On behalf of

Federal Ministry for the Environment, Nature Conservation and Nuclear Safety

of the Federal Republic of Germany

ASSESSMENT REPORT

Appropriateness of climate change-oriented rice innovations and strategies for upscaling to rice production systems in the CCCEP provinces

Submitted to:

The Sustainable Livelihood Component,
Climate Change and Coastal Ecosystems Program (CCCEP)

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This document reflects the opinions of consultant, not necessarily the CCCEP program as well as GIZ projects in Bac Lieu, Vietnam

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Acronyms

AAES	Agricultural and Aquacultural Extension Station
AASC	Agricultural and Aquacultural Seed Center
AEC	Agricultural and Aquacultural Extension Center
AWD	Alternate Wetting and Drying
CC	climate changes
CCCEP	Climate Change and Coastal Ecosystems Program
CLUES	Climate change affecting land use in the Mekong Delta: Adaptation of Rice-based Cropping Systems
DARD	Department of Agriculture and Rural Development
DARDD	District Agriculture and Rural Development Division
FFS	Farmer Field School
IMP	Integrated Pest Management
LSCP	Large-scale Collective Production
MDR	Mekong Dental Region
NAAEC	National Agricultural and Aquacultural Extension Center
NGOs	Non-governmental Organization
PC	People's committee
PMU	Project Management Unit
PPD	Plant Protection Department
PPS	Plant Protection Station
PPSD	Plant Protection Sub-Department
STR	Salt Tolerance Rice

Summary

Salt intrusion, drought, flood, and lack of fresh water in dry season are direct impacts of climate changes to two major rice farming systems in Mekong Delta Region: rice-shrimp and intensive rice systems. The rice-shrimp systems are facing with risk of harvest losses and/or low field due to the lack of salt, drought, and collapse tolerant rice varieties as well as farmers' poor cultivation experiences. The intensive rice systems are challenging by serious increase of pest and diseases, flood in the rainy season and lack of fresh water in the dry season. These impacts have pushed farmers in the situation of losing their rice cultivation land areas and harvests, and reducing productivity. Furthermore, market fluctuation and low and fluctuated prices have seriously negatively influenced to farmers' livelihood. Under these contextual conditions, adoption of technical and institutional innovations is necessary.

Rice innovation systems in Mekong Delta Region have been developed and introduced a number of innovations. These systems have not yet met the demands from the practical production due to the dominance of the 'supply-driven' approach. Implementing the Government' policies for agricultural development and food security, these systems emphasise development and transfer technical innovations to farmers, with less concern to institutional and market innovations. Although great efforts have been made for socializing extension work, the conventional extension approaches are still dominated, limiting the system's effective performance.

Seed and input supply system has an involvement of both public and private sectors. This system has operational agent systems, functioning from provincial to village level and providing diverse types of products that match to farmers' diverse needs. Nevertheless, the system's heavy structure and unfair competition among enterprises lead to the high transaction cost and the unstable quality of products. Seed and inputs prices are annually increased, causing the difficulties for farmers' investment.

Market and marketing system with involvement of both public and private sectors has significantly contributed to the flow of goods in the markets. However, domination of rice middlemen and traders, lack of concern about quality, lack of processing technologies and storing facilities, and non-transparent competition among enterprises occurred in the system leads to the unstable markets and unequal value distribution in rice value chains in Mekong Delta region.

Rice farmers in Mekong Delta region have diverse cultivation conditions and experiences as well as investment capacity and technical needs. Participating in rice innovation systems as knowledge receivers, farmers are posited in the passive situation, being trapped among various interests of different actors. Farmers, hence, have adopted innovations defensively in order to satisfy their immediate needs of income generation. This short-term production perspective leads to farmers' strategizing innovation and innovation adoption practices.

Rice innovation systems in Mekong Delta Region are operating under the both demand- and markets-driven mechanisms. There is a mismatch between one half of the system – innovation generation and transfer - operates under the governmental management, while another half – innovation adoption and market – operates under the market mechanisms. The government have involved in rice innovation systems with the roles of market managers, seeds and inputs suppliers, and marketers. Hence, the Government's role of providing institutional facilities and facilitations is limited due to the conflict with its own-benefits. The critical issue in the rice innovation systems is, therefore, a lack of coalition among involved actors.

Within the context of Bac Lieu, climate change-oriented rice innovations introduced to the province include 1) Alternative Wetting and Drying incorporating into 'One Must Do and

Five Reductions' (OMFR), 2) Salt Tolerant Rice Varieties, and 3) Large-scale Collective Production. Among these innovations, Alternative Wetting and Drying incorporating into 'One Must Do and Five Reductions' (Integrated AWD-OMFR) has high technical, natural, social, human, physical, and livelihood appropriateness at the intensive rice productions areas, especially in the winter-spring season. Bac Lieu DARD and its agencies have incorporated the Integrated AWD-OMFR into their extension activities such as development of Large-scale Collective Production (LSCP) models and training on OMFR techniques for farmers.

Upscaling climate change-oriented innovations in rice production in CCCEP provinces needs to consider the whole comprehensive setting, avoiding focusing on only technical factors. It is clear that no single innovation can help to solve the current problems in Mekong Delta's rice production. Instead, it needs practically comprehensive solutions about organizing rice production and marketing in order to assist farmers sustainably cultivating rice and ensuring their livelihood.

Hence, CCCEP program's strategies for upscaling appropriate climate change-oriented rice innovations in Mekong Delta Region should consider both institutional and technical aspects. Institutionally, CCCEP program should adopt the 'multi-stakeholder – driven' approach in order to generate impacts that can create effects to multi-levels and inputs for the systems' changes. Technically, CCCEP program should adopt basic principles of the 'demand-driven' extension approach with farmers' participation, and integrate enterprises' benefits into innovation upscaling process in order to develop win-win relationship between farmers and enterprises.

Strategic objectives of upscaling appropriate climate change-oriented rice innovations in CCCEP provinces include 1) development of appropriated climate change-oriented rice innovations' handbook/guideline/ document, 2) development 'common interests' innovation upscaling program for climate change-oriented rice production, 3) policy advocacy for the 'common interests' innovation transfer approach to both central and local governments, 4) capacity building for relevant government agencies at different levels, and 5) strengthening coordination and collaboration among CCCCEP provinces.

I. Introduction

Climate changes have been significantly negatively influenced to agricultural production in the Mekong Dental Region (MDR) in Vietnam. In recent years, rice production in MRD is facing with serious impact from climate changes (CC) such as more frequent flooded in rainy season, irregular rains, rising sea levels, water shortage and salt intrusion in the dry season, and drought in the early or the periods of rainy season. These impacts have led to the rapid increase of salt intrusion areas with high salinity. Many rice areas cannot be used for planting rice any more due to high salinity. It is predicted that many rice-shrimp areas can be used for shrimp cultivation only due to the high salinity. Rice, one of the main food and cash crops in MDR has been under the threat of the climate changes, challenging the regional economic growth and farmers' sustainable livelihood.

Under this context, several GIZ projects in different MDR provinces have implemented rice-based activities in order to introducing climate change-oriented innovations to the regional rice production systems. Climate Change and Coastal Ecosystems Program (CCCEP) was getting engaged since 2012 in four thematic areas (components): (1) Coastal Governance, (2) Area Management, (3) Sustainable Livelihoods, and (4) Environmental Awareness. The Sustainable Livelihoods Component have introduced salt tolerance rice varieties and water/input reducing technologies/rice production innovations as one of the measures to adapt to CC in Bac Lieu. In the coming years, the Sustainable Livelihood component, CCCEP plans to upscale the appropriated innovations to the rice production systems that are heavily influenced by the climate changes. The livelihood component aims for sustainably unscaling these innovations in order to increase farmers' income, to ensure local people's livelihood and to contribute to reduce the negative impact to the environment. The identification and introduction of innovative rice production techniques, therefore, is crucial for the farmers to sustain their livelihood.

An 'assessment of climate change-oriented rice innovations' appropriateness and development of institutional strategies for upscaling of innovations in rice production systems in CCCEP provinces was conducted, aiming to:

1. Assess the available resources and the capacity of the provincial extension system and study rice production systems in Bac Lieu and two other Provinces in the Mekong Delta.
2. Assess the appropriateness of the climate change-oriented rice innovations in CCCEP provinces: i.e. Bac Lieu
3. Develop strategies as to how the innovations can be integrated to the extension and seed production systems in the Mekong Delta.

The assessment was conducted by an independent consultant from 15/1/2013 to 27/2/2013 with the assistance and participation of the Rice Component, Adaptation to climate change through the promotion of biodiversity in Bac Lieu Province (referring to GIZ Bạc Liêu Project) (see detail in Appendix 1). The consultant collected information from a variety of resources including project participants, counterparts and other local partners, and field surveys as presented in the Appendix 2. More specifically, the consultant had reviewed relevant documents, discussed with representatives from all counterparts and local partners, and interviewed farmers and farmer groups participating in GIZ projects' rice-based activities. Contents covered in meetings and interviews with these stakeholders are presented in Appendix 2. Visits to field sites of GIZ projects' rice-based activities were also conducted. One consultation workshops with CCCEP's relevant stakeholders were organized for discussing about feasibility of the upscaling strategies.

Based on information collected in Bac Lieu province, this assessment report presents: (1) rice production under the climate changes' impacts, (2) assessment of available resources and capacities of extension and seed production systems, (3) assessment of the climate change-oriented rice innovations, and (4) proposed strategies for upscaling climate change-oriented rice innovations in CCCEP provinces.

II. Rice production in salt intrusion areas

In the CCCEP provinces, rice cultivation is strongly driven by level and timing of salinity intrusion, amount and timing of rainfall, irrigation structures, food security policy, and farm income. Rainfall is low in the dry season (December – April), when salinity level in canal water is high (January – June) and vice versus. Canal water salinity concentrations increase progressively and reach a peak level in April – May, when the Mekong flow is lowest. Salinity level and timing at a certain location depends upon the distance to estuaries, canal systems and the availability and/or the operation of salinity-control structures (Dang Kieu Nhan *et al*., 2011). Under these conditions, two dominant rice systems are practiced: (1) two or three rice crops per year cultivated in the fresh water areas, and (2) rice – shrimp rotational farming systems cultivated in the brackish water areas as presented in table 1. In addition, brackish shrimp farming is a system that can be shifted to the rice – shrimp rotational farming or vice versa. This shift depends on various factors, including weather and salinity level of a specific year, shrimp and rice prices' fluctuation, and agricultural development and food security policies of the central and local governments. Areas of these farming systems in the CCCEP provinces are presented in table 1.

Table 1. Rice areas in CCCEP provinces in 2011

Provinces	**Areas (ha)**		
	Two-three rice crops	**Rice - Shrimp**	**Shrimp**
An Giang	262.286	0	0
Kien Giang	309.059	86.320	84.600
Soc Trang	125.156	19.000	48.000
Bac Lieu	55.809	27.286	11.617
Ca Mau	86.969	43.544	205.000

Source: Webpages of DARD in An Giang, Kien Giang, Soc Trang, Bac Lieu, Ca Mau

Since 2000, with the promotion of agricultural diversification by the government, farmers have shifted intensive rice production to shrimp farming alone or in the rotation with rice to improve farm income. Consequently, area under shrimp farming has increased by 7% per year in the period of 2000 and 2008, and rice farming area has reduced proportionally (Dang Kieu Nhan *et al*., 2011).

II.1 Two or three rice crops system

The two or three rice crops system is common in areas with relatively high elevation and some distance from estuaries, having salinity-control structures. Depending on availability of the fresh water and soil conditions, farmers can cultivate three rice crops, two rice crops and one winter crop, or one crop and one winter crop per year. Farmers have grown high-yielding and good quality rice varieties with short-growth duration from 95 to 105 days. Land is mainly ploughed by machines, reducing the thickness of cultivated layer. Farmers often broadcast seeds or make the line sowing by machine. In the recent years, amount of seeds used reduces significantly, averagely around 5-7 kg/ha. Amounts of fertilizers and crop protection chemicals used are also reduced based on the recommendation from technical

trainings conducted by agricultural extension and plant protection department. Farmers have acknowledged that reduction of seeds and fertilizers helps rice grows better, increasing tolerance capacity to pest and diseases, resulting in the increase of yield and saving of the input costs. The average yield of Winter-Spring and Summer-Autumn crops ranges from 7 – 8 tons/ha and 5-6 tons/ha, respectively.

Under the climate change impacts, rice production of these areas has been challenged by: 1) lack of fresh water, especially for the Winter-Spring season, 2) drought due to irregular rains, 3) salt intrusion due to the rising sea level, and 4) flooded due to the rising water level. In addition, many locally high quality and high-yielding varieties are retrograded, leading to the reduction of yield. Thus, in order to sustainably cultivate rice under the conditions of climate changes in these areas, it is necessary to:

- improve seed quality through reinvigorating the existing rice varieties that have adapted well to the local conditions,
- use appropriated cultivation techniques in order to reduce costs, save water and limit impact to the environment, and
- develop appropriated cultivation techniques under the condition of water abundance.

II.2 Rice-shrimp rotational system

The rice-shrimp rotational system is dominant in low-lying areas with salinity-control structures and saline water duration of up to 8 months. In these areas, rice crop is lasting from August to December, followed by shrimp season. Farmers have grown mainly locally traditional rice varieties, which are relatively tolerant to high water depth. Rice growth is mainly influenced by salinity during early and late periods of the rainy season, due to low rainfall and slow soil desalinization and/or salinity intrusion from estuaries. Thus, washing methods for eliminating salinity and acidity in soil before sowing as well as suitable fertilizer application and water management during the period of panicle initiation are crucial for achievement of high rice yield.

Since 2005, adoption of rice-shrimp farming systems has been increased due to the drop of shrimp price as well as the outbreak of diseases in shrimp. However, farmers have not yet considered rice crop as an income creation source. Instead, farmers cultivate rice for clearing diseases' pathogens in soil and water as well as for harvesting straw used as feeds for shrimp. One of the reasons is that it is high risk to invest in this rice crop due to: 1) highly depending on irrigation systems for fresh water, 2) lack of salt tolerance rice varieties with short growth period and tolerance to high salinity and acidity that can fit to the shrimp season, and 3) less accurate cropping calendar, causing farmer's hesitation in making decision on sowing or not. Under the climate change impacts, this system is challenged by: 1) the rise of salinity, causing the reduction of rice-shrimp areas, 2) high risk of loss due to the changeable weather, discouraging farmers in planting the rice crop. Thus, in order to sustainably cultivate rice in these areas, it is necessary to:

- have appropriated and flexible irrigation schedules in order to ensure the supply of 6 month fresh water, 6 month saline water
- provide highly accurate cropping calendar with timely informing farmers
- have salt tolerance rice varieties that can grow in the salt intrusion areas with short growth period and tolerance to high salinity and acidity that can fit to the shrimp season, and
- use appropriate cultivation techniques that can reduce cost, eliminate salinity and acidity, and limit negative impacts to the environment.

II.3 Current situation in rice production

Rice production in Mekong Delta Region is facing with negative impacts to the whole system of producers-collectors-processors-consumers. Ineffective coalition in rice value chain and unfair value distribution lead to the lagging behind the commercial production's standards as well as environmental, economic and social unsustainability. There are a number of factors causing these negative impacts.

The first factor group relates to *production mode*. Rice is mainly cultivated based on subsistent household production. Increase of yield and productivity relies mainly on intensive cultivation techniques. Currently, the use of intensive cultivation techniques for increasing of rice yield and productivity reaches to the saturated point. Most of factors supporting the increase of rice yield and productivity have been maximally used. Thus, increasing speed of rice production value is slow. It is then difficult to continue increasing rice production based on expanding areas and labour scale.

The second factor group relates to *cultivation techniques*. There are two rice production systems that accordingly have two different cultivation levels. At the areas of two or three rice crops system, farmers' techniques are improved significantly, reaching to highly intensive cultivation levels. However, in these areas, farmers adopt intensive cultivation techniques mainly for increasing rice yield. They are not really interested in the improvement of product quality and production profit that determine the sustainability of commercial rice production in the Mekong Delta region. At the semi-intensive rice production and/or remote areas, farmers' cultivation levels are rather low, mainly based on their experiences. The differences of cultivation levels as well as the tendency of maximizing yield by adoption of innovations lead to the lagging behind the requirements for quality standards of a commercial rice production.

The third factor group relates to *supply of seeds and inputs*. The supply of seeds and inputs is more and more dynamic in terms of products' types, quality, price, and distribution mode. Even though there are many companies supplying a varieties of seeds and inputs to rice farmers, products' prices are continuously increased over years. Moreover, the products' quality is not guaranteed and stable. Many products do not have the classification of their origin. Supply of these products is conducted through many levels of agents that significantly increase the final sale price to farmers. Rice farmers are posited in the defensive situation, depending totally on this supply system. This situation negatively influences to profit of rice production and eco-system of rice areas.

The fourth factor group relates to *climatic conditions and pest and diseases*. Under the context of climate change impacts, drought is reduced; however, salt intrusion is seriously increased, leading to the increase of salt instruction level and the reduction of rice cultivation areas. Furthermore, water level of the Mekong River is lower and lower, flood is less and less in the region compared to the natural flooding appearance before, resulting in the remarkable reduction of sediment depositing in the delta and causing difficulties for irrigation system. The irregular weather conditions cause the increase of pest and diseases that challenge the prevention and control. These factors influence to the reduction of rice yield and productivities in Mekong Delta areas

The fifth factor group relates to *product collection, preservation, processing, and consumption*. Harvesting, processing and preserving technologies are lagging behind the growth of the rice productivity in Mekong Delta and far behind the efficient support to increase of the region's competitiveness in the export markets. In addition, price management and quality control are difficult to handle when middlemen, collectors and traders system holds the exclusive role in collecting and purchasing rice from farmers. This system positively

contributes to the active operation of commodity flow and marketing. Nevertheless, it has created negative impacts on the increase of transaction costs and reduction of product quality in the rice value chain. Rice markets are facing with a number of challenges such as the last of low price, high fluctuation, and high competition with other international exporters in many recent years. Rice producers are trapped in the 'rabbit cycle', facing with many disadvantages when trying to increase productivity and quality. Farmers' income and profits from rice production are considerably reduced.

The sixth factor group relates to *macro management*. Macro planning and organization of rice production have shown their inefficiency and sufficiency. The Government still hold the target of increase/stabilization of rice areas and increase third rice crop areas, increase of average yield and annual productivity, and increase of export amount and turn-over. Recently, the Large-Scale Collective Production (*cánh đồng mẫu lớn*) has been largely and intensively promoted in the Mekong Delta Region. This type of production aims for modernizing rice production under the conditions of the climate change impacts through collective adoption of rice innovations. However, investments to the Large-Scale Collective Production (LSCP) still focus mainly on infrastructures and technology transfer to increase rice yield and productivity, while the coalition between farmers as producers and enterprises as marketers are ignored. These policies' orientation and implementation are followed the ideological thought, targeting quantity- and yield-oriented indicators without considering the practical conditions. These constrains have created a big gap between rice production, processing and consumption.

Under this context, upscaling climate change-oriented innovations in rice production in CCCEP provinces needs to consider the whole comprehensive setting, avoiding focusing on only technical factors. It is clear that no single innovation can help to solve the current problems in Mekong Delta's rice production. Instead, it needs practically comprehensive solutions about organizing rice production and marketing in order to assist farmers sustainably cultivating rice and ensuring their livelihood.

III. Available resources and capacities of Rice Innovation System in CCCEP provinces

Rice Innovation Systems in CCCEP provinces in general and in Bac Lieu in particular consist of public and non-public actors being responsible for different functions (Figure 1). This system encompassed five groups of actors with corresponding roles:

1) The Government and its agencies at different levels of central, provincial, district and commune, being responsible governmental management,
2) Research institutes and universities, and knowledge transferors, being responsible for developing and promoting innovations to rice farmers,
3) Public and private suppliers, being responsible for providing seeds and inputs for rice production,
4) Public and private enterprises, participating in purchasing, transporting, processing and marketing rice products, and
5) Rice producers, receiving and adopting innovations.

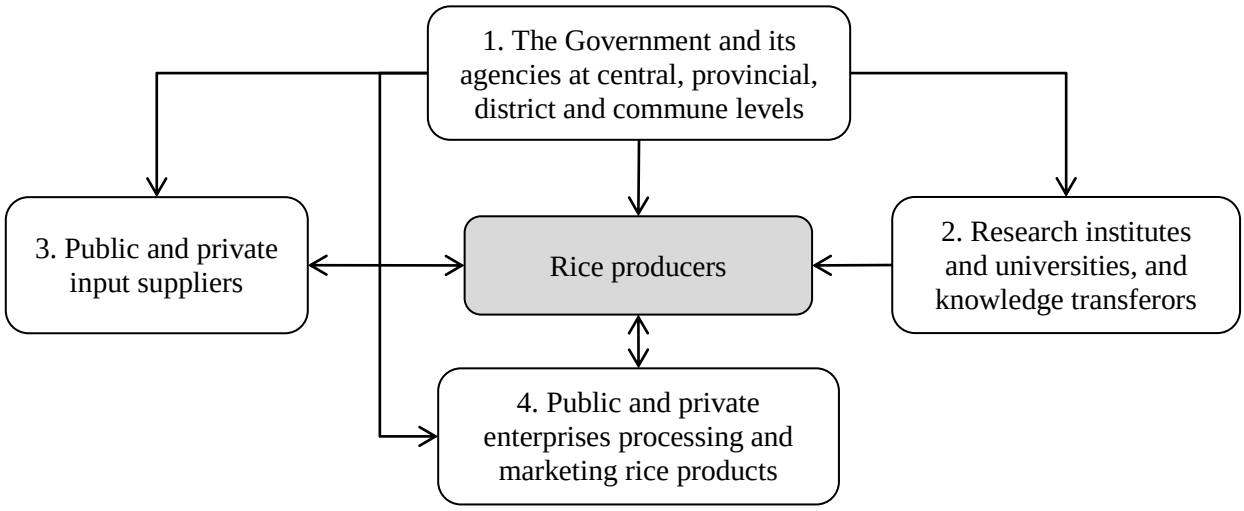

Figure 1: Structure of Rice Innovation System in Bac Lieu

Currently, relationships between group 1 and group 2, group 3, group 4 and group 5 are one-way direction, imposed through national and regional policies for the agricultural development. Consequently, relationships between group 2 and 5 are also one-way direction. Interactions between group 5 and group 3, group 4 are two-way relationships, based on demand-supply principles. Characteristics of these interactions have shown that the system is operating based on the combination of supply- and depend-driven mechanisms that so called 'semi-market mechanisms'.

III.1 Government management actors

Government management actors consist of Ministry of Agriculture and rural Development (MARD) and Department of Agriculture and rural Development (DARD). At the provincial level, DARD is responsible for guiding and coordinating Plant Protection Department (PPD), Agricultural and Aquacultural Extension Center (AAEC), Agricultural Seed Center (ASE). Government's agencies at the district level such as Division of Agriculture and Rural Development, Plant Protection Station, Agricultural and Aquacultural Extension Station directly implement activities to local farmers with the involvement of commune government and village management unit. This system is responsible for guiding and planning for the

production, building infrastructure, developing cropping calendar, managing irrigation system, and managing and participating in innovation transfer to farmers, input supply and marketing products.

The Government take determining role in developing and enforcing policies for agricultural development and management mechanism for the whole system. Until now, the governmental management system mainly focuses on construction of roads and irrigation systems, and transfer innovations and knowledge to farmers as well as participates in supplying seeds, inputs and exporting rice products. The Government has not yet effectively created the favourable environment for rice production and marketing. One of major reasons is the self-benefit conflicts between the Government' direct involvement in the functions of supplying inputs, producing and marketing products, and the Government's function of facilitating the whole rice production system. The Government needs to invest more works on directing forecasting rice markets, coordinating marketing actors, and developing the legal framework for markets and exportation. In addition, the Government needs to strengthen its coordination function in order to promote the coalition and collaboration between the governmental and private sector. The private sectors should be encouraged to participate in the markets in order to foster the flow of products and to contribute to add value for rice production. The Government needs to enforce the appropriate institutions for creating fair-play competitive environment between state-own and private enterprises.

III.2 Innovation generation and transfer system

Innovation generation and transfer system consists of pubic and non-public organizations as illustrated in Figure 2. The public organizations include research institutes and universities, DARD, PPD and AAEC as well as their agencies at district levels, and mass media as illustrated by grey-background boxes in Figure 2. The non-public organizations include mass organizations, private enterprises, development projects and NGOs as illustrated by white-background boxes in Figure 2. This system is responsible for two major functions: 1) development of innovations, and 2) transferring the innovations to farmers. Operation of these organizations at local level is under the management of DARD.

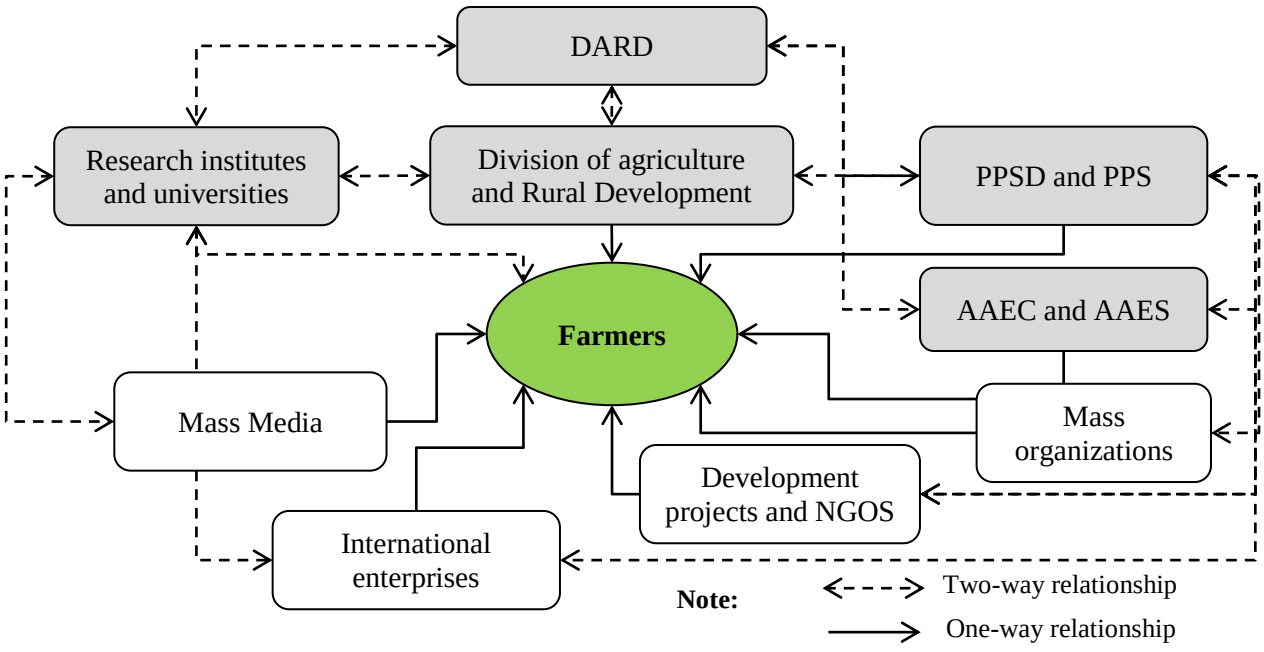

Figure 2. Innovation supply system

Research institutes and universities

Research institutes and universities such as Mekong Delta Rice research Institute, Can Tho University have many research activities and results facilitating rice production in the Region. Recently, these organizations have been intensively implemented more applied-research specifically in the region in order to support to the Government's policy for food security and rice exportation. They often collaborate with DARD and DARD's agencies to test salt tolerance rice varieties, new cultivation techniques, bio-fertilizers… the successful research results are then transferred to the government agencies for policy recommendation and promotion to the practical production. In addition, this system also conducts applied-research based on local governments' orders that addresses technical needs of local farmers. The system also collaborate with enterprises, mainly input producers and suppliers, to do research for serving the needs of these companies. These relationships reflect the two-way interaction as illustrated by dash arrows in Figure 2. General assessment shows that results from demand-driven applied-research ordered by the local governments and enterprises often have high potential for adoption and diffusion in rice producer communities.

Plant Protection Sub-department (PPSD) and Agricultural and Aquacultural Extension Center (AAEC)

PPSD and AAEC are two organizations under DARD being responsible for transferring innovation to farmers. PPSD has its station setting up in all districts. This PPSD system is officially responsible for governmental management on plant protection, plant quarantine, and crop cultivation technology transfer. Regarding the technology transfer, as a governmental agency, the PPSD system focuses on promotion of cultivation techniques such as seed treatment, fertilizer application, pest and disease control that support the state policies' implementation. For example, the PPSD system in Bac Lieu are currently promoting 'one must do and five reduction' (OMFR) using principle of Good Agricultural Practices (GAP) and 'the large-scale collective production' guided by MARD. All these packages of recommended techniques are developed based on Integrated Pest Management's (known as IPM programme) technical guideline and 'three reductions and three increases' introduced to Mekong Delta Region in the early 2000s. One advantage of the PPSD system is its application of participatory extension approaches. Since the early 2000s, the PPSD system has being approached by the IPM programme funded by FAO. This programme uses the Farmer Field School (FFS) approach which encourages interactions between facilitators and farmers and among farmers directly in their fields, mobilizing farmers' active participation, experience sharing, and innovation adoption. Due to the successes of this programme, it is integrated into the policy for promoting environmental-friendly rice production and being a national program. Benefiting from this national IPM program, participatory approaches are incorporated into the organizational culture and all most all staff of the PPSD system is using this approach. Adoption of these approaches obviously helps farmers to better understand and use the recommended techniques, increasing the diffusion of techniques in rice communities.

AAEC also has its stations setting up in all districts. Many provinces have extension workers operating in the commune area. This AAES system is officially responsible for increasing farmers' awareness about agricultural development policies and transferring technologies for farmers. This AAES system transfers technologies through 1) lectures accompanying with hand-outs, 2) technical training incorporating with demonstration models, 3) demonstration model and field evaluation day, and 4) broadcasting extension program in mass media. Generally, these extension methods are one-way communication, limiting farmers' active participation on the learning process. Due to the enforcement of the 'bidding mechanism' for

the extension public funding since 2010, many provincial AAES are challenged by lacks of budget for conducting extension activities.

Besides the funding from the central and provincial government, the PPSD and AAES systems are collaborating with development projects, NGOs, mass organizations, and private sectors to implement relevant extension activities. For example, these systems corporate with different development projects and NGOs in conducting technical trainings for farmers. The transferred techniques as well as cost norms are imposed by the projects, depending on their goals and objective of improved sustainable livelihood and environmental protection. Using the same way, these systems also carry out technical trainings and demonstration models ordered by plant protection chemicals, fertilizers, and seed companies. These corporations mainly serve the objective of advertising the companies' products and increasing the companies' profits.

The PPS and AAEC systems emphasise the need for a greater focus on technology transfer for commercial production. There is little concern about market and marketing issues. These systems assume that new technologies will spread out and reach other farmers, including poor smallholders, through demonstration and trickle-down effects. One of major limitations of these systems is their supply-driven approaches, promoting either innovations imposed by the Government or enterprises. These systems commonly introduced external-driven innovations, often ignoring indigenous knowledge and appropriated techniques to local conditions as well as farmers' demands. One example is the promotion of 'large-scale collective production' in many areas in CCCEP provinces. The Government invests in construction of infrastructures in order to support to collective production in the larger areas and adoption of synchronous technical packages. However, farmers also need the Government's support to access to market information, provide a clear orientation of export markets, to establish coalitions between rice producers and enterprises to avoid the low prices recently. These needs have not yet strongly addressed in the Governmental agenda for promotion of the 'large-scale collective production'. Furthermore, these systems often run after the quantity-oriented targets such as number of farmers trained, number of models demonstrated and ignore the quality-oriented indicators such as effectiveness of innovation adoption to households' income generation and sustainable livelihood. Due to this evaluation, extension is formalised for funding disbursement while many farmers involve only for subsidies from the Government. Human resources are in adequate both in quantity and quality aspects so the extension only approaches to limited number of farmers. Extension staff are specialised in plant production, while expertise in other fields like farm economics, and especial methodological expertise is lacking. Extension staffs also have insufficient knowledge of local production systems. The systems use subsidies as incentives to mobilize farmers' participation, leading to farmers' subsidy-oriented attitude to innovation and innovation adoption.

Mass organizations

Mass organizations such as Women's Union and Farmers' Union involve in extension work mainly for implementation of policy on 'socialization of extension' (*xa hoi hoa khuyen nong*). They get funding support from local governments and a part from national budget for extension. Their extension principles are based more on the exchange of knowledge rather than formal training. They organise training for their members in combination with their regular activities. These organisations have important social networks for the exchange of knowledge. However, these networks have not effectively used by the PPSD and AAEC systems. There are collaborations between the PPSD and AAEC systems and mass organizations when having the public funding allocated from the national extension systems. Thus, extension in these organizations is also formalised for funding disbursement.

Development projects and NGOs

Their extension work has been implemented through projects directly at local levels based on participatory principles. The local knowledge and conditions are incorporated into the whole programme implementation process to address local people's needs. They often corporate with local governments and their agents in implementing extension activities. Their extension often accompanies the following: institutionalising participatory planning, providing relevant technical, social and economic training to the poor, developing innovation with local community's participation, developing value chain production, and building capacity for local stakeholders.

These international organisations and NGOs have been successful, especially in improving training methodology and farmers' livelihoods. Nonetheless, successes have been achieved in relatively small pilot areas and at the grassroots levels and most of the achievements vanish after external support has ended. One of reason for this unsustainability is that most international development organisation and NGO programmes intensively financially invest to the pilot areas, much more higher compared to the government cost norms. Results of these projects are appropriated to farmer communities at the pilot areas; however, not many of these results fit to the Government's orientation and policies for agricultural development. Adoption and replication of these successes on a broader scale may require intensive resources that are too costly and not feasible for central and local governments. Another reason is that they either passively or not involve relevant public stakeholders. Ownership, thus, is not fully given to the government agencies. In some cases, ownership is strongly given to the government agencies through outsourcing contract mechanism. However, these projects do not have efficient facilitations to the governmental implementing agencies, and monitoring and evaluation during the implementation. Many government agencies use the projects' allocated funding to incorporate into implementation of their activities. It will be effective in increasing the diffusion of successes if these projects implement properly and have efficient monitoring and facilitations, avoiding the formalisation of collaboration and activity implementation. Finally, many projects do not intensively concerned and invested to policy advocacy. The three to five years implementation time frame, policy advocacy is a big challenge for them, especially under the political context of Vietnam.

Enterprises

These providers consist of input suppliers such as private input sellers, seed companies, plant protection chemicals, and rice processing enterprises. The input sellers provide both inputs (seeds, various types of fertilizers, plant protection chemicals) and relevant information on how to use these inputs to encourage farmers using their services. Input suppliers undertake extension activities to encourage the use of their products. Such extension is often in the form of demonstration models and seminars where farmers are invited to study various products and then distribute information leaflets. Input suppliers are interested in coordinating with the extension organisations in order to appear more unbiased. Rice processing enterprises provide extension services together by signing a 'farming contract' or 'product uses' with farmers. They often have their staff responsible of promoting "contract farming", adopting technology and directly conducting extension activities by their own mechanisms. These enterprises are actively and dynamically operating their business, approaching many different groups of farmers in many areas. However, their main concern is profits rather than contribution to farmers' sustainable livelihood and environmental protection.

Summary

As mention above, different actors in the rice innovation generation and transfer system employ different extension approaches for targeting their client groups with clear technical

aims (see Appendix 3 for more information). There are two main extension approaches: Top-down (or conventional) and demand-driven. The conventional approaches employed mainly by the public agencies focus on promoting technology for food security and agricultural modernization. These approaches base on the principle of transferring advanced techniques via demonstration models established among key farmers in order to prove their success. This is coupled with the use of input subsidies as an incentive for adoption. Contrary to these conventional approaches, the demand-driven participatory extension encourages farmers' voluntary and participation. A group of farmers gather to learn, share and experiment with production techniques on the field from the beginning to the end of rice growth cycle. Competent volunteer farmers are trained and supported to become farmer trainers, taking the role of local extension workers. New technologies are developed and tested by local farmers and inside local communities, with the support from technicians or researchers. These technologies can be widely diffused among farmers through formal and informal channels. It also aims to understand better the farmers' actual situation, to assess people's needs, and to prioritise the use of available resources.

The rice innovation generation and transfer system is operated under the 'collaborative mode' with the implementation and coordination of activities concentrated at the district level. Extension activities are organisationally very diverse with many government branches, community organisations, volunteer associations and farmer groups. In this diverse actor and approach system, the local government has overall control over extension activities in the district and in which funding comes primarily from public funds. This pluralism is encouraged with government funds, credit provision and other incentives. Rice producers easily assess to different resources of technical information and innovations. However, this leads to a strongly subsidy-oriented system, resulting in neglect of the development of service-paid extension functions, limitations in terms of financial and human resources, unclear client classification, and is production-oriented, reflecting the important potential in marketing and also in off-farm income. In many areas, farmers are confusing with received information and facing with difficulties in selecting the right techniques for adoption.

There are several issues need to be concerned in the upscaling of rice innovations. Firstly, farmers' conditions are diverse and only few farmers have better living standards and production conditions. These advanced farmers have favourable conditions for making substantial investments to technology and innovation adoption for commercial rice production. Secondly, poor and pro-poor farmers that lack of land and capital as well as access to markets cannot make sufficient investments to production, generating only low profits and efficiency. Hence, innovation transfer needs to be diverse in both technical, institutional, and market aspects and needs to be specified to each target group of farmers. Addressing diverse needs of different client group by diverse innovations will help to improve the effectiveness of innovation adoption.

Thirdly, farmers do not have adequate conditions and concerns about producing and maintaining good quality of commercial product. One critical requirement of commercial rice production is that farmers have to be aware of food safety standards and practice them accordingly in the production process. It means that developing and maintaining good quality products need to be carried out by farmers first. However, purchasing, storing, processing and marketing have not yet followed the tricky procedure in order to control, maintain, and improve the quality of products. Traders purchase different types of rice with different prices; but these different types of rice are mixed up with each other when transporting, preserving, processing and packing. Due to these practices, farmers unreasonably lose their profit, leading to their defensive reactions such as increasing yield and selling prices without a concern to the

quality of products. Thus, development of producing-processing-marketing coalition is a necessary condition for innovation adoption.

III.3 Seed and input supply system

Seed and input supply system consists of public and non-public organizations responsible for providing seeds, fertilizers, and plant protection chemicals to for farmers. Generally, private enterprises have larger market shares and provide more dynamic and diverse type of products and services to farmers. Providing seeds, inputs and accompanied services is done through the system of agents, from the first agent at the provincial level to the second, third, and fourth agent at district, commune and village level respectively. Currently, farmers easily access to different suppliers that provide diverse types of products. However, products that they can buy from these suppliers are non-uniform and unstable quality as well as the continuous increasing prices.

Regarding seeds, there are few intensive seed producers that have adequate conditions such as drying house, drying area, and warehouse for storing good seeds and maintaining their quality. Community-based seed production model has been used by many seed producers. This model helps to overcome the producers' constraint on limited land area. Seeds centres/companies sign contract with group of farmers or cooperatives, train farmers on seed production techniques, and buy seeds based on the agreed prices and amount. However, one limitation of this model is to ensure the uniform quality of seeds. In addition, seed production is not enough as assessment of market demand is not accurate. Seed demand is higher than that of supply, however, seed prices are expensive compared to afford of many rice farmers. Thus, farmers often buy a limited amount of registered seeds for multiplying seeds for the next seasons. Example from Bac Lieu shows that 40% of seeds for annual rice production is self-produced by farmers. Currently, producers mainly sell seeds directly to farmers as they do not have specified distribution system. Seeds, especially produced by the state seed centres/companies, are difficult to sell in the markets due to unstable quality and quantity, fluctuated prices depending on commercial rice prices in the markets, and mismatch with farmers' practical conditions and interests.

Regarding input supply, advantages of this system include having 1) stable resources providing diverse goods, 2) sale agent systems functioning from provincial to village level, 3) stable client systems, and 4) technical support systems integrating into the production and supplying process. One of the disadvantages is that many farmers cannot afford to pay directly when purchasing goods. It is common that this supply system sells to farmers and gets payment later when harvest come, leading to slow and/or difficult to retrieve capitals. Thus, sale agents often sell high prices to farmers in order to ensure their profits. Sale agents also sell same types of different products produced by different companies for having the promotion from these producers. Consequently, farmers also run after this promotion without consideration of the products' effectiveness and negative impacts to the environment and sustainable production. For a number of reasons, many farmers use wrong products or misuse of products. If no specific regulations managing these issues, it will be a big challenge to improve rice quality and to reduce input cost of rice production.

III.4 Market and marketing system

Rice marketing is carried out by a system of middlemen and traders, processing factories, rice exporting companies, and rice retailers in the domestic markets. Rice produced from Mekong Delta Region is mainly served the exporting purpose and a small ration sold for domestic consumption. Farmers easily sell rice through the middlemen and traders. They often sell at the form of raw paddy. Traders, with the support from local middlemen, buy rice directly in

the paddy fields and farmers are responsible for harvesting. Raw paddy can sell with higher price at the beginning and at the end of the harvesting season, when there is few raw paddies available. Often, at the middle of the harvesting season, the price is cheaper, raw paddy is more difficult to sell, and farmers are forced to sell with low price. This purchasing mode is convenient for farmers as they do not need to work on drying and storing rice. However, sometime this purchasing mode cause risks to traders if the rice is damaged rain, storm or/and other reasons. Sometime, farmers break purchasing agreement with traders if other traders offer a higher price or market prices is increased. Many farmers sell raw paddy with bad quality or do not maintain the quality properly when harvesting and transporting to traders' boats/junks. Therefore, traders recently use the signed contract/agreement with farmers in order to avoid the business losses and ensure the quality of raw paddy. Farmers also sell dry rice after drying and pre-processing and small amounts of seeds for others used for the next seasons. Selling dry rice requires more labour and financial investments in harvesting, drying and storage. Compared to raw paddy sale, the selling dry rice does not have a significantly higher price due to more investment and losses during the storing period. Moreover, selling dry rice is uncertain due to market fluctuation and farmers cannot predict precisely the market changes. Farmers also want to retrieve their investment quickly for re-invest for the next crop and it is difficult to do so when selling dry rice. Thus, selling raw paddy is more and more common in Mekong Delta Region.

The trader system can be divided into three main groups: 1) trader middlemen that buy rice products and sell to other rice traders; 2) traders that buy rice, husk and rub at processing factories, and sell to rice agents, exporters, and retailers; and 3) buy rice and deliver to large processing factories. Rice is mainly transported by boats and junks through the canal systems. Based on their network and modern communication technologies, trader system is regularly updated about market and price information. They also have strong network of farmers who become their regular providers. However, the trader system is also being influenced by the price and market fluctuation. Market share and price competitiveness is high among traders. They often do not register for their business that causes difficulties for governmental agencies in managing and controlling their business. As result, they also cannot access to the business support program funded by the Government. Traders also lack of capital and storage facilities for expanding and improving their business. Their business profits are often uncertain. Similar to farmers, the traders system does not concern much about maintaining and ensuring quality of rice when delivering to processing factoring or/and rice agents. They often mix rice that has low quality with rice that has high quality in order to sell with the price of high quality rice and to increase their business profits. This practice leads to low quality rice and to difficulties in managing and controlling the quality when selling to both export and domestic markets. Furthermore, traders do not buy rice products accordingly to the governmental tariff and guideline that ensure at least 30% profits for farmers. In addition, the Government's current calculation on production cost applied to the governmental tariff and guideline for 30% added value distributed to rice producers is not appropriated. Due to these reasons, rice farmers are facing with more difficulties to maintain and improve their sustainable livelihood.

With the traders' services, system of processing factories has relatively stable raw material supply and good networking practice and networks with traders and feed export companies. These networks help the system of processing factories access easily to transport facilitations and the information flow effectively and intensively within the relevant actors. Challenges for processing factories include the unstable quantity and quality of processed products due to a lack of the government tariff for commercial rice products, and poor quality of commercial rice products due to uncontrollable quality of raw material (raw paddy and dry rice).

Management and coordination of rice exportation in Vietnam is responsible of the Government. Decree 12/2006/NĐ-CP launched on 23/01/2006 provides general orientation and guidelines for managing and coordinating the Vietnamese rice exportation. MARD is responsible for forecasting the rice exportation tariff based on the surpluses from total productivity after the use for domestic consumption, for seeds, for animal husbandry, for industry and storage. In order to stable prices and limit the increase of rice prices in the domestic markets due to the increase of rice prices in the international markets, the Government has adopted the export taxes and export quota. The use of export taxes benefits to Government, while the use of export quota benefits exporting enterprises. In addition, export quotas apportion leads to the common practice of 'asking and giving mechanism', creating unfairness among exporting companies, especially between state-owned and private enterprises. The export quotas apportion, thus, does not create a fair play competition among rice exporters as well as optimal benefits for the Government and rice producers (Võ Thị Thanh Lộc và Lê Nguyễn Đoan Khôi, 2011). Rice exporters do not tie by resources and investments for developing raw material areas, processing technologies and storing facilities. Therefore, there are more than enough 'middlemen exporters' in the rice exportation. Most of Vietnamese enterprises focus on collection for exploration and stabilization of domestic market prices, while there are few enterprises seriously investing to long-term business development through developing and organizing owned raw material areas or establishing coalition with rice producers, processors, and traders in order to improve quality and develop trade mark. Moreover, lack of proactive action to the markets due to the low national reservation capacity, poor reservation facilities and quality, and poor product quality. Rice exporters cannot control quality as well as prices that trader's use. Strong competition among rice exporters and their heavy dependence on rice supply chain have created a rice value chain with many layers of middlemen, increasing transactions costs and losses as well as reducing rice quality and rice producers' profits. Vietnamese enterprises do not have adequate financial potential and resources to compete with foreign enterprises. If these constraints and shortcomings are not sorted out, export markets and opportunities will be taken by foreign enterprises.

III.5 System coalition and current trend in innovation adoption

In upscaling and adoption of innovations to rice production in Mekong Delta Region, it is impossible to focus only on techniques and separate them from supply of seeds and inputs, and rice market and marketing as analysed above. Thus, coalition between different nodes in rice value chain is necessary to ensure the sustainability and fairness of the whole chain. Currently, coalition in rice value chains in Mekong Delta Region is challenged by a number of issues. Firstly, the Government has not yet performed well its management and coordination functions. The Government emphasises investments to production through promoting technologies and relation between researchers and farmers. The Government's role in connecting farmers with enterprises is still weak. Secondly, the government-researchers-farmers coalition is strongly driven by the Government's orientation and policies for agricultural development and food security. Farmers are driven by these governmental interests that are not yet matched to the farmer demands for their livelihood. When having different interests and demands of relevant stakeholders are not met, the coalition is just for form's sake.

Thirdly, farmer-enterprise coalition is let loose without coordination from the Government. In a system operating under the Government's management and control like rice innovation system, lack of coordination and management from the Government will lead to the unbalance and mismatch in the system operation. More specifically, it is a mismatch between

one half of the system – innovation generation and transfer - operates under the governmental management while another half – innovation adoption and market – operates under the market mechanisms. Fourthly, it is enterprises' characteristics and roles in rice innovation system. Enterprise sector encompasses both state-owned and private ones. While the Government give priority to the development of the state-owned enterprises, the private enterprises are posited in the difficult situation for their balance business growth that can help to balance the development of the whole enterprise sector. The Government's policies favour the state-owned enterprises while there is no strict management and control to export prices and quotas allocated to the state-owned and private ones. This is one of root causes for the lack of coalition in the rice innovation system in Mekong Delta Region.

Under this context, rice farmers in Mekong Delta Region have adopted many changes to respond to the unfavourable conditions. Regarding organization of production, farmers tend to adopt more flexible farming systems. They adjust their farming systems among sole shrimp system, rice-shrimp system, rice+ giant prawn - shrimp ones or among 3 rice crops, two rice crops, and one of two rice crops – one winter crop in order to increase income and adjust to the changing climatic and physical conditions.

Responding to the current unfavourable market and marketing conditions, many farmers have adopted defensive changes. For example, as mentioned above, traders often force farmers to sell with lower prices, especially for the high-yielding type of rice, compared to good quality type of rice. After purchase, traders then mix these different types of rice together in front of farmers they just bought rice from. Seeing these practices, farmers recently mix up high-yielding and good quality varieties when sowing seeds in order to increase the total productivity and income. They argue that by mixing varieties, they can finally increase their income without harming to the market as if they do not do that, others will do so. Moreover, farmers argue that mixing varieties will help to limit rice falling down when having heavy rains and strong winds as rice with stronger stem can support one with weaker stem.

Regarding techniques, farmers are keen in adopting techniques and products such as micro-fertilizers and chemicals that can help them maximizing productivity. Farmers also adopt single techniques or/and packages of cultivation techniques such as IMP, three reductions and three increases recommended by PPSD and AAEC systems. However, partial adoption is commonly seen in farmers' practical production. Farmers select only few techniques that are appropriated to their farming conditions and practices such as reduction of fertilizers and plan protection chemicals. When adopting to their farming practices, farmers have made further adjustments based on their practical farming conditions and experiences.

One example is the line sowing technique aiming for reducing amount of seeds used, limiting the growth of weeds, and creating easier condition for caring work. Not many farmers use line sowing technique; instead they still broadcasting by hand but reduce the amount of seeds used from 3 % to 40% compared to the normal amount used before. Another technique is the AWD method; farmers instead of four times pumping out water as recommended, they pump out water two to three times, depending on water availability in the winter-spring season. Specially, one farmer shared the experience that he drainages water out five times, including one time when rice brushing in order to limit the growth of ineffective buds and preventing mousses eating rice as they can be able to find snails in the dry paddy fields. AWD adopted farmers also do not use the plastic pipe for measuring water level. Instead they dig a hole in their paddy fields for measuring water level or make observations on soil surface in order to identify time for pumping water. Another example is the reduction of plant protection chemicals used aiming for reducing cost and limiting negative impacts to rice quality and environment. Farmers mix up different types of plant protection chemical, or plant protection

chemical with micro-fertilizers and growth simulation substances in order to reduce the spraying time. Many farmers do not want to take risk of heavy financial and labour investments at the various first stages of rice production, they return to the old farming techniques: sowing large amount of seeds without fertilizer application in the early stage of rice growth, and making heavy fertilizer application at the later stages to ensure high yield and good harvest.

With these trends of defensive action, innovation adoption is not sustainable in many aspects, harming to quality of commercial rice products and food safety. Root causes of these behaviours in innovation adoption include 1) the loose of market and quality control and management, and 2) yield-oriented competition among farmers. Rice farmers often compete with each other about yield rather than profits from investment. Due to this yield-oriented competition, many farmers do not want to share techniques they successfully apply to other farmers. Many farmers are conservative to new techniques as they strongly believe to their own experiences. May farmers take advantage of 'subsidy' as a condition for adopting innovations. Adoption takes place only when having subsidy and support from the Government. These subsidy-driven thought and behaviours challenge the upscaling of innovation in farmer communities. Moreover, adoption of innovations can help to increase yield and quality of products; but also the adoption requires intensive labour and financial investments as well as high cultivation level. Meanwhile, there is no incentive from rice markets and marketing to encourage farmers' innovation adoption. Thus the loose of quality control and the lack of incentive to promote the production of good quality products discourage farmers in adopting innovations for good agricultural practices.

IV. Appropriateness of the climate change-oriented rice innovations in CCCEP provinces

Since 1990s, rice innovation system has introduced many innovation and packages of innovative techniques to rice farmers in Mekong Delta Region. Generally, the introduction of these innovations serves the Government's orientation, agenda and policies for national food security and agricultural development. Intensive rice production had been commonly practiced before 2000, as the result of the food security policy of the government. Since 2000, with the promotion of agricultural diversification by the government, farmers have shifted intensive rice production to shrimp farming alone or in the rotation with rice to improve farm income. The Vietnamese government has released the national strategic plan to respond to climate change (MONRE, 2008). The Vietnamese Ministry of Agriculture and Rural Development (MARD) has released an action plan to respond to climate change for agricultural and rural development in the period of 2008-2020 (MARD, 2008). Accordingly, major mitigation measures include: (1) development of large-scale salinity management structures (i.e. dikes, sluices and reservoirs), (2) development of small-scale irrigation infrastructures (i.e. canals, sluices, pumping stations), (3) development of adaptive farming technologies (i.e. crop varieties, farming techniques and farming systems).

It is obviously seen that eco-system in the Mekong Delta Region has changed remarkably. It is evident throughout different periods is that there is no single technique can help to solve problems farmers are facing in the current situation of rice production. When innovation are introduced, farmers either do not adopt or partially adopt some selected techniques or/and pick up only the basic principles of these introduced innovation. First reason lead to the selective innovation adoption in farming communities is innovations' appropriateness. Many innovations have technical advantages to meet the requirements and targets set in the Government's policies. However, adoption of these innovations requires significant changes of the existing farming cultivation and practices, and big labour and financial investments. It shows that many innovations are not appropriated to farmers' practical conditions, experiences, investment capacity, and livelihood strategy as well as the location-specific ecosystem.

The second reason is farmers themselves. Farmers' thought is based on the practical observation and practices. They only change their behaviours when the obviously see the effectiveness of innovation, the convenience in the use of these innovations, and the advantages in income generation as well as ensure their sustainable livelihood. If these outcomes are not approved by their own practices, the innovation adoption will stop at the testing phase if having subsidy from the Government.

The third reason is the innovation transfer approaches and methods. As analysed in the Section III.2, the main innovation transfer approach is top-down one with one solution for all farmers and all areas, and the main extension methods are lecture and one-way communication with limited practical activities. These transfer approaches thus have not yet introduced appropriated innovations that fit to farmers' condition and needs.

The fourth reason is the Government's policies and management. The Government's policies rapidly changes overtime without the consistent and long-term view for development. The later development, hence, do not heritage the results from the previous ones. Moreover, the Government intensively emphasise technical investments, while lack of concerns to development of physical and institutional market infrastructure for market economy, and mechanism for building coalition between producers and marketers. Due to these

circumstances, farmers are acting defensively to innovation adoption as analysed in the Section III.5.

Within the context of Bac Lieu Province, climate change-oriented rice innovations include 1) Alternative Wetting and Drying incorporating into 'one must do and five reductions', 2) salt tolerant rice varieties for rice-shrimp areas, and 3) large-scale collective production. In this report, assessment of appropriateness of these three innovations uses indicator set derived from the sustainable livelihood and livelihood strategy framework developed by Farrington et al., (1999). Specific indicators include:

- *Technical appropriateness*: it is the degree to which an innovation is perceived as being better than the idea it supersedes, as consistent with the existing values, past experiences and the needs of potential adopters, as relatively difficult to understand and use, may be experimented with on a limited basis, and is visible to others. With these climate change-oriented innovations, technical appropriateness is possibility to help rice resisting to pest and disease, and salt intrusion as well as easily to apply and possibility to help to increase yield.
- *Appropriateness to human capital:* Human capital is the stock of education, competencies, knowledge, social and personality attributes, including creativity, embodied in the ability to perform labour to produce economic value. In the innovation adoption, appropriateness to human capital is the degree of an innovation to fit in farmers' cultivation practices and innovative capacity when using innovation.
- *Appropriateness to social capital*: Social capital is the expected collective or economic benefits and values derived from the preferential treatment and cooperation between individuals and groups based on networks of relationships, reciprocity, trust, and social norms. For example, the web of social relationships and ties individual actors to increase personal access to information and skill sets and enhanced power; shared norms or values that promote social cooperation, instantiated in actual social relationships. In the innovation adoption, appropriateness to social capital is possibility of an innovation to fit in the rice societies' cultural characteristics such as the collaboration and competition among farmers, the exchange ideas and information in the community, and individual interests in collective production.
- *Appropriateness to natural capital*: Natural capital is the stock of natural ecosystems that yields a flow of valuable ecosystem goods or services into the future. For example, a stock of the mineral, plant, and animal formations of the Earth's biosphere when viewed as a means of production of oxygen, water filter, erosion preventer, or provider of other ecosystem services. In the innovation adoption, appropriateness to natural capital is possibility of an innovation to match with local climatic, and meteorological conditions, and farming systems...
- *Appropriateness to public capital*: Public capital is the aggregate body of government-owned assets that are used as the means for private productivity. In the innovation adoption, appropriateness to public capital is possibility of an innovation to fit in the existing infrastructure conditions such as land, electricity, road, canals and dyes, irrigation…
- *Appropriateness to financial capital:* it is possibility of an innovation to match with farmers' financial capacity to buy seeds and inputs, and to rent machines, labour and land…
- *Appropriateness to sustainable livelihood*: it is possibility of an innovation to limit the risk occurred when farmers adopting the innovation, to increase farmers' income and sustainable use of capital, and to avoid vulnerability to farmers' livelihood.

IV.1 Alternative Wetting and Drying Method integrating into 'One Must and Five reductions'

Alternative Wetting and Drying Method (AWD) has been introduced by International Rice Research Institute in cooperation with Vietnamese research institutes to Mekong delta Region, especially to An Giang province. In Bac Lieu, the Rice Component, GIZ Bac Lieu in corporation with DARD and its agencies has introduced AWD to farmers at pilot areas. Bac Lieu DARD and its agencies have integrated AWD into technical package so called 'One Must and Five reductions' (OMFR) promoted by MARD since 2008. OMFR recommends that farmers must use certificated seeds, and reduce amount of seeds, fertilizers, plant protect chemicals, water, and losses after harvesting. When being integrated into OMFR, AWD becomes major message and is comprehensively explained and trained for farmers. The appropriateness of AWD was assessed by three groups of farmers participating in the pilot trials in Bac Lieu province using indicators in the appendix 4. Results are summarized in table 2.

Table 2. The appropriateness of AWD

Category of appropriateness	Appropriateness	Inappropriateness
Technical appropriateness	• Reducing the number of pumping times compared to before • Simple, easy to try, to observe, and adopt • Saving water, fostering the growth of root system, reducing pests and collapse	• It is not necessary to use plastic pipe for measuring water level as it can be replaced by digging a hole in the paddy. • It is not always 4 water pumping-in times and 3 water pumping-out times as water availability is varied
Appropriateness to human capital	• Matching with farmers' cultivation practices and innovative capacity, especially at intensive rice production areas	
Appropriateness to social capital	• Fitting into collective action culture and community-based work exchange	
Appropriateness to natural capital	• Fitting into winter-spring crop as AWD can save water when this crop is facing with water shortage	• Not applicable to summer-autumn and autumn-winter
Appropriateness to public capital	• Matching with large field areas having stable boundary and irrigation system.	• Difficult to apply to the uneven paddies and unstable boundary • Difficult to apply to the large yield areas without having irrigation system
Appropriateness to financial capital	• Fitting into farmers' financial and labour capacity as AWD helps to reduce labour and water pumping cost	
Appropriateness to sustainable livelihood	• Increasing income through reducing cost and increasing yield • Low economic risk and livelihood vulnerability when adopting	

General assessment shows that AWD has high technical, natural, social, human, physical, and livelihood appropriateness at the intensive rice productions areas, especially in the winter-spring season. Example in Bac Lieu shows that DARD and its agencies in the rice innovation

system have integrated AWD into their extension activities such as development of large-scale collective production models and training on OMFR techniques for farmers. Recently, integration of AWD and OMFR has been used by DARD its agencies as technical package transferring to farmers participating in large-scale collective production demonstration models. Almost all farmers participation in AWD demonstration models established in 2012 are applying AWD again in winter-spring 2013. There is spreading impacts of AWD from 2012 model farmers to other farmers in their communities.

In order to upscale AWD, it is necessary to use an effective institutional arrangement that can avoid the formalism commonly practiced in the existing rice innovation systems. More specifically, DARD and its agencies continue to integrate AWD into other relevant extension programs and activities funded by the Government's budget. However, the institutional arrangement of upscaling needs to be changed from the top-down to more demand-driven approaches – 'farmers to farmers' or farmer-led extension in order to meet farmers' demand. DARD and its agencies such as PPSD and AAEC institutionally develop 'voluntary farmer extension network' at commune and village level through 1) selection of key farmers voluntarily participating into the network, 2) technical and method training for networks' members, 3) facilitating 'voluntary farmer extension network' developing their extension plan based on farmers' needs, and 4) assisting 'voluntary farmer extension network' to implement their extension plan. In addition, it also needs to concern about creation of market incentive for farmers' innovation adoption. When adopting the integrated AWD-OMFR, farmers consider it as a technical package of GAP. They have to invest more labour as the package includes more complicated techniques. Quality of product is expected to be improved. However, market price and marketing for these GAP-products are not different with non-GAP products. This lack of market incentive might be a factor discouraging farmers' adoption of the integrated AWD-OMFR.

IV.2 Salt tolerant rice varieties

Breeding and selection of salt tolerant rice varieties (STR varieties) is one of the national program implemented in Mekong Delta Region funded by the Government. A number of STR varieties have been created and selected by Vietnamese research institutes and universities such as OM10252, OM6677, OM8105, OM8104, OM5924, OM5951, OM5629 … In 2012, The Rice Component, GIZ Bac Lieu Project together with Bac Lieu DARD has tested two STR varieties (OM6677 and OM5629) in some salt intrusion rice-shrimp areas. Assessment of these STR varieties' appropriateness is presented in table 3.

General assessment shows that OM5629 has advantages in higher yield and higher tolerance to piricullariose as compared to OM6677. However, comparing with other local varieties, these two varieties do not have advantages in terms of tolerant capacity to salt, flood, collapse, and pest and diseases. Moreover, many farmers participated in the 2012 testing trials did not have harvest, especially with OM6677. One reason is due to the unfavourable weather conditions of drought at the seed sowing time and high humidity at the last period of rice growth. Another reason is that STR trial farmers did not properly apply the cultivation techniques and make adequate investment.

In the coming years, it should be continued with testing OM5629 in areas that have highly salt intrusion level in order to assess its salt tolerant capacity and yield. It is necessary to train trial farmers with cultivation techniques using demonstration model so that farmers can apply directly to their paddies. Moreover, it should be continued to look for and test other STR varieties in areas with the highly salt intrusion level.

Table 3. The appropriateness of OM6677 and OM5629

Category of appropriateness	OM6677		OM5629	
	Appropriateness	**Inappropriateness**	**Appropriateness**	**Inappropriateness**
Technical appropriateness	• Short growth period compared to local varieties • Better tolerant to drought	• Lower salt tolerant capacity compared to local ones • Lower tolerant capacity to collapse, pest and diseases compared to local ones	• Short growth period compared to local varieties • Better tolerant to drought and piricullariose	• Lower salt tolerant capacity compared to local ones
Appropriateness to human capital		• Requesting the application of a comprehensive cultivation package that may be too complicated compared to farmers' experiences in rice-shrimp areas		• Requesting the application of a comprehensive cultivation package that may be too complicated compared to farmers' experiences in rice-shrimp areas
Appropriateness to social capital		• New varieties are a sensitive issue with rice communities. Many farmers do not want to share information about new varieties		• New varieties are a sensitive issue with rice communities. Many farmers do not want to share information about new varieties
Appropriateness to natural capital	• Fitting in the rice-shrimp since it has short growth period		• Fitting in the rice-shrimp since it has short growth period	
Appropriateness to public capital	• Fitting in farm areas that have irrigation systems providing 6 months with fresh water	• If there is no irrigation system for providing fresh water during 6 months, it will be no harvest	• Fitting in farm areas that have irrigation systems providing 6 months with fresh water	• If there is no irrigation system for providing fresh water during 6 months, it will be no harvest
Appropriateness to financial capital		• High economic risk when sowing based on inaccurate cropping calendar		• High economic risk when sowing based on inaccurate cropping calendar
Appropriateness to sustainable livelihood		• High economic risk and vulnerability due to its poor tolerant capacity to salt, flood, collapse, and pest and diseases	• Having high yield potential	• High economic risk and vulnerability due to its poor tolerant capacity to collapse

IV.3 Large-scale collective production

In Vietnam's practical agricultural production in general and commercial rice production in Mekong Region in particular, it has been long lasting of the non-coordination value chain. More specifically, seed and input supply is divided into many layers with many middle actors creating high transaction cost. The Government's policies are general and its authorities' and researchers' recommendations to farmers are general too. Farmers produce rice based on their experiences and capacities. Since 2008-2009, MARD has been developed and promoted 'Large-scale Collective Production' (LSCP) mode to Mekong Delta Region in order to overcome these problems in rice production. The LSCP aims for 1) reducing production cost as low as possible and generating maximal profits for farmers and 2) ensuring the stable provision of high productivity with good quality for export in order to improve rice-related enterprises' business performance. Assessment of LSCP's appropriateness is presented in table 4.

General assessment shows that the LSCP is appropriated to strategy for commercial rice production. It is right direction for the future. However, this production mode is not appropriated to the existing production systems in Mekong Delta Areas in terms of technical, human, social, natural, public and livelihood aspects. Furthermore, the development and promotion of the LSCP is strongly driven by technical and infrastructural supports while it is 'an institutional innovation' that tries to change the way to organize rice production from subsistent individual to commercial collective one. These practices lead to the failures of this institutional innovation in many pilot areas.

Thus, it is not recommendable for upscaling this institutional innovation now as the upscaling will be a formalized trend which will not be accepted by the practical production systems. It could be further tested only in areas that have appropriated social, natural, human and infrastructural conditions as well as rice-related enterprises' interest in coalition with farmers. Continuing testing this production mode to consider to the following issues:

- *The government management:* The governmental agencies from central to provincial need to drastically corporate in implementing what are pledged with farmers and rice-related enterprises. To successfully develop this production mode, the Government's local agricultural agencies need to take lead forming their appropriated management infrastructure and in planning for production based on farmers' practical needs and conditions. The Government's investments must be effective to right places and in the right time, avoiding the use of LSCP's investment for hunger elimination and poverty reduction as happened in many areas now. It is necessary to enforce policies for rice-related enterprises taking part in providing inputs and services as well as marketing for rice produced by the LSCP. One regulation could be, for example, issuing quota for rice-exporter enterprises based on the areas that enterprises pledge to buy from farmers in the LSCP
- *Rice producers:* changing from subsistent individual to commercial collective production is the prerequisite condition for participating in the LSCP. LSCP farmers need to aware about and practice accordingly that ensuring quality and pledging product provision to enterprises is critical to develop and maintain LSCP. Farmers, then, need to improve their cultivation techniques as well as self-consciously abide by standards of the commercial production.
- *Rice-related enterprises:* One sufficient condition for LSCP's successes is the strong coalition between farmers and rice-related enterprises in production and marketing. Without investments from these enterprises, it is difficult for the LSCP to be successful as implementation of LSCP needs rice-related enterprises take responsibility for

marketing. A higher level is that these enterprises provide a package of services including supplying seeds and inputs, technical training for farmers, providing technicians assisting farmers, investing in postharvest techniques and storing facilities, and buying rice from farmers based on market prices. Agreement between LSCP farmers and enterprises needs to be specified with what and how seeds need to be used and criteria for purchased products.

Table 4. Appropriateness of 'large-scale collective production'

Category of appropriateness	Appropriateness	inappropriateness
Technical appropriateness	• Fitting in the existing innovations being introduced to rice communities such as in timely sowing seeds, 'three reductions and three increases' technical package, 'one must do and five reductions' technical package; mechanization of land preparation and harvesting	• More complicated compared to the existing individual production mode • Requiring uniform and high intensive cultivations level in all household participants
Appropriateness to human capital		• Inappropriate to individual production mode with independent decision making
Appropriateness to social capital	• Fitting in areas where farmer groups or/and cooperatives have been formed	• Not fit to majority group of farmers' interests in individual-drive production • Not fit to farmers' interest and practices of diverse techniques and varieties
Appropriateness to natural capital	• Appropriate to rice production under the context of climate change impacts, especially increasing salt intrusion	
Appropriateness to public capital	• Fitting in the existing conditions including investment from enterprises in storages and processing facilities • The Government invests in dyke system surrounding large-field	
Appropriateness to financial capital		• Requiring higher labour and financial investments
Appropriateness to sustainable livelihood	• Has high positive social and livelihood impacts as farmers are not forced to sell their lands to others, • Farmers own their paddy fields and are equal in innovation adoption as well as profits from their production	• High economic risk and vulnerability due to the marketing issues

V. Strategies for upscaling climate change-oriented rice innovations in CCCEP provinces

V.1. Necessary conditions for successfully upscaling rice innovations

The above analysis about current situation of rice production, capacity and avaibalibe resources of rice innovation systems, the appropriateness of innovation points out a number of necessary conditions for successfully upscaling appropriated innovations. These conditions are as following:

- *Appropriateness of new varieties and innovations*: Technical appropriateness to the existing techniques is a condition to attract the first impression from farmers when knowing about innovations, leading to innovation adoption. The technical appropriateness is also a condition for attracting other farmers' interests, creating the spreading effect in the local communities.
- *Infrastructures:* Water and cropping calendar are two important factors for cultivating paddy rice under the climate change impacts as they determine yield and productivity harvested. Thus, systems of dykes, culverts, irrigation canals that can sufficiently provide fresh water is another condition for adoption of climate change-oriented rice innovations. For intensive rice cultivation areas, the systems must be capable to provide fresh water suitably and flexibly to changeable conditions caused by climate change. For rice-shrimp areas, the systems need to ensure the supply of 6 month fresh water, 6 month salt water. In addition, development of high accurate cropping calendar and timely inform farmers can reduce the economic risk, encouraging farmers' investment.
- *Farmers' investment:* Farmers' willingness and capacity to invest to innovation adoption are factors influencing further adoption. Innovations that have high technical appropriateness but cannot be successfully diffused if the application requires financial, labour and time investment and innovative competences that are over farmers' capacities.
- *Upscaling approach:* Transfer approaches determine the nature of innovation and amount of information that farmers can absorbed. With the current top-down approaches, many innovations serve policies' objectives, but do not meet farmers' needs. Farmers then have to re-innovate innovations to fit them into their conditions. In addition, transfer methods are often one-way communication and propaganda, negatively influence farmers' understanding and innovation adoption. Changing from top-down to more participatory approaches is necessary for successful upscaling innovations.
- *Market and marketing:* Farmers can increase paddy yield and quality of by adopting GAP innovations. Nevertheless, if market prices for GAP products are not higher compared to the non-GAP products, farmers will reluctant to adoption of innovation. Thus, limiting market risks and price vulnerability is necessary for encouraging farmers' innovation adoption.
- *Corporative culture*: Changing farmers' subsistent individual production and yield-oriented competition is a condition for spontaneous diffusion of innovation in rice communities. In order to change these behaviours, promotion of collective production and corporation is necessary for strengthening sharing and collaborative cultures in innovation adoption.
- *Government's policies and management*: Under the context of 'market economy under socialist guidance' like Vietnam, the Government's steering and guidance is

indispensable. Thus, with appropriate innovations, having Government's support for is favourable element for successful upscaling. With support, the Government will issue policy to promote innovations. However, to avoid the formalized trend like the case of promotion of LSCP, the Government needs to have specific mechanisms in order to 1) organize production based on principles of value chain concepts for ensuring reasonable value distribution among actors involve and livelihood for rice farmers, 2) develop a transferring market competition, 3) support the coalition between farmers and rice-related enterprises, and 4) provided specific institutional framework for local governments to optimal mobilize their roles and proactive in selecting appropriated innovations matching with farmers' needs.

- *Participation of enterprises:* Involvement of enterprises in upscaling innovations is a sufficient condition to ensure marketing products for farmers. To encourage enterprises' participation, it is necessary to connect their direct benefits with farmers' innovation adoption. By doing so, coalition between farmers and enterprises will be sustainable, positively benefiting upscaling innovation.

V.2 Proposed strategy for upscaling climate change-oriented rice innovations to CCCEP provinces

Principles and approach

Proposed strategy for upscaling climate change-oriented rice innovations to CCCEP provinces is developed based on principle of 'addressing common interests of actors involving in rice innovation systems'. There are three major groups of actors participating in rice innovation systems as illustrated in figure 3a. Each actor group has its own roles and interests. However, there are still some common interests that can be a basic for recommendation of demand-driven/participation approaches to upscaling innovations.

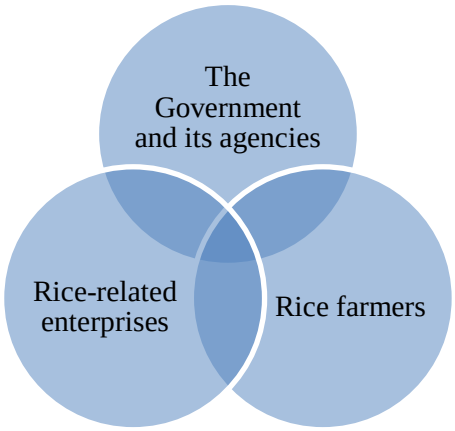

Figure 3a. Current approach to upscaling appropriate climate change-oriented innovations

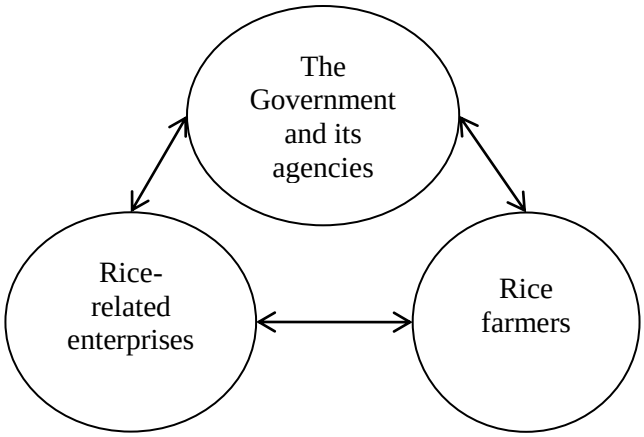

Figure 3b. Future Current approach to upscaling appropriate climate change-oriented rice innovations

The first actor group is The Government and its agencies such as MARD, DARD, PPSD and AAEC, research institutes and universities. They take responsibility for implementing the Government's direction and policies for food security and rice production. The Government's current direction is to maintain the Vietnamese export position in the international rice markets. Acting from this perspective, this actor group is interested in the development of large-scale production with the Government – researchers – farmers - enterprises coalition, use of intensity cultivation techniques for increasing yield and areas of the third rice crop, improvement of infrastructures to respond to climate change in Mekong Delta Region, and

development of ‘new countryside’. Beside these interests from the central Government, local governments also want to take advantages of their location-specific strengths and opportunities to upgrade and improve the existing farming systems. After many decades having been trying with many new crops, animals and farming systems, local governments really want to have a more sustainable development, depending on the local potentials and conditions. This interest is started from the local government and farmers’ needs.

The second actor group is rice farmers and their communities. Their interests are relatively diverse, depending on their economic conditions, ecosystem, and cultivation level. Their general need is to approach to innovations that are appropriated to their practical conditions, and cultivation experiences and level. Adoption of these innovations must benefit their likelihood such as more income, improved food security, increased well-being, more sustainable use of capital, and reduced vulnerability. Regarding poor households and households leaving in the remote areas, their interest is how to maintain and improve their livelihood. Regarding rice-shrimp households, their interest is how to cultivate rice with good harvest and not influencing to shrimp crop. Regarding medium and better-off households at intensive rice cultivation areas, their interests are how to increase yield, to reduce cost, to ensure sustainable profits, and to become rich by rice production. These different types of households’ common interests are appropriated innovations that are easy to apply and can ensure yields and harvest as well as stable market and marketing that are less risky.

The third actor group is rice-related enterprises, including state-owned and private ones. Their interest is their profits generated from supplying seeds and inputs, and market and marketing for rice products. Common phenomenon is that many enterprises do business for short-term profits while ignoring long-term business investment for the future development. There are some enterprises that are really working for their long-term business development such as An Giang Plant Protection Company. Despite having long-term or short-term vision of business development, rice-related enterprises are interested in having stable raw material sources with good quality and quota for exportation to ensure their profits.

Hence, the common interests of these three groups of actors are: 1) investments to commercial rice production under the climate change condition in Mekong Delta Region, 2) development of stable market and prices that can ensure reasonable profits for involving actors, and 3) coalition among actors in order to ensure the sustainable commercial rice production. Under the context of ‘market economy under socialist guidance’, the feasible strategy for successful upscaling climate change-related rice innovation to CCCEP provinces needs to develop based on this base of common interests. This ‘common interests’ approach help to initially satisfy relevant actors’ needs that fit well to the current political, social and economic circumstances. In the future, the strategy for successful upscaling climate change-related rice innovation to CCCEP provinces may change from ‘common interests’ to a more ‘interactive’ approach as illustrated in figure 3b. In this ‘interactive’ approach while the sectors are interacting they are maintaining their current structures and interests and co-operating toward achieving their common and separated interests. However, this approach can only be suitable to the future when market takes its roles in determining the actors’ coalition.

Overall and Specific objectives

Based on the condition and approach mentioned in the previous sections, overall and specific objectives of upscaling strategy are presented in figure 4.

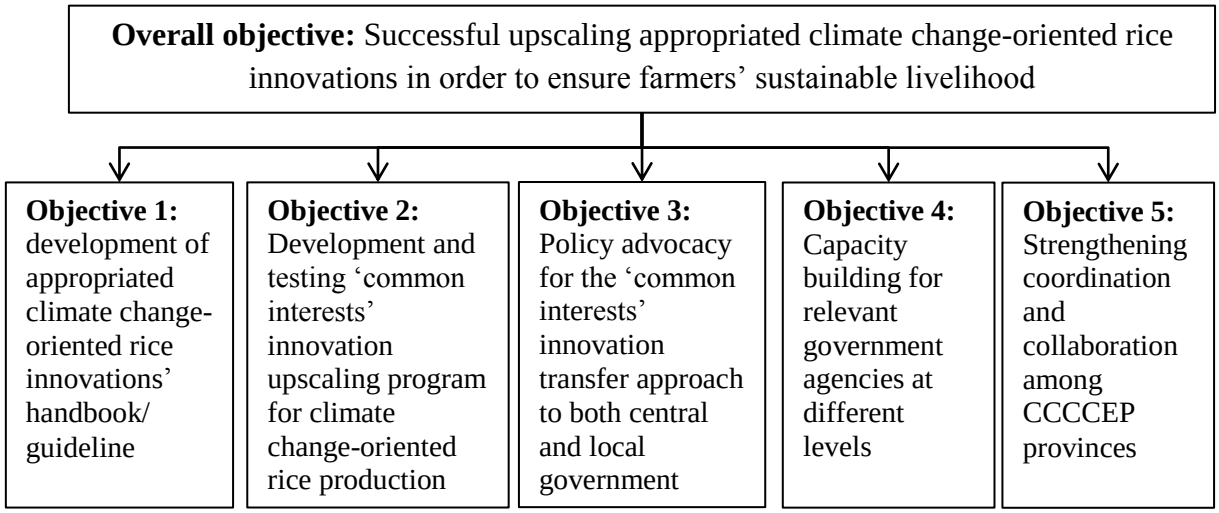

Figure 4. Strategy for upscaling appropriated climate change-oriented rice innovations to CCCEP provinces

Objective 1: development of appropriated climate change-oriented rice innovations' handbook/guideline/document

Operational principle:

1. Assessment of appropriateness of climate change-related rice innovations needs to use the comprehensive set of indicators presented in the Section IV.
2. Selection of appropriate climate change-related rice innovations needs active participation of relevant stakeholders such as farmers, enterprises, researchers and developers, and central and provincial governmental agencies in order to stimulate their ownership and to ensure the satisfaction of their common interests.

Key activities:

- Investigating and documenting climate change-related rice innovations (i.g. STR varieties, cultivation techniques, postharvest technologies, organization of production, etc.) that have been successfully developed and tested by research institutes and universities, development projects and NGOs, enterprises in corporation with DARD, and farmers and their communities in Mekong Delta Regions.
- Assessing appropriateness of these innovations to natural, social, economic and infrastructure conditions of specific rice farming systems.
- Selecting appropriate climate change-related rice innovations and developing 'smart rice cultivation innovations toward climate change impacts' with the active participation from National Agricultural and Aquacultural Extension Center (NAAEC) and AAEC, Plant Protection Station (PPD) and PPSD, DARD, and rice farmers.

Objective 2: Development and testing 'common interests' innovation upscaling program for climate change-oriented rice production

Operational principle:

1. Development 'common interests' innovation upscaling program for climate change-oriented rice production needs to follow local demand-driven approach in order to stimulate local stakeholders' proactive selection of innovations and planning for feasible upscaling activities.

2. Application of participation or demand-driven extension approaches in order to promote farmers' voluntary participation, ownership and innovative capacity.
3. Encouragement of co-investment and proactive corporation among relavant stakeholders at different levels.

Key activities:

- Assessing effectiveness of the existing extension methods and approaches such as conventional methods, mass media extension programs, participatory extension approaches.
- Investing and assessing effectiveness of the existing farmers-enterprises coalition/partnership in rice production in Mekong Delta Region.
- Developing and testing the 'common interests' innovation upscaling program for climate change-oriented rice production. The 'common interests' innovation upscaling program should starts from common interests among involving actors of the local government and its agencies, farmers, and rice-related enterprises. Regarding methodological aspect, this program can use or adopt IMP FFS extension approaches that have been applied in Vietnam since the early 2000s. In addition, the program should address and incorporate the development of farmers-enterprises coalition in order to ensure sustainable innovation adoption.
- Establishing 'voluntary farmer extension network' at commune and village level for assisting extension system in implementing the 'common interests' innovation upscaling program with the role of 'farmer trainers' (see more details in recommendation for upscaling AWD in Section IV.1).
- Monitoring and evaluation, and documentation of lesson learnt for objective 3 – policy advocacy.

Objective 3: Policy advocacy for the 'common interests' innovation transfer approach to both central and local governments

Operational principle:

1. Approach to and from multi-stakeholders including farmers and their communities, local and central governments.
2. Maximizing mobilization ownership and active participation of local governments' and its agencies'.

Key activities:

- Documenting the 'common interests' innovation upscaling program and results from the testing phase based on outcomes from objective 1 and 2.
- Sharing and recommending the programme for NAAEC and MARD.
- Sharing and recommending the programme for other provinces
- Transfer the program including technical guideline, extension approaches and institutional arrangement to provincial and central systems.
- Recommending collaboration mechanism among voluntary extension actors such as Women's Union, Farmers' Union, development project and NGOs, and others in upscaling the program.

Objective 4: Capacity building for relevant government agencies at different levels

Operational principle:

1. Selection of right target groups and addressing their training needs towards the long-term use and the change of organizational systems.
2. Demand-driven approaches are the first priority in capacity building for rice innovation systems in Mekong Delta Region.

Key activities:

- Selecting right target groups for capacity building such as young staff at district level.
- Building capacity for local governments on organizing rice value chain production, including 1) value chain concept and how to organize production based on value chain principles, 2) developing socio-economic development plan based on value chain coalition under the climate change impacts, 3) developing farmers-enterprises coalition in rice production and innovation transfer, etc.
- Improving extension system's capacity and competence in :1) demand-driven extension approaches, 2) economic management and market analysis, 3) effective monitoring and evaluation of extension services, and 4) Knowledge on salt intrusion and rice' tolerance mechanism, etc.
- Improving knowledge and understanding about climate change: 1) climate change-oriented information analysis, 2) GIS, etc.

Objective 5: Strengthening coordination and collaboration among CCCCEP provinces

Operational principle:

1. Institutional coalition is crucial in strengthening coordination and collaboration among CCCCEP provinces. If over-using technical aspect in in strengthening coordination and collaboration, the unfair competition and formalized corporation might be occurred.
2. Corporation among CCCEP provinces needs to base on 'bottom-up' principles, starting from common interests and achievements.

Key activities:

- Developing program-based implementation approach applicable to all components in CCCEP program.
- Establishing the component's organizational and operational structure ensuring the vertical coalition within component in the program and the horizontal coalition among different components at the provincial level.
- Establishing CCCEP monitoring and evaluation system, and reporting and feedback channel.
- Organizing regular coordination activities.
- Identifying mechanisms for promoting corporation among CTA and CCCEP provinces.
- Identifying roles and responsibilities of staff and program management unit.

VI Recommendations to Rice Component, GIZ Bac Lieu

General assessment of Rice Component, GIZ Bac Lieu shows that the Component has achieved a number of outcomes that include 1) successful introduction of Alternative Wetting and Drying method to pilot areas in Bac Lieu, 2) capacity building for counterpart on Geograpical Information System (GIS) and stress tolerance rice cultivation, and 3) corporation with Climate Change Affecting Land Use in the Mekong Delta: Adaptation of Rice-based Cropping Systems (CLUES) project in implementing socioeconomic assessment in pilot areas in Bac Lieu.

Together with these outcomes, the component, however, has a number of issues need to be concerned. For example, some activities (i.e. testing salt tolerant rice varieties and training on rice cultivation techniques adapted to salt intrusion areas) did not target the right targeted groups. Salt tolerant rice varieties were not distributed to farmers participating in training on rice cultivation techniques adapted to salt intrusion areas. Some farmers were provided seeds, but not using them for their own cultivation, but selling them to others. Local partner implementers were not informed early enough about activities' implementation plan, causing the delay and chaotic in implementing at the village, commune, and district levels. Methods and skill of district extension staff are mainly based on one-way communication approaches, then cannot mobilize farmers' active participatory on innovation transfer process. Monitoring and evaluation is formalized and results have not yet effectively used for planning as well as for other follow-up activities. The corporation among implementing partners is not effective. Few opportunities are created for implementing partners sharing information about progress, exchanging experiences gained from the project participation, and interactively developing the component's annual working plan. The component's activities have been implemented in many scattered areas and in sometimes not in the right location, challenging the monitoring and evaluation works as well as the evaluation of the component's impacts. Finally, the component has set the objective for supporting and improving farmers' sustainable livelihood; however, its activities are focusing mainly on technical support without proper support to market development for farmers. In order to achieve better outcomes in 2013-2014, the Rice Component, GIZ Bac Lieu should consider the following issues:

- Adaptive Approach: Using the existing conditions for upgrading the existing rice production systems for improving farmers' sustainable livelihood through using strengths and opportunities to overcome weaknesses and threats in rice production
- Concentrated investment, especially to remote rice-shrimp areas
- Selection of right target groups and corresponding investments to their demands/needs
- Planning with active participation of and interactions between implementing agencies and the Rice Component, GIZ Bac Lieu
- Strengthening monitoring and evaluation
- Enhancing coordination and collaboration among implementing agencies
- Capacity building for counterparts

Specific recommendations for further implementation of Seed Component

Seeds

- Establishing community-based seed production cooperative for Mot Bui Do varieties in Hong Dan district

- Improving farmers' knowledge and awareness about seed quality standards for the existing community-based seed production cooperatives
- Reinvigorating and preserving local varieties (1 bui do, Hong Dan)
- Continuing identification and testing salt tolerance rice varieties in the typical salt intrusion areas
- Infrastructure improvement for seed centre for breeding

Cultivation techniques

- Testing and evaluating performance of rice+giant prawn - shrimp farming systems (including use of bio-fertilizers and bio-products)
- Testing 1 or 2 rice crops and winter crops in fresh water shortage areas
- Testing training on seed preservation and postharvest techniques, especially to farmers that do not sell raw paddy (fresh rice)
- Try 1 or 2 models of integrated AWD-OMFR in Larger-Scale Collective Production Evaluate the model of deep-ploughing (land preparation) on 3 rice systems

Upscaling rice innovations

- Assessing the implementation and its outcomes in 2012 pilot models and training areas in order to identify focused areas and target groups for focused investments
- Investigating rice production, market, and marketing in Bac Lieu in particular and Mekong Delta in general for directing the upscaling of climate change-oriented rice innovations for the second phase of CCCEP
- Upscaling Alternative Wetting and Drying integrated in 'one must do and five reductions' in winter-spring crop in intensive rice areas
- Identifying farmers' training needs and developing mechanism for farmers' participation and join-investment to upscaling rice climate change-oriented innovations: what are benefits and contributions that are accounted for participant farmers?
- Investigating and looking for coalition mechanism/opportunities between farmers and enterprises
- Evaluating the existing extension methods and activities and testing participation (demand-driven) extension approach
- Adjusting and improving extension methods for AAEC's and PPSD's district staff and Division of Agriculture and Rural development

Management and coordination

- Establishing and operating monitoring and evaluation system
- Organizing regular progress meetings for sharing information
- Organizing annual meeting with counterparts and implementing partners for outcome evaluation of planning for the next year implementation
- Capacity building for counterparts and implementing partners focusing on for example: planning value chain-based rice production under the climate change impacts, knowledge and information analysis on climate change, knowledge on salt intrusion and tolerance mechanism
- Conducting study tours counterparts and implementing partners to other GIZ propjets in Mekong Delta Region, and other districts in Bac Lieu
- Developing join-investment and responsibility between GIZ Bac Lieu, counterparts and implementing partners, and beneficent farmers
- Documenting results and lesion learnt for sharing with other GIZ propjets and for recommending to the second phase of CCCEP program

VII. Conclusions and recommendations

Climate changes have created a number of negative impacts to rice production systems in Mekong Delta Region. Rice farmers are facing with challenges such as salt intrusion, flood, pests and diseases, and less cultivation areas. Rice cultivation under such climate change impacts need both technical and institutional innovations that have not only technical appropriateness but also appropriateness to farmers' social, natural, public, and financial capital, and sustainable livelihood. Integrated AWD-OMFR introduced by the Rice component, GIZ Bac Lieu project is appropriated to the winter-spring crop in intensive rice cultivation areas in Bac Lieu. Hence, it is recommended for the upscaling to other areas that have similar conditions for practical cultivation.

For a long time, rice innovation systems in Mekong Delta region have used mainly the 'supply-driven' approaches. These systems develop and introduce rice innovations based on the Government's policies for agricultural development and food security. These systems' competence to addressing farmers' and practical production's needs is weak. Most of technical and institutional innovations introduced to rice production are less appropriated or only appropriated to technical requirements, but inappropriate to farmers' comprehensive livelihood strategies. These systems' coalitions are weak and mainly 'one-way' relation. Changing from the 'supply-driven' or 'top-down' to a more 'demand-driven' approach is a necessary condition for improvement of these systems' performance.

CCCEP program's strategies for upscaling appropriate climate change-oriented rice innovations in Mekong Delta Region should consider both institutional and technical aspects. Regarding institutional aspect, CCCEP program should adopt the 'multi-stakeholder – driven' approach in order to generate impacts that can create effects to multi-levels and inputs for the systems' changes. This approach needs to employ the following principles: 1) addressing the 'common interests' of involving actors, including the Government and its agencies, farmers and their communities, and enterprises; 2) active participation and ownership from involving actors and relevant stakeholders; and 3) institutional coalition for strengthening coalition and corporation among involving actors. Regarding technical aspect, CCCEP program should adopt basic principles of the 'demand-driven' extension approach with farmers' participation, develop 'voluntary farmer extension network' for carrying on innovations to other farmers in their communities and to other communities, and to integrate enterprises' benefits into innovation upscaling process in order to develop win-win relationship between farmers and enterprises.

References

AAEC. 2013. Report on results from salt tolerant rice varieties and technical training on VietGAP rice cultivation (Original in Vietnamese).

Bac Lieu People's Committee (Bac Lieu PC, 2012). General planning for Bac Lieu socio-economic development to 2020, vision 2030 (Original in Vietnamese)

Dang Kieu Nhan, Vu Anh Phap, Tran Huu Phuc & Nguyen Hieu Trung. 2011. Rice production response and technological measures to adapt to salinity intrusion in the coastal Mekong delta. A project technical report submitted to CSIRO (November 2011).

DARD Bạc Liêu. 2012. Report on achievements on agriculture and rural development in 2011 and 2012 implementation plan (Original in Vietnamese).

Department of Agriculture and Rural Development (DARD). 2012. Report on 2011 achievements and 2012 plan in Bac Lieu (Original in Vietnamese).

Department of Science and Technology (DST). 2012. Report on action plan for responding to climate change impact in Bac Lieu (Original in Vietnamese).

Gia Rai People's committee. 2012. Report on results of multiplying salt tolerant rice varieties OM6677 and OM5629 in rice-shrimp areas in Phong Tân, Phong Thạnh và Phong Thạnh A communes in 2012 (Original in Vietnamese).

GIZ Bạc Liêu. 2011. Operational plan for the salt tolerant rice support in Bac Lieu – The Rice Component for the period of 2011-2014

GIZ Bạc Liêu. 2012. Operational plan for collaboration between GIZ Bac Lieu and IRRI-coordinated project CLUES – 2011 – 2014 period.

GIZ Bac Liêu. 2012. Report on multiplying salt tolerant rice varieties OM6677 and OM5629 in summer-autumn 2012 in Bac Lieu Province (Original in Vietnamese).

GIZ Bac Liêu. 2012. Report on technical training and implementing the demonstration model at the pilot sites for rice farms using alternative wetting and drying techniques for the early summer-autumn season 2012 in Bac Lieu Province (Original in Vietnamese).

John Farrington, Diana Carney, Caroline Ashley and Cathryn Turton. 1999. Sustainable livelihood in practice: early applications of concepts in rural areas. Natural Resource Perspective, 42.

Minh, T.T., Larsen, C.E.S. & Neef, A. 2010: Challenges to institutionalizing participatory extension: the case of Farmer Livestock Schools in Vietnam. Journal of Agricultural Education and Extension 16: 179-194.

Thai Thi Minh, Larsen, C.E.S., Anh, T.K. 2007: Participatory Training Approach - a Training Manual for Training of Trainers. Agricultural Publishing House, Hanoi, Vietnam, 170 pp (Original in Vietnamese).

Thai Thi Minh. 2010: Agricultural innovation systems in Vietnam's Northern Mountainous Region – six decades shift from a supply-driven to a diversification-oriented system. Margraf Publishers, Weikersheim, Germany.

Võ Thị Thanh Lộc và Lê Nguyễn Đoan Khôi. 2011. Policy impact and strategy for upgrading rice value chain production. Science magazine, 19b 110-121 (Original in Vietnamese).

Appendixes

Appendix 1: Term of References

Upscaling of innovations in rice production systems in the Mekong Delta

Context of the project

GTZ together with Bac Lieu Provincial People's Committee have begun to implement the project "**Adaptation to climate change through the promotion of biodiversity in Bac Lieu Province"** funded by the German Federal Ministry of Environment, Natural Resources and Nuclear Safety (BMU). The project goal is to enhance the protective effect of coastal forests through sustainable resource use and the promotion of biodiversity.

The context of the required consulting services

The Mekong Delta is the most important area for rice production within Vietnam. However, adverse effects of climate change can already be noticed: rising sea levels, salt intrusion up to 70km inland and changing precipitation patterns; all of which have an effect on rice production.

Therefore the identification and introduction of innovative rice production methods is crucial for the farmers to sustain their livelihood. Such innovations include water saving methods, like Alternate Wetting and Drying, as well as the introduction of new varieties which are better adapted to a changing environment, e.g. salt tolerant rice varieties.

The objective of consulting services

The overall aim of this assignment is to:

1. Assess the appropriateness of the following two innovations:
    a. Alternate Wetting and Drying Method (AWD)
    b. Salt tolerant rice varieties
2. Assess the available resources and the capacity of the provincial extension system and study rice production systems in Bac Lieu and two other Provinces in the Mekong Delta.
3. Develop strategies as to how the two innovations can be integrated to the extension and seed production systems in the Mekong Delta.

The methodology and detailed tasks

The methodology:

The work will require information from a variety of resources including: (a) project participants; (b) field surveys; and (c) counterparts and other local partners.

The key tasks:

The service provider will be responsible for the following sequence of tasks:

1. Assess the appropriateness of two innovations: Alternative Wetting and Drying Method (AWD) and salt tolerant rice varieties
    - Review the project related documents and reports
    - Meet and interview relevant stakeholders to collect information
2. Assess the available resources and capacities of the provincial extension and seed production systems in Bac Lieu Province and 2 neighbouring provinces.
    - Review the project related documents and reports
    - Meet and interview relevant stakeholders to collect information
3. Prepare an assessment report
    - Process data and information
    - Write report
4. Develop strategies to integrate AWD and salt tolerant rice to the extension and production systems.
    - Develop strategies to integrate AWD
    - Develop strategies to integrating salt tolerant rice varieties in Bac Lieu rice production system
5. Consult with relevant stakeholders about the findings and strategies
    - Prepare a presentation
    - Present findings at a stakeholder consultation workshop
    - Collect comments and feedbacks for further improvement
6. Finalize and submit a report
    - Process stakeholders' comments and feedbacks
    - Revise report based on comments and feedbacks from consultation workshop
    - Revise strategies

Expected outputs and languages

The Outputs

The following outputs will be required:

1. A detailed overview of the appropriateness of the two innovations
2. A clear overview of the existing capacities of extension and seed production systems

➔ Summarized in an assessment report

3. One or more strategies on how to integrate the two innovations into the extension and seed production systems in the Mekong Delta
4. A stakeholder presentation about the findings

➔ Summarized in a final report with no more than 30 pages (without annexes)

The languages

Reports and other outputs are required to be submitted to the GTZ Bac Lieu office in English and Vietnamese language.

The responsibilities of the project and of the service provider

The Bac Lieu Project will assist with arrangements for travel, accommodation and meetings with stakeholders as well as for field visits.

The service provider will be responsible for expected outputs and the tasks assigned in respective fields.

Itinerary

The expected duration of the consultancy is **25 days,** and should occur within January 15, 2013 and February 15, 2013. The consultant will be based in Bac Lieu province but will have to travel within the province and to other provinces.

The copyright

All intellectual property and proprietary rights, including rights to maps, drawings, photographs, documents and any other materials produced during this consultancy will become the sole property of the GTZ, which will have the sole right to publish the same in whole or in part and to adapt and use them as may seem desirable, and to authorise all translations and quotations from them. The consultant may not publish or use any of this material without the prior permission of GTZ as represented by the Implementing Agency.

Appendix 2: Mission program

Time	Activity	Participants	Location
12 -13/1/13	Traveling from Copenhagen to HCM city		
14/1/2013	Meeting with CLUES project to discuss about existing Climate change-related innovations in rice production and possibility for corporation between CLUES and GIZ Bac Lieu project	Prof. Lê Quang Trí, Prof. Nguyễn Hiếu Trung; Dr. Đặng Kiều Nhân, Dr. Võ Thành Danh, Mr. Nguyễn Thanh Giao, Mr. Joachim Hofer, Nguyễn Hải Hà, Mr. Phú Phúc Nhân	CLUES office, Dragon Institute, Can Tho University
15/1/2013	Attending workshop on 'evaluation salt tolerance rice varieties introduced to Gia Rai district'	60 participants, including representative from Bac Lieu DARD, Bac Lieu AAEC, AASC, Gia Rai PC, Gia Rai DARDD, and farmers	PC in Phong Thanh commune, Gia Rai District, BL
16/1/2013	Meeting with GIZ Bac Lieu Rice project to plan for the 1st stage of Mission	Trung Tân Kiệt (PMU); Phan Văn Liên (AASC); Phan Hồng Thái (DARD); Nguyễn Phương Hùng (AAEC); Hồng Kim Thư (PPSD); Nguyễn Hải Hà and Phú Phúc Nhân (GIZ)	GIZ Bac Lieu office
	Meeting with AASC to discuss about: • AASC activities related to rice production • Innovations on salt tolerance rice production • Plan to work with salt tolerance rice production • Future cooperation with GIZ Bac Lieu	Phan Văn Liên (Director); Mr. Thai (Vice director); Mr. Ngo (Head of Technical Unit); Mr. Phong (Head of Administration Unit)	AASC office
	Interviewing rice traders in Bac Lieu Province on rice trading and market situation	Mr. Lê Minh Chiến (rice trader and processor in Hoa Binh district); Mr. Lê Văn Khánh (rice trader in Hoa Binh district); Mr. and Mrs. Lê Văn An and Nguyến Thị Thi (rice trader in Hong Dan District)	AASC office
17/1/2013	Meeting with AAEC to discuss about: • AAEC main activities • AAEC activities and corporation with other organizations related to rice production • Innovations on salt tolerance rice production • Plan to work with salt tolerance rice production • Future cooperation with GIZ Bac Lieu	Mr. Lê Công Tâm (Director – PPSD); Mrs. Hồng Kim Thư (Vice-director - PPSD)	AAEC office
	Meeting with PPSD to discuss • PPSD main activities • PPSD activities and corporation with other organizations related to rice production • Innovations on salt tolerance rice production • Plan to work with salt tolerance rice production	Nguyễn Phương Hùng (AAEC)	PPSD office

	• Future cooperation with GIZ Bac Lieu		
18/1/2013	Meeting with DARD to discuss about: • Rice production orientation • Management and coordination of Bac Lieu GIZ Project • Plan to implement Bac Lieu GIZ Project	Mr. Quang Phan Hồng Thái	DARD office
	Meeting with Gia Rai DARDD, PPS, AAES to discuss about: • Rice production • activities and corporation with other organizations related to rice production • Innovations on salt tolerance rice production	Mr. Trương Hữu Mến (Head of Gia Rai DARDD); Mr. Lộc (Gia Rai DARDD) Mr. Bảo (AAES) Mr. Tĩnh (PPS)	DARDD office
19/1/2013	Interviewing farmers participating in STR variety trial in Phong thanh and Phong Tan communes on: • Appropriateness of STR tested in the communes • Organization of STR testing activities at village level • How to improve the organization of STR and AWD trials at the village level	Mr. Du Van Kiem (non- STR trial), Phong Thanh Mr. Liem (village head man), Phong Thanh Mr. Nghia (STR farmers), Phong Thanh Mr. Nguyen Phong Tam (STR farmer), Phong Tan	Farmers' houses
	Visiting AWD trial in Vinh My B Commune, Hoa Binh District	Mr. Vũ – trial farmer	Trial site
21/1/2013	Meeting with Dong Hai DARDD, PPS, AAES to discuss about: • Agricultural and rice production • Climate change impact to agriculture • activities and corporation with other organizations related to rice production • Corporation with GIZ • Orientation for Agriculture production	Mr. Nguyễn Trường Hận (Head of Dong Hai DARDD) Mr. Hung (Dong Hai DARDD) Mr. Phuc (PPS) Mr. Cường (AAES)	DARDD office
	Meeting with Hong Dan DARDD, PPS, AAES to discuss about: • Rice production • activities and corporation with other organizations related to rice production • Innovations on salt tolerance rice production • Corporation with GIZ • Organization of innovation transfer	Mr. Nguyễn Trung Hiếu (Vice-Head of Hong Dan DARDD) Mr. Lương Trung Tính (Hong Dan DARDD) Ms. Võ Thị Hồng Cẩm (Hong Dan DARDD) Mr. Nguyễn Chí Linh (PPS) Ms. Hồ Thị Ngân (AAES)	DARDD office

22/1/2013	Interviewing group of farmers participating in AWD trial in Vinh Binh communes, Hong Dan district on: • Rice cultivation • Rice innovation • Appropriateness of AWD tested in the commune • Climate change impact to rice	08 farmers Mr. Linh (PPS)	Farmers' house in Ninh Hiep village
	Interviewing farmers participating in STR variety trial in Vinh Loc commune, Hong Dan district on: • Appropriateness of STR tested in the communes • Rice-shrimp cultivation	07 farmers DARDD representative	Farmers' house in Vinh Thanh village
23/1/2013	Preparation of results and presentation for Upscaling workshop		GIZ Bac Lieu office
24/1/2013	Upscaling workshop with CCCEP counterparts and field trip	30 participants from GIZ's counterparts in Bac Lieu, Soc Trang, Tra Vinh, Tien Giang, CCCEP Hanoi and MARD	Bac Lieu Hotel
25/1/2013	Meeting CCCEP livelihood group and planning for the second stage of the mission	TCA of GIZ project in Soc Trang, Tra Vinh and Bac Lieu	GIZ Bac Lieu office
28/1/2013	Data analysis and report writing		GIZ Bac Lieu office
29/1/2013	Data analysis and report writing		GIZ Bac Lieu office
30/1/2013	Data analysis and report writing		GIZ Bac Lieu office
31/1/2013	Interviewing 02 groups of AWD farmers in Long Thach Commune, Vinh Loi District and Phong Tan Commune, Gia Rai District on: • Appropriateness of AWD tested in the commune • Rice production and market • How to get other farmers adopting AWD	Long Thach Commune, Vinh Loi District:Mr. Vien and Mr. Dam (Farmers) and Mr. Ngo Van Vinh and Mr. Luu Ngoc Thanh (Vinh Loi PPS) Phong Tan Commune, Gia Rai District: Mr. Pham Van Vui and Mr. Bui Duc Toi (Farmer), and Mr. Le Tan Loc (Gia Rai PPS)	Farmers' houses
1/2/2013	Interviewing 02 groups of AWD farmers in Vinh Binh commune, Hoa Binh District and Vinh Phu Dong Commune, Phuoc Long District on: • Appropriateness of AWD tested in the commune • How to get other farmers adopting AWD • Rice innovation • Difficulties of rice production	Vinh Binh commune, Hoa Binh District: 11 farmers, and Mr. Hung and Mr, Khien (Hoa Binh PPS) Vinh Phu Dong Commune, Phuoc Long District: 8 farmers, and Mr. Ngũ Văn Ai (Phuoc Long PPS)	Farmers' houses
4/2/2013	Participating in STR final evaluation workshop in STR demonstration in Ninh Hoa Commune, Hong Van district	35 farmers, 03 representatives from AAEC, 01 representative from Department of Rural Development, 02 representatives from District Division of Agriculture and Rural Development	Farmers' houses

5/2/2013	Meeting with Rice Component staff and discussing about how to implement and to manage a development project	Mrs. Phuong, Ms. Nguyen Hai Ha and Mr. Phu Phuc Nhan	Can Tho
6/2/2013	Traveling to Hanoi		
7/2/2013	Data analysis and report writing		Hanoi
8/2/2013	Data analysis and report writing		Hanoi
13/2/2013	Data analysis and report writing		Hanoi
14/2/2013	Data analysis and report writing		Hanoi
15/2/2013	Data analysis and report writing		Hanoi
18/2/2013	Meeting with Mr. Chuc to discuss about: • How to organize and implement activities in Sustainable livelihood component • How to develop and organize the upscaling of rice innovation s in CCCEP provinces • Corporation and coordination in CCCEP	Mr. Nguyễn Công Chức – CCCEP Hanoi	GIZ office in Hanoi
19/2/2013	Data analysis and report writing		Hanoi
20/2/2013	Traveling from Hanoi to Bac Lieu		
21/2/2013	Report writing		Bac Lieu
22/2/2013	Preparation for feedback workshop with GIZ Bac Lieu		Bac Lieu
25/2/2013	Feedback workshop with GIZ Bac Lieu		Bac Lieu
26/2/2013	Finalizing and submitting report and strategy		Bac Lieu
Total: 29 working days, excluding traveling time			

Appendix 3: Summary of the knowledge transfer system

Actors	Approach used	Main target group	Focus areas
Public extension system	Technology promotion	Model farmers who are mainly in the better-off group	Modern farming technologies, mainly for crop production, especially food and cash crops
The Plant Protection and Veterinary Organisation	Risk mitigation	All types of farmers	Crop pest and disease management, veterinary medicine and vaccination campaigns
Implementing organisations of socio-economic development programmes	Socio-economic development	Poor and disadvantaged farmers in the mountainous and remote areas	Successful experiences in food production and cash generation
Commodity corporations and companies	Agricultural commodity promotion	Contract farmers (mainly better-off and well-off farmer groups)	Production techniques for industrial agricultural products such as tea, coffee, rubber, pepper, aquacultural products, sugar cane, fruits and high quality rice
Private service providers	Commercial service promotion	All types of farmers who can afford to purchase inputs	Information on using seeds, chemical fertilizer, pesticides, veterinary medicines and animal feeds
Cooperatives	Information provision	All type of farmers	Mainly economic activities for rice production, market, credit, and irrigation
Mass media	Broadcasting of new techniques and farmers' experiences	All types of farmers who have access to the mass media	Techniques on commodity agricultural production
Mass organisations	Knowledge exchange	All types of farmers who register as their members	Small-scale animal husbandry (pig and poultry), credit scheme, garden-fishpond – animal (VAC)…
Village and farmers organisations	Information provision and knowledge sharing	All types of farmers	A wide range of content depending on farmers' requests and interests
International organisations and NGOs	Participatory extension (FFS, PTD, farmer extension clubs, etc.)	Poor and pro-poor farmer groups	A wide range of content for livelihood improvement

Appendix 4. Assessment of AWD appropriateness

Appropriate to: *(0 = not* appropriate*; 1= less* **appropriate***; 2 =* **appropriate***; 3 = very* **Appropriate***)*						**Help to:**					
Climatic condition	Soil condition	Irrigation condition	Cultivation practices	Labour	Investment capacity	Reduce pest and diseases	Rice grow better	Increase yield	Increase income	Limit negative impact to environment	Reduce labour cost
1. Must use of certificated seed (good quality)											
2. Reduction of seeds											
3. Reduction of fertilizer											
4. Reduction of crop protection chemicals											
5. Reduction of water used											
6. Reduction postharvest loses											