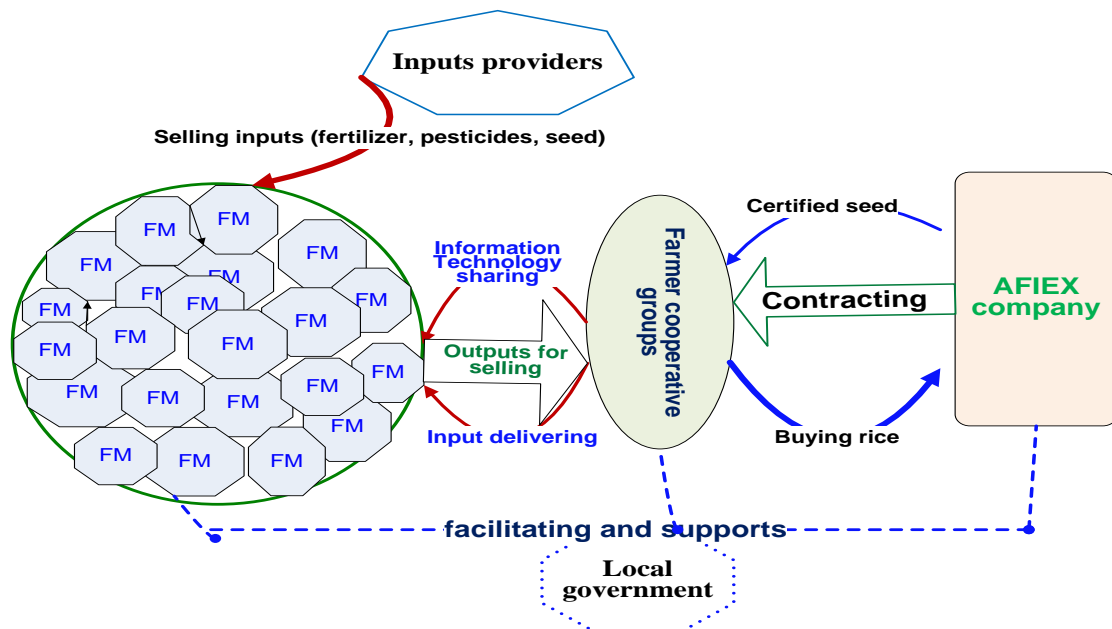


Figure 5 Contract farming of AFIEX with farmers throughout farmer cooperative groups

In this model, four main actors are involved: (i) AFIEX; (ii) Farmers' representative organization-FCG; (iii) Commune People's Committee; and (iv) local agency of DARD. In this contract farming system, the company (i.e., AFIEX) sets the conditions for the type of rice varieties to be planted and the product quality and cultivation techniques that the FCGs and participating farmers must follow.

The company defines several acceptable rice varieties, among which contracted farmers can select 1-2 rice varieties to grow. The company does not require farmers to follow a strict technical protocol. Rather, it recommends that farmers follow the technical guidelines provided by the district-level DARD, district extension staff, commune extension workers, or FCG leaders. The company agrees to buy the products from farmers at the market price plus a premium of 50 to 100 VND/kg. The FCG acts as a farmer representative in negotiating the terms and conditions of contracts and a bridge to connect the farmers with the company. Aside from its intermediarial role, FCG serves as a vehicle for transferring technologies. The local authorities act as facilitators to promote this linkage and as mediators to resolve disputes or conflicts when they occur.

The advantage of this business-famer linkage in out-scaling mitigation options is its leniency on technical guides to follow. Rice farmers are recommended to follow technical guides provided by the public extension network or government agricultural agencies that can reach all rice farmers who produce rice in the same large field.

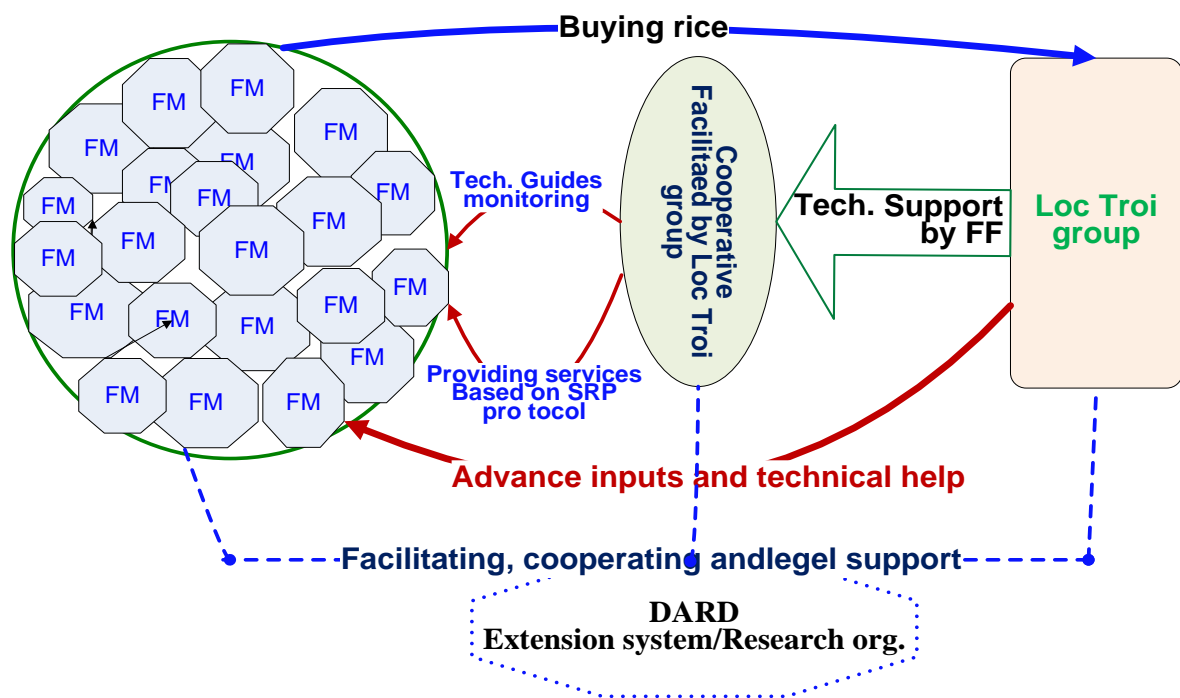


Figure 6 Business-farmer linkage through co-operatives in Vinh Binh commune

The contract farming model of business-farmer linkage via agricultural cooperatives is common in the Red River Delta (Thai Binh and Nam Dinh provinces) (Figure 6). This model harmonizes the advantages of the two contract farming models described previously. For example, Hung Cuc and Cuong Tan Co., Ltd in Thai Binh Province have been working with 28 cooperatives in producing high-quality rice on 2,500 hectares with an annual production of 15 thousand tons.

The cooperatives' role in this model is to link businesses with farmers along the rice production chain from production investment to buying farmers' rice products in accordance to the contracts signed between the two entities (VOV, 2018).

In MRD, a well-known model of this type is the newly established link of the Loc Troi Group with farmers, piloting the application of the the world's first sustainable rice production standards. In 2016, the Loc Troi Group joined SRP and has been implementing the Program's standards with about 300 farmers in three Mekong Delta provinces: An Giang, Dong Thap and Kien Giang.

Loc Troi has also piloted a modification of contract farming with rice farmers through the agricultural service cooperative in Vinh Binh Commune (Figure 6). In this model, the cooperative acts as the farmers' legal representative who coordinates activities between two parties (farmers and the company) and provides company-supported technical services to contracted farmers. This emerging contract farming mechanism appears to have a potential to out-scale the application of mitigation options in rice production. Following this method, Loc Troi Group can reach many individual rice farmers through their legal representatives while keeping transaction costs of technology transfer relatively low.

Conclusions

After the 2012 Cooperative Law was introduced, the cooperative system has developed rapidly. Cooperatives function to provide different kinds of agricultural, technical, and legal services to their members. However, as of now, only 20% of the cooperatives is registered as required by the Law.

Agricultural businesses and enterprises are lead actors in the business-farmer linkage along the rice value chain and in the contract farming system. This means that out-scaling any new technology or change in production (including mitigation measures) will depend on the participation level or the interest of the businesses.

Farmer cooperation groups and agricultural cooperatives can play a substantial role in the formation and success of business-farmer linkages. Such FCGs and cooperatives are key to out-scaling mitigation measures like AWD due to their influential position in collective coordination and technology transfer. Cooperatives and FCGs are responsible for building the capacity of and guiding farmers in complying with their contractual regulations. They can train farmers in new technologies or mitigation measures.

Mitigation options must bring benefits to rice producers and agribusiness contractors. These can include economic and social benefits, which should still be explored further with different actors involved in decision-making (i.e., community benefits from reduced standing water and reduced water-borne diseases, cross-community benefits from improved upstream water management, corporate reputation benefits from supporting sustainability, consumer benefits from making sustainable purchasing decisions, and global benefits from reducing GHG emissions).

The option of increasing income through significantly reduced production costs requires the removal of government policies such as subsidies and programs, which disincentivize change (i.e., flat-rate irrigation and water subsidies). Guaranteed higher prices (price premiums) for rice produced using sustainable practices is another promising option that will require widespread recognition and acceptance of sustainability labels from exporters and consumers. Without these enabling conditions, the wide-scale adoption of mitigation options may not pique the interest of producers.

In comparison to non-contracted farmers, contract and cooperative farming in general provide good enabling conditions to out-scale mitigation options in rice production. Among the three contract farming models analyzed in this study, the model of business-cooperative-farmers (illustrated in Figure 6) seems to present more advantages, supporting the out-scaling of AWD option in rice production in Vietnam.

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