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Report

Inception and Planning Workshop

Sustaining and Enhancing the Momentum for Innovation and Learning around the System of Rice Intensification (SRI) in the Lower Mekong River Basin

Asian Institute of Technology
Bangkok Thailand

09-12 April 2013

Executive Summary

A regional Inception and Planning Workshop of the SRI-LMB project was organized from 09-12 April, 2013 at the Asian Institute of Technology (AIT), Pathumthnai, Thailand. The workshop was attended by some 60 persons drawn from Cambodia, Laos, Thailand, Vietnam, USA and UK. In addition to project partners (FAO IPM, Oxfam, Institute of Development Studies (IDS)) and project associate (SRI-Rice Programme, CIIFAD, Cornell University, USA), the participants were from ministries of agriculture of Cambodia, Laos, Thailand and Vietnam, from academic institutes and civil society organization (CSO) from all four countries, and also from other interested organizations who are working on similar mandate area along with media personnel. .

The background of project and its planned activities, outputs and goals were shared, and the regional innovation platform as envisaged in the project was launched at the Asian Center of Innovation for Sustainable Agriculture Intensification (ACISAI). Pertinent issues, experiences, challenges and opportunities related to sustainable agriculture intensification, conservation agriculture, food loss and food waste, farmer's education for sustainable agriculture intensification, monitoring evaluation and learning aspect along with policy imperative were shared by eminent speakers in plenary session providing broader conformity with the project's planned activities and needs. A number of important learning were summarized and taken into account for the planning of the project.

In the planning part of the workshop, project partners and country teams (involving ministries, academic institutions, civil society organizations, and FAO IPM country representatives) presented their background papers which lead to discussion and development of draft work plan to be further refined and finalized during the National Inception and Planning Workshop. It was also evident from the presentation and discussion that each country needs is specific and they are at various stages of adaptation and adoption of SRI principles. The project partners also presented and discussed ways to integrate their supporting planned activities along with the central activity of the project, i.e. farmer's participatory action research (FPAR).

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LIST OF ABBREVIATIONS

ACISAI	Asian Center of Innovation for Sustainable Agriculture Intensification
AIT	Asian Institute of Technology
ALC	Action Research Cycle linked spirals
CA	Conservation Agriculture
CC	Climate Change
CFPAR	Central Farmer's Participatory Action Research
CGIAR	Consultative Group of International Agriculture Research
EU	European Union
FAO	Food and Agriculture Organization of the United Nations
FFS	Farmer's Field School
FPAR	Farmer's Participatory Action Research
IDS	Institute of Development Studies
IPM	Integrated Pest Management
LMB	Lower Mekong River Basin
M&E	Monitoring and Evaluation
MEL	Monitoring, Evaluation and Learning
MoA	Memorandum of Agreement
O	Oxfam
O-A	Oxfam-America
SDCC	Sustainable Development in the Context of Climate Change
SLWRM	Sustainable Land and Water Resource Management
SRI	System of Rice Intensification
SRI-LMB	System of Rice Intensification – Lower Mekong River Basin Countries Project
TAA	Tropical Agriculture Association
WARDA	West African Rice Development Authority
WBI	World Bank Institute

BACKGROUND

The AIT (www.ait.asia) has begun an EU-financed project entitled: "Sustaining and Enhancing the Momentum for Innovation and Learning around the System of Rice Intensification (SRI) in the Lower Mekong River Basin" (http://www.ait.ac.th/news-and-events/2012/news/ait-signs-agreement-with-eu-for-3-4-million-euro-project). The main objective of the project is to contribute to enhance resilience of rainfed small-scale farmers of Lower Mekong region confronting climate change. The project implementation period is for 60 months with a total cost of action approximately 3.4 million Euros.

The proposal was prepared in response to a EuropeAid Call for Proposals, entitled "2009-2010 Global Programme on Agricultural Research for Development-Component 1: Research and Technology." The project concept was based on recommendations emanating from a regional workshop in 2009 organized by AIT with support from the WBI (http://www.ait.ac.th/research/workshop-reports/AIT-WBI-Workshop-Report.pdf).

The workshop involved various government, non-governmental organizations, academic and UN partners that are working in the Southeast Asian region and are concerned with sustainable intensification of agriculture, especially in rainfed areas. The chief recommendation from the workshop was for the development of adaptive measures to protect against climate change so as to address the food security and livelihood issues of smallholding farmers in Lower Mekong River Basin (LMB) countries. The strategy was to set up local, national, regional and international 'innovation platforms' for joint initiatives and coordinated actions.

This recommendation gave impetus for scaling-up SRI efforts to the river-basin level to address food security challenges in the context of impacts from and adaptation to climate change. The project idea seeks to stimulate local innovation using SRI and Farmers' Field School (FFS) approaches involving smallholder farmers in rainfed areas of LMB countries in order to sustainably improve agricultural productivity and food security in the context of climate change adaptation, and to enhance research capacities to continue to support this development.

With this background, the project in its inception phase organized its Inception and Planning Workshop at AIT, Bangkok, Thailand from 09-12 April 2013.

1. OBJECTIVES

The workshop was organized in two parts with following objectives:

A) Inception workshop (one day, 09 April 2013)

- To launch project, informing large audience and media about the project, its partnership, goals, objectives;
- To kick-start the project activities;
- Inauguration Ceremony of Asian Center of Innovation for Sustainable Agriculture Intensification (ACISAI), a newly established institute-wide center at AIT as a regional innovation platform for the SRI-LMB project.

B) Planning workshop (Three days, 10-12 April 2013)

- To revisit the project documents, goals, overall work plan at regional and country levels;
- To present country background papers leading to development of country strategy papers in due course of time (with information on province selected for project activity) and basic information aligning with project activities/work plan;
- Formulation of country-specific log-frames and budgeting; and
- Formation of a regional steering committee.

2. OUTPUTS

- Awareness about project among regional organization, media and public in general;
- Detail work plan and budget for the first year of the project with links to the work plans of the subsequent project periods;
- Specific details on the responsibilities and tasks of each stakeholder involved in the project;
- Formation of a regional steering committee to provide strategic direction to the project's work

3. INCEPTION WORKSHOP (9 April 2013)

A formal inauguration ceremony along with opening of the Asian Center of Innovation for Sustainable Agriculture Intensification (***ACISAI***) preceded the plenary sessions.

Prof. Jayant K. Routray, Chairman of the AIT Academic Senate, on behalf of Acting AIT President Prof. Worsak Kanok-Nukulchai, along with Prof. Norman T. Uphoff, Director, Cornell Institute for Public Affairs, Cornell University; and Prof. Amir Kassam, OBE, FSB, School of Agriculture and Development, University of Reading inaugurated the ACISIA Center. In total, some 60 persons representing partners of the project, representatives from agriculture ministries, academic institutions and civil society organizations, from Cambodia, Laos, Vietnam and Thailand along with farmers association from Thailand (Non-formal Education Farmers group from Ban Chaeng and Ban Chiangkon villages of Roi-Et province) and media personnel from Thailand and Vietnam attended the inception workshop (see Annex 1).

3.1 Introductory session

Prof. Routray, in his welcome remarks, welcomed the delegates on behalf of the institute and wished them successful deliberations during the workshop. Followed to that Dr. Prabhat Kumar, Director, Asian Center of Innovation for Sustainable Agriculture Intensification (ACISAI) and Regional Coordinator of the SRI-LMB Project, delivered opening remarks and highlighted the importance of the project and of the Center as a regional platform linking local-global actors to contribute towards the achievement of sustainable agriculture intensification in the context of climate change and to make progress toward MDG1.

Dr. Abha Mishra, Team Leader, SRI-LMB project and Co-Director, ACISAI, AIT, provided in-depth presentation on the links of Sustainable Agriculture Intensification, the ACISAI Center, and the SRI-LMB project. She provided background on the role of AIT and the genesis of the Center of Excellence on Sustainable Development in the Context of Climate Change (SDCC, www. http://www.sdcc.ait.asia/), and, also on the newly established Asian Center of Innovation for Sustainable Agriculture Intensification (ACISAI). She added that AIT strives to become a leading and a unique regional multicultural institution of higher learning offering state of the art education, research and training in technology, management and social development - in the region and beyond. Currently AIT is consolidating its strategic principles as AIT research strategy (2012-2016) with emphasis on research focus; research quality; quality collaboration in research; and research resource mobilization.

With the launch of the Asian Centre of Innovation for Sustainable Agriculture Intensification (ACISAI) in Thailand, AIT is now the region's foremost institute for linking local practitioners to global actors and institutions to meet the goals of food security and environmental sustainability.

Finally, she emphasized that AIT-EU-SRI LMB Project aims to intensify agricultural production through stimulating local innovation using System of Rice Intensification (SRI) and Farmers Field School (FFS) approaches using participatory action research involving smallholder farmers, researchers, policy makers and development professional in rainfed areas of Lower Mekong River Basin (LMB). This regional project will be implemented in partnership with various stakeholders from local to global in order to address food security in the context of

climate change adaptation, and to enhance research capacities to continue to support this development.

3.2 Plenary Session

A total of seven plenary lectures were delivered covering selected aspects of sustainable intensification and its functional links with food security to provide basis for developing robust work plan for the project implementation.

First plenary lecture was delivered by **Prof. Norman T. Uphoff** on the topic of "A Global Perspective on Intensification in Relation to Achieving Food Security and Climate Change Adaptation".

In his delivery, he emphasized the need to change the concepts and practices of "intensification" as a major paradigm shift for the agricultural sector from an 'egocentric' to a 'heliocentric' orientation, appreciating power and productivity of natural systems which give rise to the processes and potentials of biology to meet the challenges of 21ST century. SRI is best described as work in progress; continuous farmer innovation; ideas not technology; menu not recipe; mobilizes biological potentials and processes rather than depending on costly inputs; farmer and environment friendly; promoting life in the soil – a life that can feed humankind.

Second plenary presentation was delivered by **Dr. Rosa Rolle**, Senior Agro-Industries and Post-harvest Officer on behalf of **Dr. H. Konuma**, Regional Representative and Additional Director General of the Food and Agriculture Organization of the United Nation's Regional Office for the Asia-Pacific, Bangkok, on the topics of "Managing Food Losses and Waste for Food Security in Asia and the Pacific Region: FAO's SAVE FOOD A-P Campaign".

In her delivery, she focused on the forces that shapes the region's food system that have a negative impact on food and nutrition security – and the environment (due to energy, biodiversity, water, soil and other resources embedded in food that is not consumed). She described the needed strategies to address hunger and food insecurity and to increase food productivity using existing land and also address issue of reducing food losses and waste. In the context, she highlighted the Save Food A-P Campaign, which FAO is working in collaboration with AIT to raise public awareness on food losses and waste and impact on food security and hunger; advocate for reduction toward eradicating extreme poverty and hunger.

Third plenary lecture was delivered by **Dr. Amir Kassam**, OBE, FSB; Visiting Professor, School of Agriculture, Policy and Development, University of Reading on 'Looking at Conservation Agriculture through the Lens of Sustainable Production Intensification'.

He highlighted that institutions around the world are re-aligning themselves and individuals, responding to a fundamental transformation of agriculture systems towards sustainable intensification and conservation agriculture to address the current challenges. As an example, he cited the FAO's *Save & Grow* response to SPI, which accentuates that no single overall solution can suffice, but all productivity solutions need to be based on ecologically sustainable production intensification.

In summary, he drew the attention towards three interlinked principles of Conservation Agriculture, which is based upon empirical and scientific evidence internationally, showing that their integration into production systems management provides a basis for sustainable intensification. These are the interlinked principles of Conservation Agriculture: a) no or

minimum soil disturbance by mechanical tillage; b) in practice, whenever possible, seeding or planting directly into untilled soil, in order to maintain soil organic matter, soil structure and overall soil health; and c) enhancement and maintaining organic matter cover on the soil surface and diversification of species, in practice – both annuals and perennials - in associations, sequences and rotations that can include trees, shrubs, pastures and crops, all contributing to enhanced crop nutrition and improved system resilience.

In post-lunch sessions, the next plenary was delivered by **Dr. Anil Kumar Anal,** Assistant Professor, Food Engineering and Bioprocess Technology field of study, School of Environment, Resources and Development (SERD) and member of Thematic Research area "Sustainable Land and Water Resource Management (SLWRM)", AIT on the topic of 'Sustainable Development in the Context of Climate Change (SDCC) and AIT Research Strategy for 2012-2016'. In his presentation, he briefly summarized the overall AIT research strategy and the various thematic and sub-thematic areas under the Centre of Sustainable Development in Context of Climate Change (SDCC). He stressed the need of collaboration and cooperation from all concerned stakeholders to realize the sustainable development of the region and beyond.

Mr. Jan Willem Ketalaar, CTA, FAO IPM Programme, FAO-RAP, Bangkok delivered his lecture on the topic of 'SAVE & GROW: Sustainable Rice Intensification and Ecosystem Literacy Training for Rice Farmers in Asia'. In his presentation, he provided broad overview of role of smallholders in Asian agriculture and added that small farmers are managers of about 80% of agriculture production. The link of sustainable intensification idea could be well imparted through, as experienced during last 3 decades of IPM programmes in Asia, imparting ecosystem literacy training for smallholder farmers which is vital to manage agricultural systems sustainably.

Sustainable production is knowledge-intensive, and farmers have a right to education in this regard to change their knowledge-attitude-practice. Today's youth will be tomorrow's farmers and thus their training is important first step in building the base for sustainable intensification. Enhancing productivity and profitability; increased resource use efficiency; ecological sustainability and climate-smart practices; enhancing resilience could be well contributed by management practices and technologies under the overall ambit of conservation agriculture and SRI principles.

"Monitoring Evaluation and Impact Study in Farmers' Participatory Action Research: Role and Relevance' was the topic presented by **Dr. Michael Loevinsohn**, Senior Research Fellow, Institute of Development Studies (IDS), University of Sussex, United Kingdom.

He made a case that farmers need diversified options that can be tested locally within the given context, and often programmes ignore farmers' innovation at their peril. He further raised several important questions in context of the current project: whom should M&E serve?; Action Research Cycle linked spirals – ALC -- what should responsive M&E look like? And that the MEL (Monitoring, Evaluation and Learning) should be accurate, meaningful with critical involvement and responsive relationship between all stakeholders. With regard to the current project, he provided his overview as 'what does M&E look like in our initiative? – What are farmers doing with what they learned? To what extent do practices offer resistance/resilience in face of shocks?

Dr. Brian Lund, Regional Director, East Asia Office, Oxfam America was the last speaker of the plenary session prior to a summary session chaired by Prof. Norman Uphoff. Dr. Lund presented a short and interesting synthesis from policy perspective as 'Policy towards System of Rice Intensification in the Mekong River Basin Countries: Role and Relevance'.

He drew the attention towards the complex and multi-layered environment (including the changing demography, competition for scarce resources, access to knowledge and information, national economic strategy, climate change) and raised question on whether farmers remain cultivating land? He further added that the recognition of smallholder farmers as part of the overall system is important and this requires aligning and developing newer policies

3.3. Lessons to move forward (summary session)

Prof. Uphoff, who chaired the session, initiated the summary session with following key points emerging from the plenary sessions:

a) Changing conditions of agriculture sector

- Growing population
- Increasing costs of energy and chemicals
- Increasing urbanization and ageing of rural communities
- Declining land resources and reducing amounts and reliability of water
- Threats of climate change

b) Forces shaping the region's food system

- Population growth and rising living standards
- Rising energy prices and declining farmer incomes
- Increasing urbanization and changing dietary habits
- Declining land resources and growing scarcity of water resources
- Threats of climate change
- Rising food prices
- High levels of food losses and growing problem of food waste

c) Drivers for conservation agriculture

- Erosion
- Loss of biodiversity
- Drought
- Loss of productivity
- Increasing demand for Sustainable Production Intensification

d) SRI can be best described as work in progress

- Continuous farmer innovation – learning, modification and further expansion
- Spreading exponentially worldwide and is farmer driven

e) Importance given to the soil

- Putting the soil system management back in the center of practice

- Ecological foundations of sustainable agriculture production: minimum soil disturbance; soil cover; crop diversity - enhance biology of soil + complementary crop, nutrient, water and pest management = Conservation Agriculture
- Promoting life in the soil (activity and diversity of soil organisms) – a life that can feed humankind

f) Input-use efficiency and production factor productivities

- New intensification: more output with reduced inputs
- Output intensification not input intensification

g) Working with nature and taking an ecosystem perspective

- Exploring what nature has evolved and considering the markets
- Heliocentric orientation appreciating power and productivity of natural systems which gives rise to the processes and potentials of biology
- Input use efficiency/production factors productivities simultaneously with building farming ecosystem/biodiversity services/system resilience

h) Science and thinking

- Role of microbes and how it functions
- How these could be included in the curricula for farmer's training
- How farmers could learn to appreciate it

i) Impacts

- SRI: more than just yields; water saving; resistance to climate stresses (biotic and abiotic stresses; cold temperatures), pests and diseases; reduction in cost of production; increase in income; environmentally friendly (reduction in GHG emissions); prevents lodging
- CA: increased yields, production, profit; less fertilizer use; less pesticides; less machinery and labor/drudgery and fuel consumption; less water needs; more stable yields; lower impact of threats of CC (adaptability/mitigation/C sequestration); lower environmental cost (water, infrastructure)
- What is the added value of working together (AIT-Oxfam-IDS-FAO)

As a summary, it was agreed that a holistic with broad partnership from local-global stakeholders be developed to provide platform for innovation for 'post-modern' agriculture innovation. A regional project like the one that is being embarked upon provides an excellent example and opportunity for cohesive actions and results in coming years.

4. Planning Workshop (10-12 April 2013)

4.1 Partner's and Country background paper

The planning workshop began with a 1st Day follow-up-presentation made by **Ms. AlmaLinda Abubakar**, Programme Development Officer, FAO-RAP, Bangkok where she summarized the key points from the plenary sessions. Some clarifications were provided on remaining discussion points.

Dr. Abha Mishra began the first presentation of the planning workshop by providing an overview of the project as "*Revisiting the project document: goal, overall work plan at regional and country level*'. In her presentation, she presented the goal, overall work plan at regional and country level as per project document. As per work plan the project would be working in rainfed provinces of Cambodia, Laos, Thailand and Vietnam; 3 provinces each in Cambodia and Laos and 2 provinces each in Thailand and Vietnam. In each province, 3 selected districts will be focused for the series of Farmers' Participatory Action Research (FPAR). A regional Training of Trainers (TOT) (planned in 7-9 months of 2013) will be followed by setting Central Farmer's Participatory Action Research (CFPAR) in dry season next year, possibly from January 2014-May 2014 to be able to set-up first series of Farmers Participatory Action Research (FPAR) from wet-season of 2014. A Participatory Rural Appraisal (PRA) and baseline survey will support the development of the training curricula and set the baselines for subsequent research either agronomical or social. All these researches will be integrated at CFPAR level. She also emphasized that FAO IPM Programme will be national coordinating body for project activity in Cambodia, Laos and Vietnam whereas AIT will be responsible for regional coordination along with country coordination support to Thailand.

Followed to that, **Mr. Jan Willem Ketelaar**, FAO-IPM, briefly presented on the topics of 'FAO IPM's project coordination and governance structure plan at country level in Cambodia, Laos, and Vietnam'. He stated that FAO-IPM would be responsible for providing programme development and administrative support by establishing Project Management Unit (PMU), hosted by FAO-IPM country office and FAO Country Representations. The Local Management Unit (LMU) offices will be established at Provincial Department Agriculture (PDA) Offices at provincial level and work plan will be implemented by network of existing National IPM Programmes with support from FAO Asia IPM Programme in Cambodia, Laos PDR and Vietnam.

IDS' MEI' s work plan for the project was presented by **Dr. Michael Loevinsohn**, where IDS would be focusing on following MEL (monitoring, evaluation and learning) aspects that will feed to the:

- Revising the content of FFS and its research in order to achieve project goal;
- Community deliberations e.g. field days';
- Policy deliberations national, regional, global'
- FFS curriculum to address/modules on climate change (CC) awareness raising and recording specific local weather, biotic stresses (e.g. FFS Diary to collect data on weather variables).

The IDS work will be supported by PCU (AIT) based Social Researcher and four national researchers, one from each project country. Initially, MEL draft work plan will be developed and shared with all regional and national partners and later it will be adjusted as per national and local needs and interest.

Oxfam's work plan related to the policy aspect of the project was presented by **Dr. Brian Lund**. He presented an inter-connected and inter-dependent architecture of the framework for need based policy development for each of the 4 countries in the context of regional and global environment. The work would begin with conducting a baseline of policy at country and regional level and later would use the local, national and regional platforms to capture, document and disseminate the evidence-based policy suggestions to the policy makers. At the end of presentation, it was agreed that a detail work plan will be submitted by Oxfam, based on the discussions and presentation made, for better coordination and understanding by all partners.

Post-lunch sessions were devoted to the background paper presentations from each project country. The country presentation were designed to provide overview of existing important environment in relation to the goals and objectives of the project i.e. agriculture at large; rainfed farming situations and challenges; existing government policies on sustainable production, experiences of SRI adaptation and adoption by famers with emphasis on rainfed areas, opportunities existing to increase the agricultural productivity and quality produce in rainfed areas and constraint faced, and how these constraints can be addressed using goals and objectives of the Mekong SRI Project. It was expected that these 'environment' would help each country to design their own need-based objectives for the project finalizing by the time of National Inception and Planning Workshops as Country Strategy Papers (CSP).

In first presentation, **Thailand** team, led by Ministry of Agriculture and Cooperatives and their representation from Department of Rice, Department of Agriculture Policy, Land Development Department, and Department of Agriculture Extension, provided background information on rice production and related policies of the Thai government. The policy emphasis is on reducing cost of cultivation, organic and quality production, climate change adaption under the overall ambit of the HM the King of Thailand vision of "Sufficiency Economy". This provides excellent rational to develop compatible objectives of the project for Thailand in two selected provinces, i.e., (1) ***Surin*** (northeast) and (2) ***Pitsanulok*** (northern). (Picture 1) It was agreed that Thai team in consultation with the PMU Coordinator Thailand would review, and finalize the work plan and country strategy paper in coming months. The PCU Coordinator will follow-up with Thai counterparts *(See Thailand background paper).*

Second background paper was presented by **Cambodia**, where SRI has been introduced almost a decade ago and an increasing numbers of farmers are adapting and adopting one or more principles of SRI. However, the rainfed rice production areas are facing major challenges like:

- Limited technical knowledge and inappropriate use of chemical fertilizers and pesticides;
- Rice production mainly depends on rainfall and lack of irrigation support system and often experience flood or drought;
- Inadequate human resources and technical capacity, and limited fund and means to support technology transfer;
- Limited fund for agricultural research, training and extension; and
- Insufficient and limited access to credits for rice growers;

In terms of existing policies, there is strong support for sustainable rice production using SRI principles. Favourable policies are in place which has been institutionalized as "SRI Secretariat" under the Ministry of Agriculture and Forestry and Fisheries (MAFF). Three rainfed provinces i.e. (1) ***Pursat, (2) Kampong Chhnang*** and (3) ***Kampong Speu*** (Picture 1) were selected for the project implementation. FAO-IPM will follow-up the development of strategy paper leading to organization of the national inception workshop *(See Cambodia background paper).*

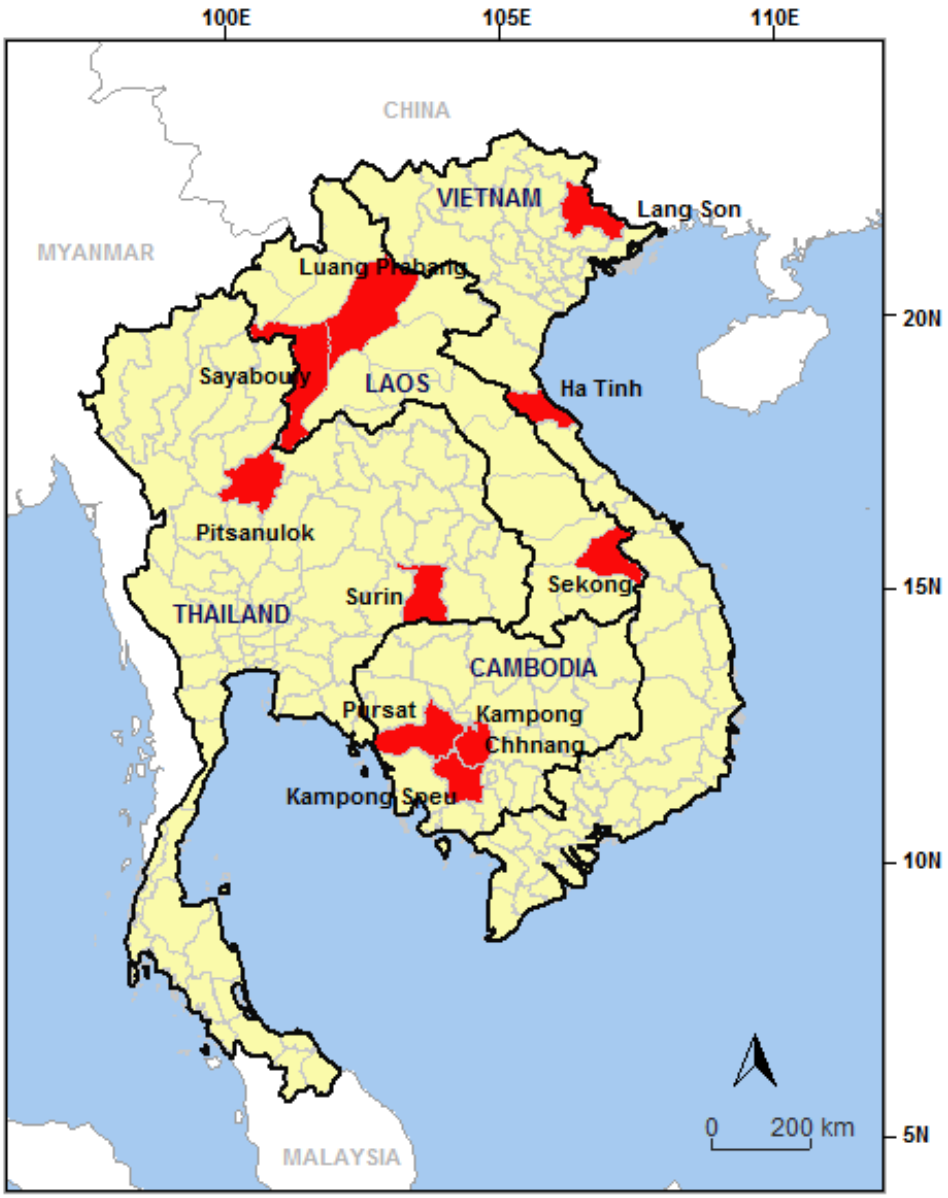
Rice Strategy Paper from Lao PDR focused on the current strategy on rice production. SRI, which has been introduced in the country by several NGOs, is yet to be fully utilized and understood in local context. The current results with regard to SRI introduction are a mix of success- and not so successful gains, as expected. It was agreed that the opportunity provided by SRI-LMB project would be an important step to test and adapt SRI principle in Lao PDR condition. Tentatively, three provinces, i.e., (1) ***Sayabouly, (2) Luang Prabang*** and (3) ***Sekong*** (Picture 1) were proposed for project implementation pending to further discussions with national stakeholders. Confidence building process and activities were identified as first set of activity in Laos. FAO-IPM will follow-up on these issues as a lead implementation partner for Laos (*See Laos background paper)*

Final country presentation came from **Vietnam**, a country that is taking lead in SRI adaptation and adoption through a number of institutions like extension agencies, NGOs, universities, etc, with support from Ministry of Agriculture and Rural Development (MARD). Steadily, a number of challenges realized in early phase of SRI adoption. These challenges were addressed involving strong research and extension back-up. Two provinces, i.e., (1) ***Lang Son*** and (2) ***Ha Tinh*** (Picture 1) were selected for the project implementation. The country team is well prepared to enter into the planning and preparation for project implementation with favourable policy support. FAO-IPM would follow-up the progress on finalization of country strategy paper *(See Vietnam background paper)*

It was evident from presentation and further deliberation that all four project-countries are at different stage of SRI adoption/adaptation. Laos could be at acceptance stage compared to Vietnam and Cambodia who are at institutionalization stage, whereas Thailand, who has some remarkable experiences working through NGOs and provincial agricultural ministries is now ready to work under the broader umbrella of Ministry of Agriculture and Cooperative. The various experiences either related to SRI or "Sufficiency Economy" concept needs to be consolidated and integrated with ongoing sustainable rice production programme of country for rainfed areas so that smallholder could benefit from project intervention. The emphasis of current ongoing Thailand's research extension work is on two components: a) improving land productivity, and b) increase net return for farmers. Both components can be addressed using SRI principles.

These varied country experiences from LMB countries provide excellent opportunity for ministries, academic institutions, CSOs, and development partners to learn from each other utilizing the momentum provided by SRI-LMB project. There are several important emerging areas that need to be addressed using the SRI momentum. These are quantifying energy use in agriculture, quantifying soil carbon content, soil water holding capacity, soil biodiversity, visual soil assessment, quantifying rainfall amount and water productivity in rainfed area. These components needs to be understood and translated into practical exercises for farmer training and eventually encouraging farmers to utilize them for sustainable rice production that has in-built resilience for weather extremes. At the same time, it is important that the key abiotic factors affecting crop growth should be monitored during project implementation and brought into perspective. It was also felt important that, provided other support available, the focus of work should be on SRI-based cropping systems, where other crops, such as vegetables, pulses,

sugarcane, etc., should be tested for productivity gain using SRI principle in addition to rice crop.



Picture 1: Map showing the ten provinces (red color) selected for FPAR activities in four project countries (Cambodia, Laos, Thailand and Vietnam)

4.2. Project planning at Country Level

The country planning process began on 11 April 2013 with a short planning overview by **Dr. Prabhat Kumar** titled: "General Guidelines for Developing Country Strategy Papers and Work Plan & Planning for National Inception Workshop". The purpose of the presentation was to provide sufficient basis to the country team to reflect on the background paper, start thinking about the Goals, Objectives and Outputs of the project along with resources planning. Finally, he also suggested ideas on conducting National Inception Workshops and its objectives and relevance for each country.

Followed to that the country team comprising of the ministry delegates, academic institution representatives and CSOs in country groups started working on first draft plan that was presented later in the day.

The **Cambodian group**, representing ministry, CSO, academic institution in their presentation focused on the key activities for the first year in detail with overview of activities in the subsequent years of project. For the first year, 3 objectives, as follows, were planned:

- To increase the capacity of the SRI Secretariat to be functioned well as a coordination body to promote SRI application;
- To identify appropriate techniques through participatory action researches at research institutes, academic schools and farmer level;
- To strengthen the capacity of human resources at national, provincial, district and farmers level to promote SRI application.

These objectives will be reviewed, discussed and finalized within the overall framework of project goal and work plan.

Participants from Ministry of Agriculture and Cooperatives, **Thailand**, drawn from several departments, developed and presented their draft work plan to the meeting. Unlike other project countries, where FAO-IPM office structure and national IPM progrmmes are providing the overall implementation support, AIT would host the PMU for Thailand and work closely with MoAC designated focal point in Bangkok and provincial LMU coordinators in two selected provinces for project implementation.

The group from **Lao PDR**, who are at preliminary stage of understanding SRI, planned to undertake similar set of activities as other countries. Parallel to these plans, the team suggested that FAO-IPM requires completing the official process by sending programme dossier to the ministry for internal discussion and follow-up for approval.

The **Vietnam** team developed and presented an extensive plan for the first year starting with finalizing the CSP and organization of national inception workshop. Other activities presented were similar to other countries.

In summary, it was agreed that upon return from the workshop, the background papers will be revised and work plan presented will be further elaborated and discussed leading to development of CSP prior to organization of the national inception and planning workshops. AIT will support the process in Thailand and FAO-IPM will support in Lao PDR, Cambodia and Vietnam. FAO-IPM will also follow-up on the request from the Lao team for the needful to obtain the approval for the project from ministry.

4.3. Work-plan for the project partners

On 12 April, morning, the project partners presented their ideas and thoughts on their work plans so as to integrate and synchronize activities using the CFPAR, FPAR, workshops. **Prof. Norman Uphoff** chaired the discussion. The discussion began by **Dr. Michael Loevinsohn**, who on behalf of the IDS presented the activities for MEL studies. Several important points emerged out during discussion:

- 2013 is preparatory year and IDS will begin its activities with regional TOT planned in August 2013; Concept related to MEL could be discussed with the PMU coordinators and training experts/assistant;
- FPAR will be conducted in 2014, 2015 and2016 (3 cycles), whereas the last year 2017 will be set out for documentation process;
- The selection of regional social researcher will be done shortly where IDS will provide inputs;
- Matters related to the local monitors for the MEL studies, which would be provided by sub-contracted NGOs/academic institutions (one each in project country) discussed;
- Partner subcontracting the CSO will use the budget marked for the purpose;
- Discussion also held on the natural experiment, an idea from IDS and, it was agreed that provision of contingency grant (available in budget) could be requested from EU, if needed.

Oxfam project partner was represented by **Mr. Darryl**, a Consultant, in absence of Mr. **Brian Lund.** Following key points were disused and agreed:

- The work plan presented earlier will be further elaborated with clarity with clear set outputs and activities;
- Oxfam presented the idea of a policy baseline study for the first year activity; the idea yet to be detailed and discussed in consultation with all partners;
- Oxfam will forward the detail ToR for Policy Officer and policy work related activity details to the AIT and also circulate to other partners.

4.4 Project Steering Committee (PSC)

A general discussion was held involving key project partners and associate with following key points:

Formation of project Steering committee:

Within the context of AIT-EU grant contract agreement, it was suggested to constitute a committee to ensure followings:

- Implementation strategy advise;
- Functions as a meeting forum;
- Provide general update on Intra and inter-partner Project developments; and
- Review the results of external evaluation and use recommendation for re-directing

project implementation strategies.

Initially, the consultation will take place every 3 months (the first consultation will take plan in July 2013) on an agreed time and day; and later on every six months in project implementation phase.

Formation of Regional Steering Committee (RSC) as per project plan

To provide an overall strategic direction to the project work and to mainstream broader issue such as AR4D and climate change adaptation, a regional steering committee is envisaged. As per initial planning, members of the steering committee will include representative of project partners, AIT sub-thematic areas' representatives working on AR4D, project associates and some external members including local EC delegation, if possible. It is expected that this committee will meet annually during the regional annual workshop to revisit and review the project work in the context of AR4D and climate change adaptation and provide needed advise to achieve the project's broader goal". It was suggested that initial membership would be drawn from the ACISAI Board Member. The Board would act as a Regional Steering Committee for this project as a part of their responsibility to act as advisory body --supervising and supporting the function of the Center – a regional innovation platform for the project. The ACISAI's Board Members include:

1. **Prof. Norman Thomas Uphoff**
Professor of Government and International, Agriculture at Cornell University; Director, Cornell Institute for Public Affairs (CIPA), USA – A Project Associate

2. Dr. Hiroyuki Konuma,
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3. Professor Amir Kassam
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Visiting Professor in the School of Agriculture, Policy and Development,
University of Reading, UK

4. Dr. Prabhat Kumar
Director, ACISAI, AIT, Regional Coordinator, SRI-LMB project

5. Dr. Abha Mishra
Co-Director, ACISAI, Team Leader, SRI-LMB project

Other actors, as mentioned above, may be invited depending on the need of the project and as per the long-term strategies of the regional innovation platform.

The Center's Director and Co-Director would connect the PSC and RSC. The Co-Director and Director of the Center will prepare annual report in consultation with the PSC members to seek advise from the RSC.

ANNEXES

ANNEX 1: LIST OF PARTICIPANTS

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ANNEX 2: COUNTRY BACKGROUND PAPER

2.1. Cambodia

2.2 Laos

2.3 Thailand

2.4 Vietnam

Background Paper

Cambodia

Inception and Planning Workshop

SRI-LMB Project

09-12 April 2013
AIT, Pathumthani

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BACKGROUND PAPER

GENERAL INFORMATION

Cambodia is one of the ten nations of Southeast Asia and part of mainland Southeast Asia. It is bordered on the north by Laos and Thailand, on the west by Thailand, and on the east by Vietnam. It has a coastline on the Gulf of Thailand of 443 kilometers (275 miles). The Mekong River flows directly through the country from north to south, eventually flowing into the Mekong Delta of Vietnam. Cambodia's largest city and capital, Phnom Penh, is on the Mekong River. Cambodia is divided into 24 provinces and one capital (Phnom Penh).

Cambodia's geographic area is 181,035 square kilometers and the population is 14.8 million. The current population growth rate is a relatively high at 2.25 percent. Approximately 90 percent of the population is Khmer and Khmer is the official language. Buddhism is the dominant religious group, claiming 95 percent of the population.

Like most of Southeast Asia, Cambodia is warm to hot year round and the climate is dominated by the annual monsoon cycle with its alternating wet (May-Oct) and dry seasons (Nov-Apr). The monsoon cycle is driven by cyclic air pressure that changes over central Asia.

AGRICULTURAL SECTOR IN CAMBODIA

The Royal Government of Cambodia considers agriculture development as a priority given its contribution to the country's economic growth, national productivity and employment and the promotion of living standards of about 80% of the country's population who live in the rural areas. The progress of the agriculture sector is not just a core driver of economic growth, but also promotes the living standards of the people and contributes to food security. The promotion of paddy promotion and milled rice exports not only increase economic growth but also make the cracking-dry rice fields become lush green in all seasons as well as allow rural youths to have jobs and upgrade their living standards.

The latest report from MAFF places the rice cultivation area at 2.97 million hectares, with an average yield of 3.17 tons per hectare, resulting in total production of paddy rice at 8.78 million metric tons. The paddy surplus for 2011-12 is about 4.34 million metric tons. Total yields increased around 10.47% in 2012 compared to 2011 due to increase in the planting area, development of irrigation, improvement of farming techniques and management, new advanced technology and high yielding varieties. Other agricultural sub-sectors such as horticulture, industrial crops, livestock and aquaculture have also increased remarkably. In general, although impacts from natural phenomenon were experienced, the agricultural production was good.

FOOD SECURITY SITUATION

Poverty has been reduced from 47 percent in 1993 to 28 percent in 2010. However, a third of Cambodians still live below the national poverty line (2,473 riel or US$0.61). Eighty percent of the population is rural and of the total poor, 92 percent live in rural areas. The inequality levels have risen dramatically. As a recent trend, inequality has increased not only between rural and urban areas, but also within rural areas. Twelve percent of households, or 1.7 million individuals, were food insecure and most of these households were affected by increases in food prices. Cambodia is among the 36 countries with the highest burden of child under-nutrition and one of the 33 "alarming" countries for levels of hunger and under nutrition.

EXISTING GOVERNMENT POLICY

The key existing policy related to SRI is the Policy Paper on "***The Promotion of Paddy Production and Rice Export***" that was promulgated on 17th August 2010 by the Royal Government of Cambodia (RGC). The vision is to transform Cambodia into a "Rice Basket" and a major rice exporting country in the global markets through the increase of rice productivity, improved quality and commercialization. The RGC has set the year 2015 as the target year to achieve paddy surplus of more than 4 million tons and achieve milled rice export of at least 1 million ton. To achieve the set target, the RGC has set up long, medium and short term strategies to improve productivity through the promotion of the use of qualified, high yielding and marketable seeds/varieties; improve cultivation practices and increase the number of cropping seasons. Strategies have also been designed to enhance processing capacity and quality, logistics and expand market opportunities in the regional and international markets. All concerned stakeholders have developed an "Action Program" for efficient and effective implementation of the policy roadmap.

IMPACTS OF CLIMATE CHANGE

Cambodia's environment is increasingly under pressure from both rapid economic development and climate change. The main potential impacts of climate change in Cambodia are on agriculture and allied sectors. Climate change is therefore a tangible and current threat already affecting the livelihoods of the resource poor rural households. Poor water-use efficiency (drought and flood) is a key priority for action with regard to adaptation to climate variability and climate change in the rice-based system. Despite a significant research effort in Cambodia during the past years or so, there appears to have been little adoption of the results in the areas of varietal improvement, direct seeding, double-cropping, crop diversification, reduced tillage or land leveling. Adoption of these practices would reduce vulnerability to climate variability and climate change in the rice-based system.

To respond to climate change, the RGC set up a National Adaptation Program of Action to Climate Change (NAPA) in 2006 with the main objective to develop human resources and institutions, conduct researches, apply appropriate technology, and mobilize funds. This needs to be done particularly in the sectors that are the backbones of the national economy, such as agriculture, water resources, fisheries, forestry, energy and physical infrastructure. In 2011, floods affected 1.5 million people and destroyed at least 9.4 percent of crops, further raising the profile of climate change and disaster risk reduction on the national development agenda. Work is being done to increase communities' preparedness and resilience. In addition, there are many programs and projects have been developed and implemented by Governments and development partners.

FOOD INSECURE PROVINCES

ADB reports that some provinces are often affected by drought and flood and are considered as food insecure. These include Kampong Speu, Takeo, Prey Veng, Svay Rieng, Kampong Thom, Siem Reap, Oddar Meanchey, Banteay Meanchey, Kampong Cham and Prah Vihear. Some food facility projects, e.g. the ADB-funded Emergency Food Assistance Project (EFAP), have been established to help farmers' access good quality seeds and other agricultural inputs.

MAJOR CONSTRAINTS

Progress has been seen in agricultural development, but Cambodia has still not made the best use of the sector's potential. The primary constraint to productivity lies in the limitations of irrigation. Cambodian agriculture is still anchored to fragile subsistence rain-fed systems, centered on paddy rice production. Access to irrigation systems varies geographically. In some northeast provinces, there are virtually no irrigated areas.

Low productivity is also caused by poor management of natural resources; lack of modern technology; skill shortages and weak human capital; poor access to modern agricultural inputs such as

seeds and fertilizers; poor supporting physical infrastructure (roads, markets). There are also limited access to agricultural extension services and financial capital; limited agricultural production land and insecure land titling; poorly performing small and medium enterprise (SME) activities related to agriculture. In addition, Cambodia is particularly vulnerable to the effects of climate change, such as rising temperatures and increased/ decreased annual rainfall, erosion, inundation and salinization as well as more risks of pest infestations. The effects of these factors are likely to be more intense for those who depend solely on agriculture for their livelihood.

SRI ADAPTATION IN CAMBODIA

The System of Rice Intensification (SRI) is a low-input methodology, which can be flexibly applied based on the enabling factors and farm conditions. In order to widely disseminate and promote SRI adoption and application, the SRI Secretariat was established in January 2005 by the Ministry of Agriculture, Forestry and Fisheries (MAFF) with technical support from CEDAC, and financial support from various development partners such as GTZ, FAO, HEKS and Oxfam.

MAFF has provided strong support for the development, promotion and implementation of SRI. In early 2006, SRI was integrated into the National Strategic Development Plan (NSDP) and policy frameworks to reduce food insecurity and poverty of rural households. With strong support from MAFF, in close cooperation with relevant development partners and active involvement of PDAs, by 2012 approximately 149,657 farmers have applied SRI on an area of about 100,720 ha. The average yield was about 3.94t/ha which is higher than the national average rice yield in wet season which is only around 3.17t/ha.

Despite the success, many challenges to SRI promotion remain, such as:

- Lack of animal manure and other farm resources for compost/fertilizer;
- Shortage of farm labor to meet intensive requirement for weeding;
- SRI is only applied on small portions of the field;
- Difficult to practice alternate flooding and drying of the field;
- Most farmers still lack confidence on applying and adapting SRI;
- Different understanding and interpretation of SRI concepts among stakeholders;
- Lack of monitoring and evaluation system.

By the end of 2009, MAFF recommended to expand the promotion and implementation of SRI nationwide by strengthening the management, execution and coordination mechanism for activities, improving technical aspects via research and training activities and increasing financial support. The following tasks were designated:

- The Department of Rice Crop (DRC) as the lead agency for overall supervision and management, provides technical advice and monitoring and evaluation of SRI implementation via the National SRI Secretariat.
- The National SRI Secretariat plays key roles as national executive body for developing SRI implementation strategy, approach and guidelines, coordinating with all concerned stakeholders to push for SRI implementation and promotion, and producing technical documents related to SRI and disseminating these to all relevant stakeholders and farmers.
- The Department of Agricultural Extension promotes the publications of technical documents and draws best practices, and uses different means to broadly disseminate these to farmers.
- The Cambodian Agricultural Research and Development Institute (CARDI) and Agricultural Schools and Universities to do more researches on SRI components to provide best technical recommendations and practical options to farmers.
- Provincial Departments of Agriculture to expand the promotion and implementation of SRI in close cooperation with development partners.

- MAFF also requested all development partners to broaden their technical and financial support for expansion of SRI activities throughout the country because SRI is the way forward for enhancing rice productivity and profitability in Cambodia.

In order to improve the management, development, implementation and promotion of SRI in Cambodia and to achieve the national objective to improve rice production and productivity in a sustainable manner, the SRI Secretariat needs to be re-designed. The new vision for the SRI Secretariat is to play a leadership role in setting strategic priorities for investment in research and extension; provide technical advice and support to government bodies, development partners, NGOs, and act as a hub for information about SRI and other best practices throughout the country irrespective of funding sources and implementing organizations.

The Department of Rice Crop, GDA in collaboration with Oxfam America has worked to strengthen the National SRI Secretariat in Cambodia with the purpose to refine and test this vision and develop a plan for the SRI Secretariat to deliver its mandates effectively. Through long discussions with involved stakeholders, the vision and mission of SRI Secretariat were developed and agreed as follows:

- **Vision:** Promoting sustainable rice production and productivity through application of the System of Rice Intensification (SRI) in ecologically sound and economically efficient way with consideration of climate change mitigation and adaptation leading to rural livelihood improvement and national economy development in Cambodia.

- **Mission:**

- To prepare policies and define priorities for the implementation of the SRI promotion at national level;
- To ensure coordination between all the institutions involved with SRI;
- To encourage the implementation of research work in order to provide adapted recommendations to the different situations;
- To manage the Monitoring and Evaluation system, ensure compatible M&E tools are used by the different stakeholders and compile information at the national level.

- **Organizational structure:** The organization structure and Terms of Reference of the SRI Secretariat have been prepared and is ready for submission for MAFF approval.
- **Training and promotion materials:** Training and promotion materials on SRI such as technical books, leaflets and posters have been published and distributed to all SRI promoters and relevant stakeholders.
- **M&E system**: The M&E system has been developed and tested for use in monitoring the progress of SRI application in the country.

THE MEKONG SRI PROJECT

The overall development goal of the project is to "*enhance rainfed smallholder farmers' capacity confronting climate change sustainably by applying SRI through Participatory Action Research in order to improve food security, income and occupational health status".*

The immediate objectives of the project are:

1. To increase the capacity of the SRI Secretariat to function well as a coordination body to promote SRI application;
2. To identify appropriate techniques through participatory action researches at research institutes, academic institutions and farmer level;

3. To strengthen the capacity of human resources at national, provincial, district and farmers level to promote SRI;

TARGET PROVINCES

Three target provinces will be selected for starting up the Mekong SRI Project, namely: Prey Veng, Takeo and Kampong Speu.

MAIN ACTIVITIES PROPOSED

1. Obj 1: To increase the capacity of the SRI Secretariat to function well as a coordination body to promote SRI application.
   - Organize SRI network meeting;
   - Gather all relevant information on SRI from stakeholders and make them available for distribution;
   - Provide technical backstopping visits to strengthen SRI application;
   - Set up M&E system to identify and promote SRI application;
   - Coordinate with public institutions, NGOs and private sector for SRI promotion and application.

2. Obj. 2: To identify appropriate techniques through participatory action researches at research institutes, academic institutions and farmer level.
   - Carry out baseline survey;
   - Identify critical SRI practices that require the conduct of more researches;
   - Conduct participatory appraisal;
   - Conduct participatory action researches on farms and at stations;
   - Conduct conference/seminar for experience sharing between national and international stakeholders;
   - Document all findings from the PAR.

3. Obj. 3: To strengthen the capacity of human resources at national, provincial, district and farmers level to promote SRI application;
   - Conduct inception and planning workshop;
   - Conduct mini-TOT at target provinces;
   - Conduct Farmer Field School (FFS) and Student Field School;
   - Set up on-farm demonstration in FFS;
   - Organize study visits;
   - Organize post-FFS activities;
   - Develop extension materials;
   - Conduct annual workshop;
   - Organize SRI farmers' forum and competition to share best knowledge and practices among model farmers.

2.2 Laos

Background Paper for Lao PDR

Inception and Planning Workshop
SRI-LMB project

Asian Institute of Technology
Bangkok Thailand

09-12 April 2013

Table of Contents

A) SALIENT FEATURES AND ROLE OF AGRICULTURE AND ITS CONTRIBUTION TO NATIONAL ECONOMY

Lao PDR is a small landlocked country with a total area of 236,800 sq km of which agriculture area is 2,378 sq km (FAOSTAT, 2011). During 1990s, the rice production area accounted for more than 80% of agriculture land (World bank report 2010), reached the peak in 2010 and decreased to 57% in 2011 (DOA statistic, 2011).

The Lao population reached 6.459 million (FAO, 2013) and is estimated to reach 6.9 million in 2015. The population consists of diverse ethnic groups. It is estimated that about 80% of the population relies on farming practices in form of subsistence agriculture. Rice, mostly glutinous, is a staple food for all ethnic groups for every meal. Average agriculture land per household is low but varying, ranging from less than 1 ha to more than 4 ha/household. [2 t/ha].

The economic structure is made up of 3 sectors of which agriculture (30.4%), industry (26.1%) and services (37.2%). Agriculture plays an important role in the national economy. Average GDP growth rate in 2010 was 7.9%. A growth rate of agriculture, industry and services was 4%, 12.6% and 8.4% respectively. (7th NSEDP, 2011). Lao PDR, although rich in natural resources, is still categorized as "a least developed" country and is led by one political party.

B) RAINFED AGRICULTURE AREA AND ITS SALIENT FEATURES

- **Main crops, main growing season and contribution to total national production**

Main crops grown on rainfed lands in Lao PDR include bean, cassava, coffee, maize, rice, tobacco, and a range of fruits and vegetables. Vegetables are mostly grown in the dry season (October-May) while rice is mostly grown during the rainy season (June-September). Irrigated rice is also grown during the dry season.. Rice planted area in 2011 was 57% of the total area planted in crops (DOA, Crop statistics, 2011). Total paddy rice production was more than 2.3 million tons in 2011.

- **Number of provinces**

There are 17 provinces (including its Vientiane capital) in Lao PDR. The Lao PDR is divided into 3 parts, northern, central and southern regions.
Number of farming households in 1999, the total number of households was 798,000. Majority of households are located in the central part of the country (379,700) followed by the northern (256,600) and southern (161,700) parts.

- **Food security situation**

Food security is a key priority to be addressed in Lao PDR as reflected in Lao government development policies. FAO defines food security as "when all people, at all times, have access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life". FAO 2008 statistics reveal inequality in access to food and to income, food , food needs and consumption FAO indicators, mal-nutrition and children stunted growth rates, e.g., 37%-40% of children under five suffering chronic malnutrition (MAF Strategy 2011-2020), and 27% of Lao people still live below the poverty line. Hence, Lao PDR has not yet achieved food security as of yet.

However, under collaboration with the Swiss Agency for Development and Cooperation, IRRI has worked with the Lao Government since 1999 to improve productivity in rice based cropping systems. As a result, IRRI has claimed that Lao PDR has achieved rice self-sufficiency in lowland irrigated rice systems

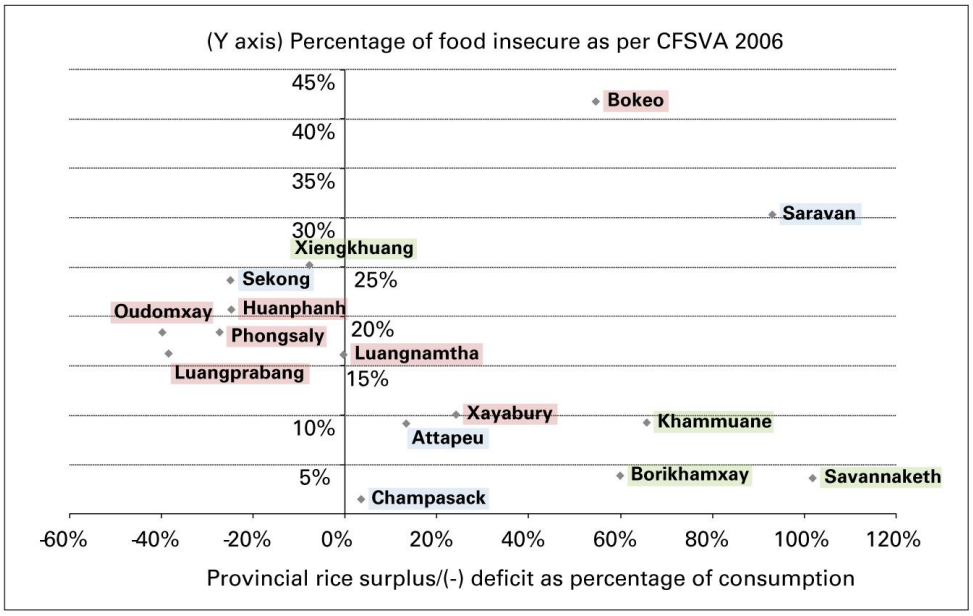
through increasing agriculture inputs and investment on irrigation system. This is done by expanding irrigation systems so that rice can be produced in both wet and dry seasons, introduction of new varieties, and increasing fertilizer use (Linguist and Sengxua, 2001). Lao-International Rice Research Institute (Lao-IRRI) and National Agriculture Forestry Research Institute (NAFRI) work has since shifted research and development focus to rainfed rice-based production systems, both in lowlands and in uplands.

- **Food insecure provinces**

Most minority ethnic groups, particularly those who do upland farming, face food insecurity. Rice shortages are common problems among upland farming communities which are usually short of rice for at least 3 months/year (Foppes and Kethpan, 2004).

Surveys carried out by Kaufmann in 1997 with 470 families in Luang Nam Tha Province (Nale and Sing districts) found that "for the average family, over a period of 10 years, there will be 5-6 years with average yield (9 months per year enough rice to eat), 3-4 years with bad yields (5-6 months enough rice to eat) and 1-2 years with good yield (no shortage). The same pattern has also been found in other case studies (Clendon, 2001, UNDP, 2001, Foppes and Ketphanh, 2003, McLennan, 2004) (Fobbes and Kethpan, 2004)".

Analysis of rice surplus/deficit (% of consumption) and percentage of food insecure households by province, 2006 (from CFSVA)



Source: CFSVA 2006 data (WFP, 2007) and the authors' calculations on estimated provincial rice surplus/deficit.

- **<u>Existing government policy and on-going development programmes</u>**

Existing government policy to be achieved by 2020 as per MAF strategy 2011-2020:

1. "Gradual introduction and increased production of modernized lowland market oriented agriculture production, adapted to climate change, and focusing on small holder farmers".

2. "Conservation of upland eco-systems, ensuring food security and improving livelihoods of rural communities."

With regards to relevant rice policies, the Lao government has set itself the rice self-sufficiency target of reaching a production level of 4.2 million metric tons of rice by 2015. For a general rice policy and strategy overview and for salient statistics on rice production in Lao PDR, the reader is referred to the World Bank-FAO-IRRI-MAF Rice Policy Study, published in 2012.

Many on-going development programmes, UN Programmes and projects (e.g. FAO, IUCN, UNDP, UNICEF, WFP, IFAD etc.), NGOs and INGOs are currently being implemented in Lao PDR. Although roles of each organization are variable, they mostly aim to build capacity of local people for sustainable, environmental-friendly production, addressing food security and improving livelihoods of rural communities, etc. and achieving MDG targets as well as those outlined in UNDAF.

FAO and the Lao government's National IPM Programme have been active in its support for sustainable rice intensification (SRI) and promotion of integrated pest management (IPM) through Farmers Field School (FFS) interventions in the irrigated and lowland rainfed rice production systems in about 11 provinces throughout much of the 1996-2002 period. FAO is currently involved in the development of a Regional Rice Initiative which includes Lao PDR. This initiative is aimed at reviving the network of rice IPM trainers for renewed farmer training efforts towards promotion of sustainable rice intensification in Lao PDR starting in 2013. For more information on FAO's support to the Lao National IPM-FFS Programme, see weblink:

http://www.vegetableipmasia.org/docs/Countries/Laos/Lao-IPM%20Brochure%20_English-final-%20Jan%202010.pdf

- **Impacts of climate change, if any**

Climate change is still considered to be a new concept for most of Lao people. Awareness on climate change is also estimated to be limited or low to zero among the rural people. But climate change has already resulted in new field problems and crises including pests and diseases as well as natural disasters (e.g., droughts and floods). Hence, impacts of climate change are costly and not to be overlooked in Lao PDR. Impacts of climate change include warmer weather, loss of crops, production, property, etc.

C) GOVERNMENT POLICY, FOOD-INSECURE PROVINCES, AND PRIORITY PROVINCES TO ADDRESS THE FOOD SECURITY ISSUES

- **Existing government policies to support rainfed areas**

The existing government policy for upland areas is "to totally stop slash and burn cultivation". The focus is to be on 47 poorest districts and to be linked to initiatives for rural development, poverty reduction, and environmental protection." (MAF Strategies 2011-2020).

According to 7th NSEDP for 2011-2015 (2011), the government policy on agriculture (including policy on support for rainfed areas) is to:

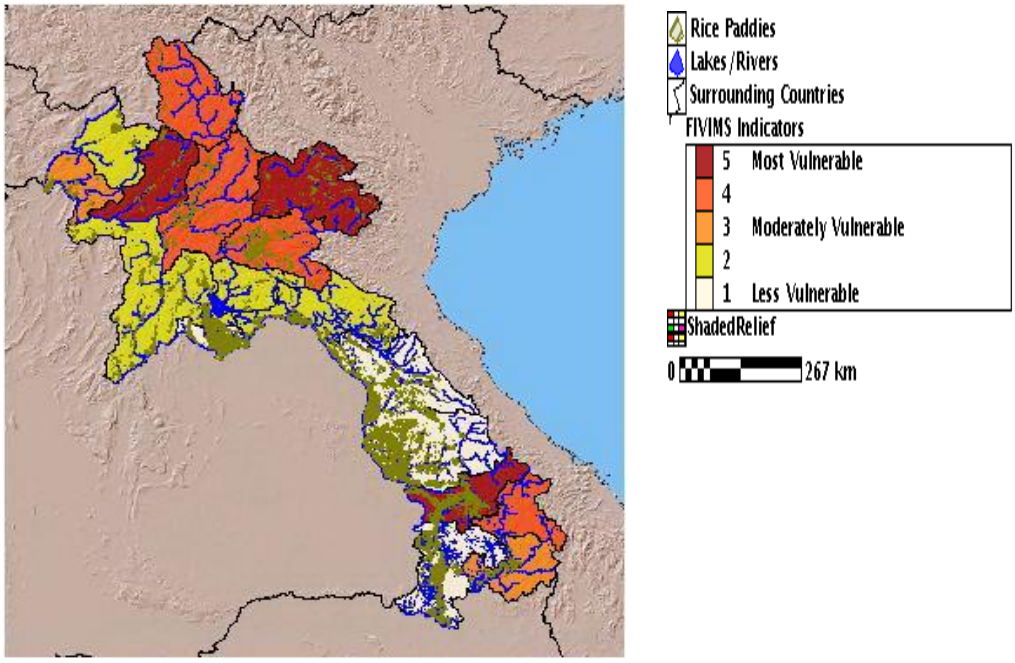
1.) Ensure food security and encourage agriculture for local consumption as well as export.
2.) Increase of agriculture productivity applying of newer scientific and technological methods.
3.) Increase the number of model families, stop shifting cultivation completely, regrouping small villages located in the mountains and encourage re-settlers, and provide land (on permanent basis) and regular work to the landless and re-settlers;
4.) Raise land yield rates by improving the existing methods of production, constitute production groups, and boost rural enterprises.

Target for implementation of the government policy (including rainfed areas), by the end of 2015, includes:

1. Food production should be enough to meet food demand. That is, part of it will be used for consumption and reserve, and some part of it will be for commercial use and export.
2. Total rice production should reach four million tons, grown in 1.04 million hectares (2.9 million to be produced in rainy season in 740 thousand hectares; 1 million tons to be produced in the dry season in 200 thousand and 0.2 million tons is for upland production and should be produced in 100,000 hectares). Expected average rice yield is 4 tons/hectare.
3. In Lao PDR, rainfed lowland rice areas are more than rainfed upland rice areas. Rainfed lowland and upland rice areas accounted for approximately 70% and 21% of the agricultural areas, respectively. Rainfed lowland and upland rice production accounted for 76% and 14% of a total rice production. (Schiller et al. 1999).

- **Food security map**

Map of food-insufficient areas



Source: FAO 2005

D) MAJOR CONSTRAINTS AND NEEDS

Major constraints for crop production:

1. Human resources: Population is made up of many ethnic groups with different cultures, lifestyles, languages, etc., which have implications for crop production techniques. People with technical knowledge on good practices for production intensification in the various (irrigated, rainfed lowland and upland) agro-ecosystems are limited.
2. Limited availability of technologies along a supply chain ranging from pre-production, production and postharvest technology, etc.
3. Insufficient pest, disease and production management
4. Ill-preparedness for result and impact of climate change
5. Low infrastructure
6. Budget deficit resulting insufficient funding from the national budget

- **Needs for crop production**

Technologies/technical assistance that encourage sustainable rice production intensification in both rainfed lowland and upland areas. Priority should be given to upland areas to work with farmers with large scale production. If so, it would also allow them to reduce agriculture inputs and to stop using herbicides, particularly Paraquat.

E) EXPERIENCES OF SRI ADAPTATION AND ADOPTION BY FAMERS WITH EMPHASIS ON RAINFED AREAS

SRI work in Lao PDR has been implemented by Irrigation Department, MAF, and also by many NGOs (called as Non profit association in Lao PDR). SRI was piloted in Lao PDR since late 1990s and was widely promoted in most provinces during early 2000. However, practicality versus results of SRI have been discussed and reported with multiple views. Some are as follows below.:

1. Yield received under SRI practice reportedly to vary from 1.3 – 6 or 7 tons/hectare (Schiller 2004) but also were reported much higher, up to 9 tons/ha. Farmers in Northern Laos, (Sayabouly and Luang Prabang Provinces) successfully implemented SRI innovation and received yields from 6-8 tons/ha and up to 9 tons/ha whilst traditional method could only yield 3-4 tons/ha (http://sri.ciifad.cornell.edu/countries/laos/index.html).
2. SRI tested in Lao PDR could receive high yield, but with high inputs of fertilizer, which found to be difficult to be followed for wider adaptation in Lao PDR. In addition, SRI is found be unsuitable in Lao condition particularly in wet season in rainfed production areas when lack of control over water can impede management of water regimes. In the past, SRI could only adopt in irrigation areas. SRI planting technique of a single young seedling was found to be too demanding by Lao farmers (Schiller, 2004).
3. Farmers in Fueng District who tested out SRI found that SRI is only appropriate for a small area per household e.g. 1,600 sq m or 0.2 ha;
4. Farmers who tested out SRI indicated that despite of demanding land preparation for weed control and drainage under SRI golden apple snail control is notably more problematic. Young seedlings to be planted under SRI were attractive to -and easily damaged by- golden apple snails (Schiller, 2004).
5. At the moment the government is at the center of SRI extension activities in Laos. On the other hand, there are various international organizations, donors, and international NGOs that have projects within which SRI extension activities are a sub-component. Along with these hands-on extension activities, it is necessary that the doubts and issues that have arisen regarding SRI be addressed through experimental studies based on specialized skills and knowledge of agriculture. The sharing among all relevant parties of technical information that has been gleaned through the SRI extension activities of the government and various organizations, as well as the results of experimental studies is expected to be carried out in tandem with SRI extension in the

future, will help firmly root SRI in the Lao countryside and will be extremely fruitful for all (Simazaki.K., 2011)

F) OPPORTUNITIES EXISTING TO INCREASE THE AGRICULTURAL PRODUCTIVITY AND QUALITY PRODUCE IN RAINFED AREAS, AND CONSTRAINTS FACED

1. Supportive Government policy on agriculture sector and rice. Rice is a staple food for Lao people and it is one of main/most important crops for the nation;
2. Knowledge and research activities done by IRRI and others and results available for rice productivity improvements but uptake by smallholder farmers still limited ;
3. Despite of more attention towards strengthening agricultural education and extension systems in Lao PDR in recent years, outreach systems still insufficient, lack of capacity, understaffed and impeded by lack of operation resources.
4. Previous work done on SRI in Lao PDR (e.g. research, pilot activities, etc. including what's done by NGOs) both lowland and upland, for building on the success of and lessons learned from SRI done in Lao PDR, and adapting those are sound and applicable;
5. Department of Irrigation responsible for SRI work in Lao PDR shares the same ministry with Department of Agriculture (DoA) and Department of Agricultural Extension and Cooperation (DAEC, formerly NAFES).
6. Existing rice IPM network and experience on Rice IPM FFS in Lao PDR.

LIST OF IMPORTANT REFERENCE ON SRI IN LAO PDR

- FAO, IRRI, MAF and WB: Lao People's Democratic Republic Rice Policy Study, 2012;
- Linquist, B. and Senxua, P.: Nutrient Management in Rainfed Lowland Rice in Lao PDR, 2011;
- Ministry of Agriculture and Forestry: Strategy for Agriculture Development for 2011-2020, 2010;
- Ministry of Planning and Investment: The seventh Five-year National Socio-Economic Development Plan for2011-2015, 2011;
- John, S.: SRI- Suitability for Lowland Rice Production in Lao PDR, 2004;
- http://www.irri.org/index.php?option=com_k2&view=item&id=12341:irri-in-lao-pdr&lang=en;
- http://sri.ciifad.cornell.edu/countries/laos/index.html;
- http://www.vegetableipmasia.org/docs/Countries/Laos/Lao-IPM%20Brochure%20_English-final-%20Jan%202010.pdf;
- Kazuyuki, S., *Rice Farming Revolution by SRI, published by J-SRI in Sept. 2011*

Background Paper

Thailand

SRI-LMB Project

09-12 April 2013
AIT, Pathumthani

Agricultural Technology and Sustainable Agriculture Policy Division (ATSAP)
Ministry of Agriculture and Cooperatives
Royal Government of Thailand

TABLE OF CONTENT

SUMMARY

Agriculture sector despite its decreasing contribution to the national GDP is an important part and parcel of Thai economy, social and spiritual life. Rice, which occupies over 50% of the area, is by far a most important crops in the Kingdom not only to meet the domestic consumption needs but also for export to number of countries in the world. Thai Rice fetches a premium price in the word market and known for its quality and high standard. Majority of rice are grown in Central and NE part along with Northern part of the country. The geographical, hydrological as well as social and economic base in North and NE Thailand requires special attention in the wake of serious challenges on account of several important drivers but not limited to climate change, resource degradation, globalization and above all re-orientation towards the 'Sufficiency Economy" and Sustainable Agriculture Production policies of the HM the King, which is implemented by the Ministry of Agriculture and Cooperatives (MoAC).

To improve farmer livelihoods, natural resources and infrastructure must be considered and developed. Soil is an important factor in agricultural production. The poor soil health is a major problem in Thailand, with an area of about 27.988 million hectares, salt affected area is about 2.302 million hectares. Farm holding areas are about 24.31 million hectares or 47.31% of the total area of Thailand in 2010. More than a half of farmer's lack land ownerships that contribute to the problem of access to resources in the production of food security. Water management is a main problem lead to water shortage where irrigation areas cover just a 22.5% of the total agricultural land use areas. The agricultural sector is likely to have communities with a high proportion of the elderly population due to low birth rate and low attraction to new generation in term of income. Agricultural policy in 2012 fiscal year was mainly focused on urgent issues to embark and the reconstruction of agricultural economy. Crop insurance was introduced in relation to policy on food security.

To address some of the above-mention challenges under the broad umbrella of available policies of MoAC, principles of SRI, which has been applied and tested on a pilot basis by farmers group in Central and NE Thailand, provides a robust opportunity to undertake systematic action research as envisaged in the AIT-EU SRI Project. Asian Institute of Technology (AIT) in collaboration with Thai Education Foundation and DoAE has undertaken multi-year projects utilizing the principles of SRI, which provide evidence of not only factor productivity increase but also the increase in knowledge and capacity of the farmers to apply sustainable agriculture practices in their own farm.

A. SALIENT FEATURES AND ROLE OF AGRICULTURE AND ITS CONTRIBUTION TO NATIONAL ECONOMY

Thailand is fundamentally an agrarian society and Agriculture, value added (% of GDP) contributed 12.37% in 2011 (World Bank, 2012). Agriculture plays a crucial role as a source of food, raw materials, employment, export earning, ecology, culture, wisdom and social solidarity. Rice alone occupies over 50% of total cropped area (see Table 1, Table 2 and Table 3). The agriculture sector always faced the crisis and other changes arising from globalization. His Majesty the King realized that there are many risks that occur after the crisis, especially in small-scale farmers in agricultural sector. Farmers or the small-scale farmers face the risks not only in economic crisis such as the price of agricultural product and debts, but also natural disasters like droughts, water supply, plant diseases and pests. Therefore, His majesty the King has given the practical way in agricultural sector under "Sufficiency Economy" Philosophy. It was namely as **"New theory"** concept which simply implies the new approach of development in the agricultural sector. This concept is the guiding force in reducing dependence and at the same time envisage to increase the capability of farmers to manage the production independently with a minimum of risk to the smallholder farmers.

The Ministry of Agriculture and Cooperatives (MoAC) is responsible for implementing the sustainable agricultural development framework to achieve the goals set out by the His Majesty the King. Sustainable agriculture development framework provides the best guideline for small-scale farmer which can reflect the balance among three aspects, *i.e.,* economical, socio-cultural and environment and it aims to improve farmer's quality of life, food security and self-sufficiency in household and at community level.

The Royal initiative is to help farmers who usually suffer from the impact of other changes, crisis, natural disasters and external factors. The implementation process of agricultural development comprises of three phases:

(1) The first phase is to adapt production process to enable farmers to understand and apply it into their own farmland. By doing so, a farmers not only produces for the family consumption but also able to sell surplus to the market to generate additional income. Making informed decision on resources use for production could lead to reduce cost of production and enhanced income for families to reduce dependency.

(2) In second phase of this framework, farmers are encouraged to set up groups or cooperatives to carry out activity work in the areas of production, marketing, living conditions, welfare, education and other societal goals, and

(3) The third phase envisages that the farmer should be able to connect better to banks or private sector to obtain funds to assist in investment or developing their quality of life. In this phase, farmers can get more benefits, improve the quality of their life and strengthen their capacity building into the network both in community and national level.

Table 1 Agricultural land use in Thailand

Agricultural land use	Area (hectares)	Percent (%)
Household	594,654.56	2.72
Paddy field	11,464,468.8	49.74
Field crop	5,615,360.16	21.37
Orchard	5,539,374.88	21.35
Vegetable and flower plants	243,646.08	0.84
Pasture	159,974.24	0.74
Unclassified	252,390.56	1.38
Other	437,797.76	1.86
Total	24,307,667.04	100.00

B. RAINFED AGRICULTURE AREA AND ITS SALIENT FEATURES

1. Rainfed areas

The rainfed areas in Thailand primarily concentrated in northeastern and northern part of the country. In NE Thailand only 8% area is irrigated and remaining 92% is either rainfed or partially irrigated with the water harvested from higher slopes. Besides, in most part of the northeastern region the underground water is mostly saline because of the underlying rock salt geological formations (Senanarong et al., 2013). The following table (Table 2) provides the details of the main crop, planted area and other details. Similarly majority of households are engaged in either full-time or part-time farming for their livelihood needs.

Table 2 Main crops of Northeastern and Northern in Thailand 2011/2012 (Source: Department Agricultural Extension, http://www.agriinfo.doae.go.th/)

Sl.	Main crops		Growing season	Area (hectare)	Contribution to total national production (kg)
Nakhon Ratchasima	Wet season rice	186,615	May - October 54	641,148.16	1,898,760,405
	Cassava factory	71,976	March 54 - February 55	283,628.16	5,933,504,614
Roi Et	Wet season rice	188,519	May - October 54	570,592.00	1,404,776,825
	dry season rice	26,480	November - April 55	56,845.92	302,508,092
Kalasin	Wet season rice	130,701	May - October 54	271,582.24	709,174,404
	Sugar cane	31,640	August54 - January	79,893.12	3,747,951,254
Maha Sarakham	Wet season rice	127,199	May - October 54	376,702.40	1,118,392,876
	dry season rice	20,087	November - April 55	37,413.44	203,047,524
Sakon Nakhon	Wet season rice	139,313	May - October 54	358,273.76	992,637,368
	Rubber	19,352		39,138.72	28,486,458
Khon Kaen	Wet season rice	169,332	May - September 54	465,557.76	1,106,974,801
	Sugar cane	43,760	September 54 - July 55	129,923.36	7,041,088,981
Ubon Ratchathani	Wet season rice	248,720	May - October 54	696,212.64	1,654,229,298
	Cassava factory	50,040	March 54 - February 55	73,687.04	1,111,413,737
Buri Ram	Wet season rice	187,826	May - September 54	568,965.92	1,459,777,638
	Sugar cane	9,874	November 54 - September 55	40,548.32	5,957,655,162
Nong Khai	Wet season rice	31,804	May - October 54	108,307.52	201,385,805
	Rubber	12,117		36,649.28	33,996,919
Chaiyaphum	Wet season	103,709	May - October 54	309,926.08	820,017,945

Sl.	Main crops		Growing season	Area (hectare)	Contribution to total national production (kg)
	rice				
	Cassava factory	36,887	March 54 - February 55	131,371.52	2,303,368,829
Si Sa Ket	Wet season rice	204,709	May - October 54	512,888.96	1,460,678,194
	Rubber	19,767		32,487.20	46,039,559
Nakhon Phanom	Wet season rice	87,341	May - October 54	253,974.72	491,614,844
	Rubber	18,217		41,849.76	11,747,170
Udon Thani	Wet season rice	171,062	May - September 54	381,766.72	989,636,176
	Sugar cane	26,010	January 54 - December 55	96,243.68	5,452,452,549
Surin	Wet season rice	200,058	May - October 54	567,558.08	1,350,629,481
	Rubber	11,087		26,074.24	8,306,965
Yasothon	Wet season rice	70,402	May - October 54	244,000.00	624,695,487
	Cassava factory	12,634	March 54 - February 55	20,996.32	352,677,638
Mukdahan	Wet season rice	45,012	May - October 54	84,027.36	213,808,778
	Rubber	15,423		24,729.44	11,170,857
Loei	Maize	45,395	May - December 54	159,550.40	738,844,850
	Rubber	35,826		127,934.72	24,281,428
Nong Bua Lam Phu	Wet season rice	52,897	May-September 54	153,573.60	392,171,636
	Sugar cane	19,569	November 54 - July 55	59,591.84	2,792,247,770
Amnat Charoen	Wet season rice	56,968	May - October 54	179,679.36	386,026,952
	Cassava factory	8,217	March 54-January 55	13,134.40	205,016,650
Buengkan	Wet season rice	34,336	May-October 54	107,384.80	158,417,361
	Rubber	32,643		102,821.44	319,223,499
Kamphaeng Phet	Wet season rice	29,609	May - October 54	270,946.56	1,047,399,638
	Dry season rice	21,078	November - April 55	209,400.80	899,293,507
Chiang Mai	Wet season rice	57,114	May - October 54	81,463.52	288,125,720
	Shiitake	19	March - July	78,880.00	41,005,000
Phichit	Wet season rice	34,236	May - October 54	305,424.96	890,963,077
	Dry season rice	161,470	November - April 55	253652.96	891401999
Nakhon Sawan	Wet season rice	50,736	May - October 54	500,762.24	1,389,426,637
	Dry season rice	27,586	November - April 55	300,014.08	1,056,128,541
Phitsanulok	Wet season rice	53,464	May - October 54	282,990.56	840,593,354

Sl.	Main crops		Growing season	Area (hectare)	Contribution to total national production (kg)
	Dry season rice	33,018	November - April 55	238,908.48	885,893,000
Chiang Rai	Wet season rice	79,781	May - October 54	225,606.08	654,481,071
	Maize	60,743	March - January	125,226.88	425,724,750
Lampang	Wet season rice	57,763	June - October 54	76,252.80	251,525,552
	Maize	13,714	May - March	27,480.00	155,355,383
Phrae	Maize	27,335	May - March	59,818.08	269,386,111
	Wet season rice	31,281	May - October 54	50,695.84	177,148,699
Uttaradit	Wet season rice	37,827	May - October 54	108,964.48	471,761,196
	dry season rice	17,989	November - April 55	62,363.36	263,043,209
Uthai Thani	Wet season rice	14,365	May - September 54	116,827.68	548,703,364
	Sugar cane	9,223	January-November	56,290.72	3,064,542,530
Phayao	Wet season rice	45,649	May - September 54	131,354.40	394,172,672
	Maize	22,980	May - February	65,551.52	312,671,056
Lamphun	Lounganoi	45,171		43,455.84	253,272,891
	Wet season rice	18,665	May - October 54	22,016.32	80,413,444
Nan	Maize	40,254	March-February	133,858.24	459,267,848
	Wet season rice	31,889	May-September	35,574.56	113,538,774
Sukhothai	Wet season rice	56,501	May - October 54	222,172.16	727,701,000
	dry season rice	42,239	November - April 55	165,612.00	622,663,112
Tak	Maize	29,750	May - January	114,721.92	555,576,438
	Wet season rice	17,421	May - September	46,078.24	142,335,520
Phetchabun	Wet season rice	50,577	May-September 54	208,002.08	806,493,249
	Maize	43,585	May-October	163,971.36	872,058,602
Mae Hong Son	Upland rice	20,010	May - September	16,385.44	34,156,577
	Wet season rice	15,588	June - October	15,018.56	41,668,124

Table 3: Paddy: Planted Area, Harvested Area, Production, and Yield - Thailand

Year	Planted Area	Harvested Area	Production	Yield
	(1000 ha)	(1000 ha)	(1000 metric tons)	(kg/ha)
1983	9,984.666	9,830.875	17,251.817	1,755
1984	9,950.420	9,597.610	19,606.114	2,043
1985	10,220.243	9,905.908	20,017.566	2,021
1986	9,935.829	9,276.221	20,073.831	2,164
1987	9,295.088	9,028.594	18,667.025	2,068
1988	10,170.237	9,727.559	18,811.181	1,934
1989	10,272.953	9,944.899	18,629.893	1,873
1990	10,155.691	8,942.783	19,082.447	2,134

1991	9,518.909	9,028.328	19,240.098	2,131
1992	9,706.334	9,193.761	21,451.638	2,333
1993	9,611.074	8,648.250	17,707.114	2,047
1994	9,645.958	8,777.150	21,005.863	2,393
1995	9,633.943	8,847.830	21,050.208	2,379
1996	9,978.011	9,197.470	22,102.853	2,403
1997	10,004.641	9,794.750	22,772.761	2,325
1998	10,157.640	9,625.680	23,907.757	2,484
1999	10,365.344	9,774.090	23,581.636	2,413
2000	10,078.570	9,745.090	24,947.540	2,560
2001	10,833.345	10,193.901	28,487.408	2,795
2002	10,388.170	9,514.140	27,051.947	2,843
2003	10,479.256	9,513.302	29,336.704	3,084
2004	10,900.248	9,865.321	29,299.043	2,970
2005	10,623.307	9,997.229	29,387.010	2,940
2006	10,621.338	9,970.422	29,792.050	2,988
2007	10,818.556	10,165.160	29,641.871	2,916
2008	9,285.248	8,861.551	32,119.347	3,625
2009	10,321.315	9,933.601	31,909.794	3,212
2010	10,523.538	10,083.128	30,971.004	3,072

2. Food insecure provinces

The Thai government, supported by the FAO's Asia FIVIMS project, developed the National Food Insecurity and Vulnerability Mapping System (FIVIMS) as part of its commitment to the World Food Summit in 1996. The system was launched in 1997. It was later integrated in the regular national budget program in 2003, under the coordination of the Office of Agricultural Economics. The map (see Map 1) identifies vulnerable population in different parts of the country. The Thai FIVIMS classifies 76 provinces into 3 clusters based on food security and nutrition. Each cluster is divided into sub-groups (class) of provinces.

The first cluster, classified as the most vulnerable, is located in the *Northeastern* and the *Northern* regions. Population are characterized by high rate of low birth weight, underweight in children under 5 years old, and prevalence of iodine deficiency, in addition to other vulnerability factors such as low per capita income, high rate of inactive members and land ownership problems. This cluster is illustrated in red and pink colors.

Provinces in the second cluster are in the Central, the East, the West and the South of the country. These provinces have more favorable environments for food security and nutrition with higher per capita income. But there are some vulnerability factors. This cluster is illustrated in yellow and ample green. The last cluster is the least vulnerable group, consisting of the remaining provinces in the Central, the East, the West and the South of the country. Under this cluster, the populations have higher-than-national average income. There are also some negative factors in terms of food security. The cluster is illustrated in dark and light green. (Prachason, 2009)

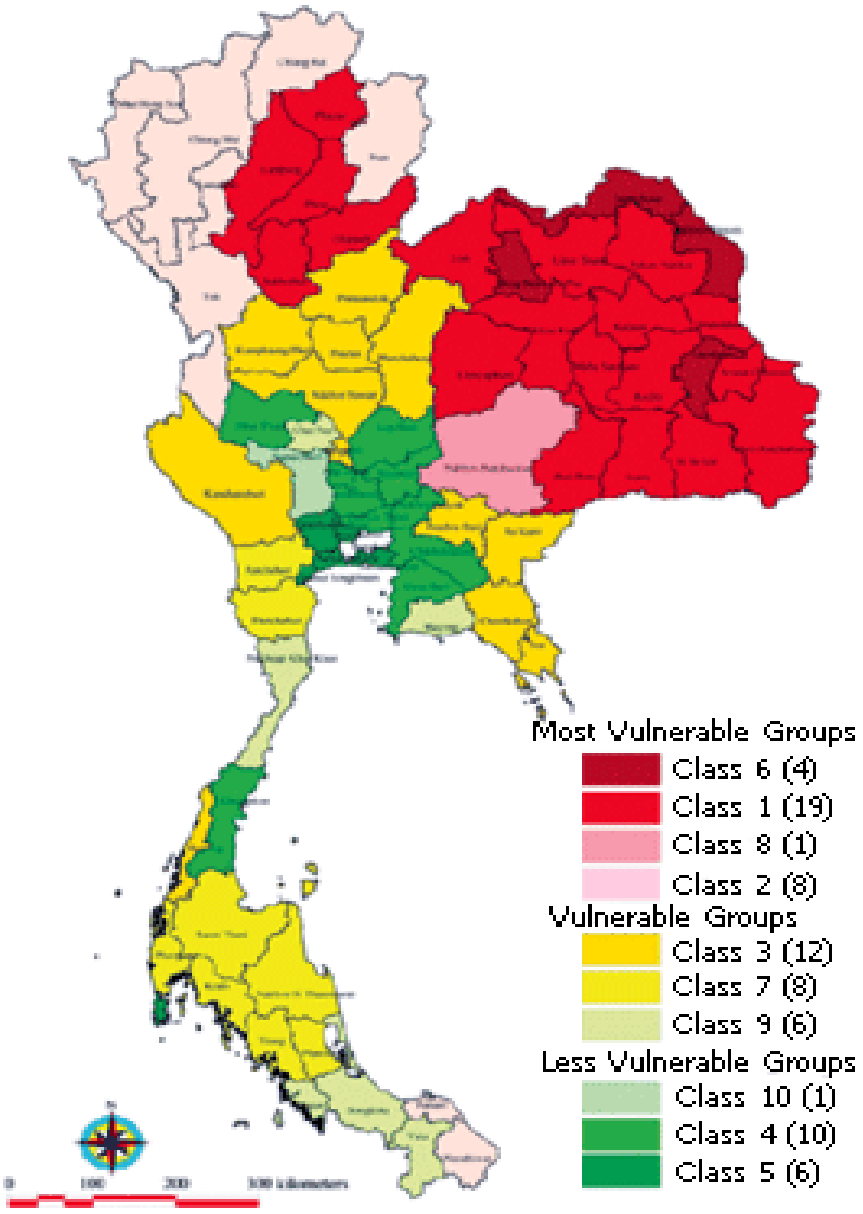


Figure 1 Thailand's Development of Food Insecurity and Vulnerability Mapping Systems (FIVIMS)*
Source: Ministry of Agriculture and Cooperatives, 2005, "The Results of the Thailand Analysis", <http://www.asiafivims.net/thailand/fivims/analysis.htm, 10 October 2008>

3. Climate change

Several studies pertaining to the impact of climate changed pointed that in the year 2100 there will be 1.4 to 5.8 degrees Celsius increase in temperature, which will cause sea rise of about 0.9 m. This would result into alternation of weather patterns, which in turn will cause flood and drought in some areas of the world including in some part of Thailand as well. There is a prediction that there would be wide ranging impacts on growth and development of the important crops, and general impact on overall biodiversity could not be ruled out The sea rise will cause corrosion of coastal fisheries and also worsen the plant diseases and would increase herbivory by a number of insect-pest either prevalent ones. Apart from climate change there are other factors, which are adversely affecting the agricultural production base. For instance, one cannot rule out emergence and spread of new insects and vectors from other parts of the world not because of climate change but due to increasing transport and movement of peoples and goods.

Thus, in general a negative impact of climate change and other factors are predicted that would pose serious challenge to maintain the crop growth and overall productivity.

3.1 Impacts of climate change

Thailand GHG Emission (as estimated by Ministry of Energy)

In 2000:

- 454.3 ton CO_2 equivalent/ US$ one mill. GDP
- 0.75% of the world GHG emission
- Ranked as the 31stor 109thin term of per capita GHG emission
- In 2003, 344.2 ton CO_2equivalent/ US$ one mill. GDP

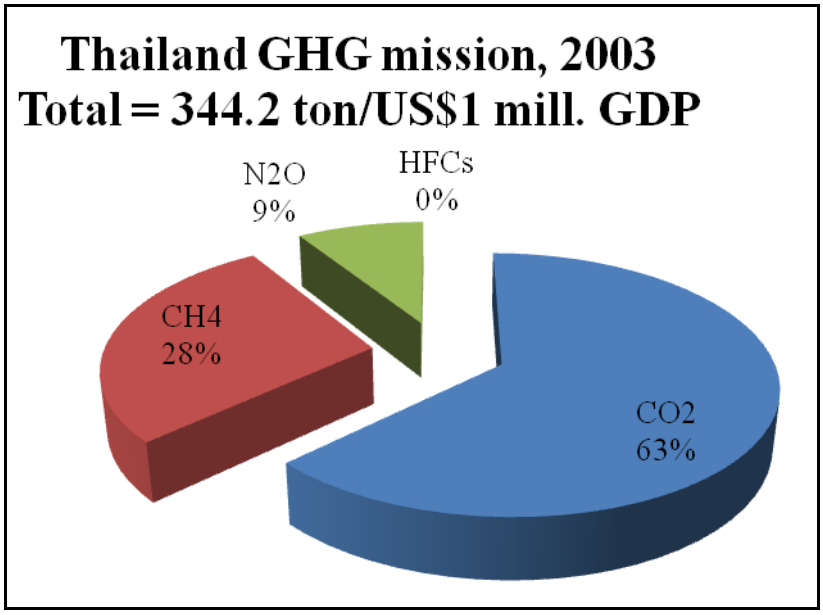


Figure 2: Thailand GHG Emission (Source: Ministry of Energy, Thailand, 2005)

The impact of climate change will make the region hotter with long hot summer with increased evaporation of water, reduced water retention capacity and increased water scarcity. In Thailand, a study of the issue of climate change has to be pointed out that with temperature rise of 1-2 degrees Celsius rainfall tended to decrease. The rainfall during the rainy season tends to be lower in the dry season of the following year. Thus causing a shortage of water for agriculture as a whole. The Table 4 shows the rainfall and number of rainy days during the period of 2001-2010.

Table 4: Rainfall and number of rainy days in 2001-2010.

Year	Rainfall (millimeter/year)	Number rain days (day/year)
2001	1,682	139
2002	1,586	132
2003	1,499	122
2004	1,408	118
2005	1,590	129
2006	1,655	133
2007	1,601	129
2008	1,751	142

2009	1,610	130
2010	1,647	131
Average	1,603	130
Growth rate (2001-2010) (%)	0.68	0.25

Source: Department of Meteorology

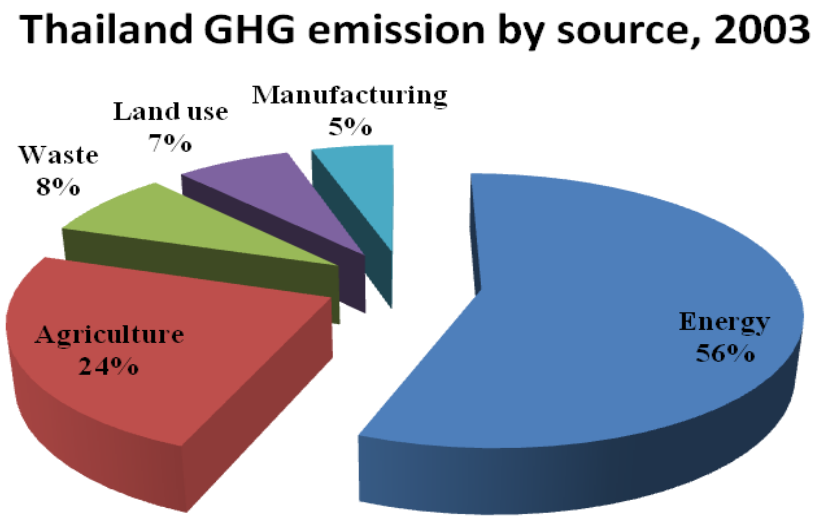


Figure 3 Thailand GHG Emission by source, 2003 (*Source: Ministry of Energy, Thailand, 2005)*

3.2 Emission in agriculture (GHG emission from agriculture)

- Agriculture: 58% is CH_4 or 12.7% of total emission
- Livestock 25%
- N_2O: soil 15%,
- Burning 2%

(Source: Office of Agricultural Economics, 2000)

Table 5: Climate and Optimal Climate by region

2010	Northern	Northeastern	Central	Southern
Temperature (Celsius)				
Minimum	6.7	7	15.2	18.5
Average	26.6	26.7	27.8	27.3
Maximum	42.3	40.6	38.8	36.8
Rainfalls (Millimeter)	1,112	1,504	1,393	2,264

Table 6: Climate and Optimal Climate for Major Crops

Crop	Growing period	Temperature			Rainfalls		
		Min	Optimal	Max	Min	Optimal	Max
Rice	120-150	8	25-35	43	600	800 - 1,200	2,000
Rubber		10	24-27	45	1,350	2,000 - 4,000	6,000
Sugar cane	300-450	15	30-35	40	600	1,500 - 2,000	3,000
Cassava	240-365	10	25-37	45	500	1,000 - 1,500	2,500
Maize	100-120	10	25-35	40	600	1,000 - 1,200	1,800
Oil palm		12	22-32	38	1,400	1,800-2,500	2,800

3.3 Trend of Climate change in Thailand

3.3.1 Temperature

- Increased by 1degree during the last 45 years
- Less rain volume and number of raining days in summer but longer in winter monsoon
- Increasing high temperature days in summer and less lower temperature days in winter
- 4 degree increase in temperature can lead to change in direction and degree of typhoon by 10 – 20%

The impact of higher temperature

- Increased water evaporation, more frequent but concentrated rain in specific areas, leading to flood in the south but drought in the north and northeast.
- Changes in water flow thus affecting the ecosystem and biodiversity.
- Loss of some marine species, coral bleaching.

3.3.2 Sea water level

- Increased by 3 mm/yr. during 1940-1960, followed by 20 mm/yr. afterward
- In 2020, the increase in the Gulf of Thailand was estimated to be 17 –49 mm/yr.
- Impact on lower Chao Phraya River

The impact from higher sea level

- Bangkok will be only 1 m. above sea level, in risk of flood and damages on public utilities
- 40 km intrusion of sea water into fresh water –increasing salinity, impact on agriculture in the lower central plain
- Less shorelines along the coasts in the south
- Loss of mangroves and agricultural and shrimp farm areas in the south (Ruangrai Tokrisna, 2008)

3.3.3 Volume of rain

- Estimated to decrease from 960 –1,290 mm/yr. to 800-900 mm/yr. with greater variation – impact on agriculture

Impact of lower rainfall

- Lack of water in major river basins.
- More frequent and severe flood in lower plain.
- Greater drought in the north, and northeast and more flood in the south
- Water sources: Reduce by 5 –10%, main impact on paddy production but lessen by the irrigation system and less aquatic abundance. (Tokrisna, 2008)

3.3.4 Drought hazard and desertification

- Total risk area = 2.2% of country area
- Share of risk area by region (% of total risk area)–North 56.21–Northeastern 23.27–East 7.69–Central 6.62–West 6.21

3.4 Rain-fed farmer vulnerability and adaption to climate change impact

- Rain-fed rice farmers in Kula field, northeastern Thailand
- 45.5% loss in rice yield due to climate change
- High risk 10%, medium 56.2%, low 33.8%
- 76.8% vulnerable
- 43.4% adaptation

(Source: Wichien Kerdsuket et al., 2005)

3.4.1. Private and public responses

Farmer response

- Appropriate production technology, breed resistant varieties, adjustment in planting schedule
- Improve Water management and soil management
- Concentrate on livestock and integrated farming
- Increase avenue for Off-farm employment
- Develop Farm/farmer group on local water management
- For saving group
- Establish rice bank

Government support

- Payment on loss, grace period on credit payment, credit on farm inputs, reduction on interest rate (Ruangrai Tokrisna, 2008)

3.5 Climate Change Policy (chronology in Thailand)

- 1994: UNFCCC ; 2005: Kyoto Protocol
- 2007: Office of the Prime Minister Regulation on Climate Change Management (2007) National Climate Change Policy Committee, chaired by PM set up Thailand Greenhouse Gas Management Organization (TGO)
- 2008: National Strategy for Climate Change Management (2008-2012) Building adaptive capacity & reducing vulnerabilities to climate change impacts

- Promoting GHG mitigation activity in harmony with sustainable development
- Promoting climate change R&D
- Raising awareness & encouraging public participation
- Building capacity of relevant personnel & institution
- Supporting international cooperation on climate change mitigation & sustainable development
- 2007: Climate Change Alleviation Plan for Agriculture (2007-2011) Knowledge management; Prevention & correction; Public relation

3.5.1 Adaptation actions

- Climate Change Knowledge Information Center
    - Conduct research on risk and vulnerability of coastal areas
    - Organize policy dialogues
    - Process & disseminate climate change knowledge
    - Encourage society & coastal community
- Water Resource Management in Agricultural Sector
    - Royal projects on water resource development
    - Irrigation systems for low land areas
    - Top soil conservation using Vetiver grass
    - R&D on local plants & animals
    - Natural Disaster Management
    - Disaster Prevention & Mitigation Act 2007
    - National Disaster Prevention & Mitigation Committee

3.5.2 Specific adaptation actions implemented

- Early warning system: Utilize climate model for projection, assess impact and vulnerability of climate change on agriculture
- Water harvesting in rainfed area: Excavate a 1,260 cubic meter well per household (co-fund by government)
- Insurance for Natural disaster: started pilot project in 2006 in Northeastern region, later expanded to many crops
- R&D in rice varieties: New varieties being developed are more focused on varieties resistant to drought, saline soil, short-live harvest crop in certain area, and of course high yield varieties.

3.5.3 Adaptation strategies at different levels

- Farm level: cropping patterns, delay growing seasons
- Institution level: raise awareness, build adaptive capacity, provide reliable climate and crop information, infrastructure development (irrigation system)
- Technology level: R&D in climate change, soil improvement, drought & flood resistant varieties (Anupit Supnithadnaporn et al.)

3.5.4 Future policy options

- Network on CC R&D
- R&D on effective CC model
- Climate change projection and warning system

- R&D on varieties in tolerance on CC
- Records on CC for effective forecasting and precautionary approach
- For the farmers: bio-fuel, animal work, reducing plough, reducing deforestation and increasing replanting, increasing use of organic fertilizer, better water management, adapting cropping system

3.5.6. Existing government policy and on-going development programme

In response to the various challenges mentioned in the above section, the following set of policies to restructure the agricultural economy by Ministry of Agriculture and Cooperatives (MoAC) are underway in the Kingdom:

- Production Development for Sustainable Agriculture
- Food Security: By promoting the reasonable production of food crops and energy. Allocating production for sufficient consumption and renewable of energy which emphasizes on the importance of the food.
- Organic: Promotion of organic farming to farmers to comply with environmental friendly production.
- Regeneration / Conservation land: Promoting the planting Vetiver grass at highland to prevent soil erosion and planting green manure as soil conditioner
- Promote integrated water management
- Promote the development of agriculture and farming
- Crop of insurance
- Reduce production costs
- GAP (Good Agricultural Practices)
- Rice Bank
- Promote rice productivity (Demonstration field , training , supporting inputs)

4. Food security maps

Discussed in Section 2.0 above.

4.1. General government policies, food insecured provinces, and priorities

The policies and guidelines of the Ministry of Agriculture and Cooperatives are in accordance with government administration plan in related to the implementation of the basic policies of the State under the Constitution. The government policy statements to Parliament on 23 - 25 August 2012 consisted of two main policies.

4.1.1. Policy on urgency to embark for the first fiscal year consists of:

a) Promote integrated water management in order to deal with flood and drought and the increase of water-use-efficiency through adjusting cropping systems accordingly and expanding the land and the accelerating expansion of the irrigated area in all its forms is performed;
b) Promote the development of agriculture and farming in the Southern provinces;
c) Development of cooperation with neighboring countries in order to create a trade cooperation among the various partners. The data link standards for certification of agricultural products and with National Single Window will be established;

d) Moratorium of household and low income farmers: To set up the revitalization plan and occupational development for farmers after moratorium;
e) Upgrade agricultural prices: Promoting the development of agricultural insurance risk appropriately by set up price hedging and crop of insurance crop as a result of natural disasters.

4.1.2. Policy to restructure the agricultural economy

The policy framework and operational guidelines are as follows:

4.1.2.1. Development of the farmers

a) Creating a new generation of farmers through knowledge production and production management;
b) The establishment and development of agriculture and village volunteers to gain knowledge in order to support the implementation of the Ministry of Agriculture and Cooperatives;
c) Preparation of farm household registration book electronically for further development of the subject and farmer's household registration which can be linked to farmers' credit card information as well as to a pledge system by government policy for obtaining a clear and accurate;
d) To ensure security (social as well as financial) to farmers who are building career in agriculture and also to old age farmers (welfare scheme). This is capped by the Ministry of Agriculture and Cooperatives and it has already initiated several schemes, such as the Commonwealth Fund for farmer;
e) Development of the farm business through training, knowledge management organization and access to funding sources thoroughly and fairly;
f) Vocational Rehabilitation farmer moratorium regarding the government policy on the moratorium for farmers, the Ministry of Agriculture and Cooperatives is required to prepare a revitalization plan for the occupation farmer;
g) National Farmers Federation Farmers National Council Act 2553 was announced in Gazette on 19 November 2553 and effective. According to the transitional provisions, the Minister of Agriculture and Cooperatives is acting under this law for a period of two years;
h) Televisions for agriculture: By equipping television program for agriculture. This is a channel for the dissemination of agricultural knowledge. In particular, it has been communicated to the farmers via various information and knowledge.

4.1.2.2 Production Development (Focused on producing environmentally friendly products)

a) Reduce production costs: Focus on promoting the use of appropriate technology or the supply of various inputs of fertilizers breeds and agricultural machinery.
b) Commodity Standards: By supporting farmers and entrepreneurs develop production and quality international standards. The product is safe to consume the crops, livestock and fisheries.
c) Production efficiency: Enhance the production of agricultural crops, livestock and fisheries by the transfer of knowledge from research to farmers on appropriate breeding technology and the production system to suit local conditions.
d) Food Security: By promoting the reasonable production of food crops and energy. Allocating production for sufficient consumption and renewable of energy which emphasizes on the importance of the food.
e) Organic: Promotion of organic farming to farmers to comply with environmental friendly production.
f) Research and development of plant species, livestock and fisheries production: Research results led by the government and institutions will be adapted to accommodate the change and adaptation of the production process in accordance with the changing weather as remedies to reduce global warming from agriculture.
g) Developing agricultural industries: To increase their ability to compete on the world market by processing of various products and value-added product development including the promotion of new products to be effective.

4.1.2.3. Development of the infrastructure and factors support.

a) Integrated water management in preventing floods and drought and increase water use efficiency by adjusting cropping systems accordingly and expand land consolidation.
b) Expansion of irrigation: Rapid expansion of all forms of irrigation as well as ponds to the farm community and throughout the country.
c) Organized arable land to the landless farmers: By land reform and land rights in a fair and sustainable manner for poverty alleviation and livelihood security.
d) Warning system in agriculture for floods, drought, pests and plant outbreaks.
e) Protection of agricultural land: By precipitation and push for legislation to protect the potential and appropriate agricultural areas, especially the areas where the infrastructure are already being developed.
f) Regeneration/Conservation land: Promoting the planting Vetiver grass at highland to prevent soil erosion and planting green manure as soil conditioner.

Accordance with the policies and guidelines of the Ministry of Agriculture and Cooperatives, the thrust is to focus on the development of products such as rice, maize, cassava, palm oil, rubber, soybean / green beans, fruit, livestock and fishing (fresh water/sea).

4.3 Government policies and measures related to food security

4.3.1 Crop insurance

Agricultural insurance is one way to build food security in Thailand. The project was initiated by the Department of Insurance Cotton. Committee, and corn, sorghum and soybean insurance are unified by a private company. Later in the Development Plan No. 7 of the Cabinet, it has approved the Bank for Agriculture crop insurance in a mutual fund relief in all the protected areas, especially rice, maize, and hurricane flood protection only drought, but not implemented due to lack of funding in the 9th Development Plan Committee scrutinize the Council of Ministers. A resolution of the Ministry of Agriculture and the agricultural insurance to the Bank for a pilot project using an index crop insurance, weather (Weather Index Insurance) and the World Bank to assist the crop insurance programs. The weather index insurance use to study patterns of droughts and floods.

Council of Ministers had a resolution (dated 9 November 2010) to approve the creation of a system of crop insurance to farmers by the Ministry of Finance. Ministry of Agriculture and Cooperatives, Ministry of Natural Resources and Environment, Ministry of Commerce established a common set of guidelines for proper operation which has appointed a working group to prepare a national strategy for the development of crop insurance. Ministry of Agriculture and Cooperatives is to response for seven major strategic as detailed:

- Project of development of information database and the district mapping and flood risk for economic crops.
- Project to disseminate information to the insurance company as a researcher and executives.
- Pilot project for the production of natural wet season insurance.
- The study of the plant monitoring: land cover change by using an index of plant growth.
- The further development of a comprehensive weather index crop insurance suits
- The prototypes programs in each region of the country.
- Project the possibility of wet season insurance in the production area.
- The project preparation of a list of areas suitable for economic crops of insurance.

A national strategic crop of insurance for year 2010-2012 was presented by the Department of Agriculture to the Chairman of the Permanent Secretary, Ministry of Finance, for the Fund. The Department of Agriculture acts as the Secretary of the Committee.

4.4 Major Constraints and needs

In general followings are categorized as major constraints that would need more focused attention to be solved:

- Technological know-how
- Water management: Technology pertaining to less water by measuring the water level inside the soil and around the roots
- Land management: enhanced soil fertility management
- Rice varieties: Varieties suited to local conditions. Resistant insects. Market requirements.
- Loan and credit facilities to the farmers
- Farmers knowledge and practical understanding on sustainable agricultural development aspect to enable them to apply these principles in their own farmland
- The farmers can produce the agricultural product for the family's daily consumption. The surplus will be sold in community to get more income in household. This aspect is to help farmers to cut down in living expenses and allow the farmers to be self – reliant
- The farmers unite in the form of groups or cooperatives to carry out activity work in the areas of production, marketing, living conditions, welfare, education and society.
- The farmer's connection, the farmers should move into this phase by making contacts with banks or private sector to obtain funds to assist in investment or developing their quality of life. In this phase, farmers can get more benefits, improve the quality of their life and strengthen their capacity building into the network both in community and national level.

C. EXPERIENCES OF SRI ADAPTATION AND ADOPTION BY FAMERS WITH EMPHASIS ON RAINFED AREAS

5. Experiences with SRI in Thailand *(Extracted from SRI website maintained by Cornell University, USA)*

Although initial 2001 trials of SRI methods by the Multiple Cropping Center (MCC) at Chiang Mai University were not successful, continued evaluations by MCC, the McKean Rehabilitation Center (see MRC trials) and others led to a national SRI network, which was formalized at a national SRI workshop held in Chiang Mai in May 2003. A February 15, 2005, meeting of the SRI Network in Thailand held at MCC reviewed progress of network members (4 government groups and 9 NGOs and projects). With Thailand Alternative Agriculture Network (AAN) coordination, the SRI Network organized a workshop in June 2005 co-hosted by the Surin Farmers' Support Project (SFS) in the southern section of northeast Thailand.

During 2005-2006, Abha Mishra, at the time a PhD student at the Asian Institute of Technology (AIT), wrote successful proposals to the Asia Rice Foundation USA (see resulting journal article) and the CGIAR Challenge Program on Water and Food to support participatory action research with farmer field school groups to evaluate SRI.The CPWF project, undertaken by an AIT team headed by Prof. V. M. Salokhe (Professor at AIT), introduced SRI through action-research with villages in northeast Thailand (see report at Cornell website).

The 2008 AIT project proposal on Community preparedness for climate change and increased water use efficiency for rice cultivation using principles of System of Rice Intensification (SRI) in central Thailand was selected for the Asia-Pacific Forum for Environment and Development (APFED) Showcase 2008 Programme. The project, which used FFS extension, took place in Ratchaburi Province between 2009 and 2011 (see summary report).

A Southeast Asia regional workshop on SRI involving Mekong River Basin (MRB) countries (Cambodia, Laos, Vietnam and Thailand) was organized at Asian Institute of Technology (AIT), Bangkok, Thailand, June 22-23, 2009, in collaboration with the World Bank Institute. During 2011, AIT began a EU-financed regional project, Sustaining and Enhancing the Momentum for Innovation and Learning around the SRI in the Lower Mekong River Basin, which is focused rainfed SRI in Cambodia, Laos, Thailand and Vietnam. During 2012, a thesis and several academic papers were published on SRI (see 2012 updates for summaries). One of these, Rice root growth and physiological responses to SRI water management and implications for crop productivity, won the SAWADA Prize for best paper published in the journal Paddy and Water Environment Engineering for the year 2012. Also during 2012, AIT recieved an EU grant for working on SRI in the Lower Mekong Delta River Basin in Cambodia, Laos, Thailand and Vietnam.

The details could be seen at the SRI homepage hosted at Cornell University Website (http://sri.ciifad.cornell.edu/countries/thailand/index.html).

5.1. Challenge Program for Water and Food

A competitive grant was won by AIT from Challenge Program on Water and Food (CPWF), Consultative Group of International Agriculture Research (CGIAR) to undertake a series of action research in Roi-et, NE Thailand in collaboration with the Thai Education Foundation (TEF) and Local office of the Department of Non Formal Education (2006-2008). With funding support from FAO-IPM to the NGO partner, TEF, an additional third season experiments were carried out.

The followings provides short summary of the project (http://sri.ciifad.cornell.edu/countries/thailand/index.html):

- An innovative Participatory Action Research (PAR) program was initiated in Ban Chaeng, Roi-Et province, NE Thailand during wet season of 2006 to meet the project objectives of increasing water productivity of rice by using some elements form the SRI principle in-combination of inter-cropping of local bean species for the first 40 days of rice growth and development. During first season PAR (June-Dec. 2006) 3 experiments were set-up; testing of two different seedling age (12 days and 30 days (farmers practice) under two different water regime; and, testing of performance of three local bean species (Mung bean; cow pea and jack bean);

- Younger seedlings performed better under either of the water management practices and a total yield of 477 kg./Rai and 597 Kg./rai with 30 days and 14 days old seedlings were achieved respectively ($F = 12.33$; $df = 1, 5$; $P < 0.0248$), (Tukey's test [SAS Institute 1999]). Whereas, under flooded condition (15 cm or more ponded water), yields of 456 kg/rai and 531 kg/rai with 30 days and 14 days old seedlings were achieved respectively (($F = 18.33$, $df = 1, 5$, $P < 0.0123$), (Tukey's test [SAS Institute 1999]). Similarly when a hybrid variety was tested in following dry season similar trends of yield increase were obtained;

- A much higher yield under SRI and Bean at 1200 Kg./rai at 14% moisture were obtained. In all cases, the productivity of supplementary irrigation increased up to 4kg/m3 of water. In contrast, water productivity at farmer's level are in range of 0.5 to 0.6 kg rice/m3 of water in the region. Net return from the level of 100 baht/rai was increased up to 3000 Baht/rai. Experiences showed that farmers and trainers proved excellent partners in this action research initiative which allowed them to better understand SRI principles and which helped them, in turn, to generate location-specific and knowledge-intensive sets of agronomic practices for better rice yields with lesser inputs.

5.2. Civil Society Organization (CSO) - Consultative Group of International Agriculture Research (CGIAR) initiative

The AIT in association with International Water Management Institute (IWMI—a CGIAR* center) and Thai Education Foundation (TEF—a national NGO) with funding support from the World Bank through CSO-CGIAR Competitive Grant Programme set up a multidisciplinary and integrated mode of enquiry in Roi-Et and Surin province of Northeast Thailand. The purpose of the study was to address the major and common constraints to rice production in Northeast Thailand, that include poor fertility and physical conditions of the soil, frequent flood and drought, and limited farm management skill. The team investigated and assessed the results of a collaborative action research, and undertook season-long learning and training to address the above stated constraint. The overall objective of the project was to increase the productivity of Jasmine rice production systems through integration of various indigenous (termite mound soil) and exogenous soil rejuvenating techniques (bentonite) and/or innovative agronomic crop management practices (IACM), under the umbrella of SRI principles, using the farmer field school (FFS) approach that could lead to enhanced incomes and poverty alleviation in Northeast Thailand. The project envisaged that a forward linkage to markets and at the same time a backward linkage to research institutions of national and/or international would immensely benefit farmers and participating partners in the long-term.

The three season action research works involving farmers, researchers, traders and extension personnel demonstrated that the average yield of Jasmine rice, variety "HomeMali", increased up to 40-50% under the IACM practices compared to farmers' practices (FP) so called "conventional practices". Average net return under IACM was 2.5-3 times higher compared to FP. The higher net return under IACM/SRI was due to significant reduction in seed cost (almost 90%) and increased paddy yield. Water productivity in terms of grain yield per kg of water inflow to the field during land preparation and crop growth period was also higher under IACM compared to FP. The FFS approach provided an excellent platform to bring all stakeholders together at farmers' field for coherent and inclusive actions to address such cross-cutting issues and opened the channel for information flow from local to international level (*see* Mishra et al, 2012)

5.3 APFED Showcase Project (2008-2010)

"Community preparedness for climate change and increased water-use efficiency for rice cultivation using principles of System of Rice Intensification (SRI) in Central Thailand" project has been funded by UNEP through its APFED project in 2008. The project with its partner, Department of Agriculture Extension (DoAE), RTG, rice farmers in Ratchaburi province, extension personnel, and scientists from AIT were able to successfully adapt several practices of SRI to achieve higher yields with less amount of land, water and other external inputs. Such practices are widely known to reduce the emission of greenhouse gases, thus, combining the best of science for climate-change adaption at community level.

Based on baseline survey and extensive discussions while formulating the various interventions (treatments), the existing Parachute method of rice transplanting was adapted using principles of SRI as one of planned innovative treatments in these participatory trials. Higher rice yields (over 8.0 tons/ha) coupled with higher water productivity and greater net returns in the planned interventions plots (SRI plots) (4 replications) resulted into development of locally-adapted technologies at plot scale, meeting the major aims of the project. A number of extension workers along with farmers were trained in these processes from the local government and are expected to carry forward this learning to newer places with new farmer groups. The farmers also shared their results with other visiting farmers from Southern Thailand during the Field Day, which aimed to showcase their hard work to other members of the local community and encourage them to adopt climate-friendly rice production system. Average 82% attendances (at 18 weekly meetings), over 80% enhancement in knowledge along with sustainability of seedling raising method for parachute transplanting are some of the immediate impacts that were established during the project, indicating its success in meeting set objectives (*see* Mishra and Kumar, 2011).

5.4. Regional SRI Consultation

A two-day Southeast Asia regional learning event on SRI involving MRB countries (Cambodia, Laos, Vietnam and Thailand) was organized at AIT, Bangkok, Thailand, 22-23 June 2009, in collaboration with World Bank Institute, Washington DC, USA followed by a field-visit on 24 June 2009 in NE Thailand. The workshop was attended by about 50 persons representing government organizations and ministries, non-government organizations, development organizations, academicians, journalists from print and audio-visual media, farmers, students and a United Nations agency. The current situation of SRI adaptation and adoption in the region and challenges, especially in the context of climate change and water productivity, were presented and deliberated. Emerging issues were captured for in-depth discussions.

The deliberations resulted into a set of recommendations, and chief among them were regional collaboration for scientific benchmarking and adaptive measures, as well as development of quality extensions materials for SRI dissemination. In addition, local and regional-level institutionalization of SRI support capacities was proposed to further disseminate and sustain SRI. Finally, a session on SRI in relation to water productivity and climate change clearly enlivened the imagination of a majority of participants. This session resulted in acceptance of the potential role of SRI principles in reducing crops' vulnerability to climate change, expecting that scientific studies would produce reasons for adding SRI in local and regional plans and initiatives of governments and regional groupings (like ASEAN).

In summary, these initial initiates provided opportunity to scale up SRI efforts at national and regional level for addressing the productivity and food security concern of rain-fed smallholder farmers in Lower Mekong River Basin countries. The SRI-LMB project intervention can be seen as a first step towards this direction.

D. OPPORTUNITIES EXISTING TO INCREASE THE AGRICULTURAL PRODUCTIVITY AND QUALITY PRODUCE IN RAINFED AREAS, AND CONSTRAINT FACED

Above SRI examples along with various initiatives taken under "Sufficiency Economy" concept and existing policy provide ample opportunities to address the concern of farmers as mentioned below:

- Technological know-how and practical experiences so that farmers could produce high quality rice with reduced input use;
- Land soil management: Enhancing soil fertility and vitality to be able to raise more corps per year
- Possible testing of newer rice varieties to suit the local condition, especially for the insect resistance;
- Easy access to loan;
- Farmer can produce safe foods, decrease input use and, abandon/minimize use of chemical inputs;
- Farmer can reduce cost especially for purchasing of material input and use agricultural waste for maximize benefits such as using dung and rice hush for organic fertilizer and biogas from dung etc;
- Farmer can apply the local wisdom to create agricultural innovation by using appropriated technology based on local resources.

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2.4 Vietnam

Ministry of Agriculture and Rural Development (MARD)

Plan Protection Department (PPD)

SOCIALIST REPUBLIC OF VIET NAM

Independence – Freedom - Happiness

IPM farmers' group involved in SRI Study
Dong Tru Commune, Dong Anh District, Hanoi

Background Paper

SRI-LMB Project

Inception and Planning Workshop

09-12 April 2013

AIT, Thailand

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BACKGROUND

Vietnam, located in the Greater Mekong Subregion in Southeast Asia, has a total area of about 330,000 square km, including 10,126,100 ha used for agriculture. Vietnam has 63 provinces/cities and a population of about 87,840,000, of which 70% live in the rural areas and are involved in agriculture production. Agriculture is an important economic sector of Vietnam.

MAIN CROP RICE

Rice is considered the most important crop in Vietnam. The development of rice production in the country has a long tradition and cultural history, plays a key role in national and local food security and has a big impact on people's livelihoods. About 4.5 million ha or 45% of the 10 million hectares of agricultural land area is devoted to rice production.

Upland rice is grown - mainly by ethnic minority groups practicing shifting cultivation - on 0.45 million hectares or about 8% of the total rice area of Vietnam. Annual rainfall ranges from 1,400-1,800 mm. Rainfall can be very erratic and droughts are common. The practice of planting rice is mostly direct seeded and involves using a stick to dig holes 20-30 cm apart and sowing 5-10 seeds/hole. Yields vary from 0.6 to 2.0 tons/ha. Long duration (130-160 days) traditional varieties - usually sticky/glutinous varieties - are grown. The major concerns in upland rice production are limited varieties suitable for upland rice systems, pests and diseases, weeds, soil degradation, erosion, lack of organic matter and poor soil fertility (FAO, 2000).

The area planted to rice increased from 7.44 million hectares in 2009 to 7.65 million ha in 2011. In 2012, the country had planted 7.7 million hectares of rice. Yields increased from an average of 4.2 tons/ha in 2000 to 5.3 tons/ha in 2010 and reached its highest level ever of 5.6 tons/ha in 2012.
From 1990 to the present, Vietnamese rice production has experienced constant growth resulting from application of good cultivation techniques (e.g., IPM and SRI, etc.), increased productivity, the use of high yielding varieties and partly due to expanding the area cultivated annually (GSO, 2000 and 2010.) the latter being inconsistent with reports of reducing rice cultivation area . Rice production stopped at 19.23 million tons (in 1990) but by 2000 had reached 32.51 million tons. Vietnam produced 42.31 million tons in 2011 and 44 million tons in 2012.

Since 1989, Vietnam has become the second largest rice exporter in the world. From exporting 3.5 million tons in 2000-2002 to 6.05 million tons in 2009. Export volumes have increased from 2010 (6.75 million tons) and 2011 (7.10 million tons) to 7.70 million tons in 2012.

Vietnam plays an important role in contributing to global food security. Vietnam's rice exports have provided a stable and affordable supply of carbohydrates for 120 countries worldwide. Agriculture in general and rice production in particular has had an outstanding, stable and fast development. Rice production and export income has helped improve and enhance the lives of farmers. This has led to the improvement of the value of rice in Vietnam and growth of the agricultural sector of the country. Success in rice exports earned the country billions of dollars. In 2005, income from rice exports amounted to $1.3 billion and in 2011 the country earned $3.51 billion. In recent years, Vietnam has been moving away from the expansion of the cultivated area to rice production in the direction of increasing quality: export quality rice and high value rice.

Despite these developments in the rice sector, Vietnam is faced with challenges such as low profit for farmers and competition from agricultural products that bring higher profits; competition from other large exporters such as India; competition from potential competitors such as Cambodia and Myanmar; increasing costs of inputs such as fertilizers; tapering off of productivity; changing climatic conditions - especially drought in upland/rainfed areas; poor infrastructure - especially irrigation and transport - in mountainous areas; policy-related land management resulting in reduced agricultural land and ageing rural workforce resulting from outflow of labor due to job opportunities in the cities.

Crop	Cultivation area (ha)	Production (tons)
Maize (Corn)	1,120	4,800,000
Sweet potato	44,800	1,420,000
Soy bean	120,800	175,200
Sugar cane	297,500	1,500,000
Tea	115,800	923,100
Rubber	505,800	863,600
Coffee	574,200	1,292,400
Black Pepper	46,900	112,700

Table 1: The other main crops in Vietnam
Source: General Statistics Office, Vietnam, 2011

SRI IMPLEMENTATION IN VIETNAM

The main principles and approaches used in SRI in Vietnam

The five basic principles of SRI utilization in Vietnam include:

First principle	Transplant young seedling at 2-2.5-leaf stage
Second principle	Use one plant per hill at desired square-sharp spacing
Third principle	Apply intermittent irrigation
Fourth principle	Use rotary weeding
Fifth principle	Practice organic fertilisation

The five basic principles of SRI (Ngô, 2011) could be adopted fully or partially depending on local conditions and experiences. In the first crop season one could apply some SRI principles (*partial SRI adoption*) and then apply all SRI principles in next crop seasons (*full SRI adoption*).

Partial SRI adoption could start with simple and easy principles that are suitable to conditions of the soil, crop season and varieties that could bring more yields. For example, planting one or two seedlings per hill without changing the space between hills; using seedling at less than 4-leaf stage, minimizing root damage while uprooting seedlings from the seedbed and transplanting the same immediately. In the main field, only one plant per hill at desired spacing should be planted in the intersection of the grid made by pulling a rake over the soil. Transplanting is done by pushing the roots

into the soil sideways at a shallow depth (1-2 cm) for bountiful root growth. IPM (improved) practices for fertilization, irrigation and pest management are followed. In rainfed production systems, the application of intermittent irrigation will be a challenge. However, the other 4 principles applied in irrigated systems can easily be adopted.

The general approach and steps in dissemination of SRI practices and human resource development follow:

- Organize Training of Trainers for IPM Trainers and Farmer Field School for farmers;
- Farmers conduct small field studies to practice and learn SRI principles, draw experiences on best local-fit practices of spacing, varieties, fertilizing, etc.;
- Conduct expanded model of SRI adoption on small and medium area (i.e., from 2 to 5 hectares);
- Apply SRI on large scale, i.e., on 10 hectares or more.

In Viet Nam, SRI adoption starts by training and developing Key Farmers who have deep understanding about SRI principles, capacity and willingness to modify/practice innovations, can define most appropriate technologies/skills to fit local conditions, and willingness to assist other farmers apply SRI.

Development, adoption and policy initiatives

The practices of rice cultivation on the plain, hilly and mountainous areas in northern Viet Nam are characterized by over application of nitrogenous chemical fertilizers and high transplanting density. These practices lead to reduced resistance to diseases as conditions make it more favorable for crops to become more easily infected and in turn brings reduced yields and economic returns. Over-application of chemicals like fertilizers and pesticides in rice production also contaminates the environment. SRI, perceived to be able to address the situation above-mentioned, was first introduced in Vietnam in the provinces of Hoa Binh, Ha Noi and Quang Nam in 2003 and 2004 by the National IPM Programme and PPD.

In 2004, PPD developed and disseminated Technical Guidelines for SRI Adoption for different rice cultivation conditions. In 2005 - 2006, with assistance from the IPM Component of the Danida-funded Agriculture Sector Support Program (ASPS), SRI was tested on larger areas of 2-5 ha per model in irrigated rice production systems in 12 provinces[1]. Results of activities during 2004-2005 showed that application of SRI practices brings higher efficiency compared with current conventional rice production practices: reduction of 70-90 % in seeds, reduction of 20-25 % in nitrogenous chemical fertilizer, increase in rice yield at an average of 9-15%. SRI adoption has improved the micro climate in the field and prevented the development of plant diseases such as sheath blight and bacterial leaf blight and pests including brown plant hoppers and golden apple snails. It also improves resistance to diseases as the practices develop healthier plants. Profits from full SRI adoption have been reported to bring increases by VND 2 million per hectare per crop, among others brought about by reduction in costs of seeds from VND520 to VND342 and a reduction in costs for irrigation by one third.

SRI adoption has improved rice health and plants are better able to cope with extreme weather events related to climate change. Rice plants develop better and deeper roots and stronger tillers that can survive strong winds or drought. Water usage in SRI fields is 30% less than fields employing current farmers' practices. The reduction in water for irrigation is important in view of increasing scarcity of water resources.

[1] Ha Noi, Hoa Binh, Nam Dinh, Ninh Binh, Thai Binh, Hai Duong, Hung Yen, Ha Nam, Ha Tay, Nghe An, Quang Binh, Quang Nam

Figure 1: Dong Anh District, Hanoi, 2003

In 2007, OXFAM America supported Viet Nam develop the Community-based SRI model successfully on 170 hectares in Dai Nghia commune, My Duc district, Ha Tay (now Ha Noi) province (Vietnam National IPM Programme, 2007). The results provided important evidence on the basis of which MARD issued decision No.3062/QD-BNN-KHCN on 15 October 2007 that officially announced SRI as technical advancement at national level. Lessons learned from the implementation of the Community-based SRI model were consolidated to prepare the document on "Practical Guidelines for SRI Field Adoption". This document is useful for helping communities follow SRI practices, in SRI TOT and SRI Key Farmers training.

To enhance sustainability of SRI adoption in Viet Nam, OXFAM America has also supported initiatives such as "The System of Rice Intensification (SRI) - Advancing small rice farmers in Mekong region" in 2007 and the programme "Farmer-Led Agricultural Innovation for Resilience (FLAIR) from 2010 – 2022. FLAIR aims at making the agricultural extension system more responsive to small-holder farmers' concerns and constraints by utilizing and expanding the adaptive capacity of farmers. In 2011, under this programme, OXFAM America introduced the model on Community Capacity Building for Agricultural Innovation where SRI is viewed as a farmer-led innovation to increase resilience to climatic and economic shocks.

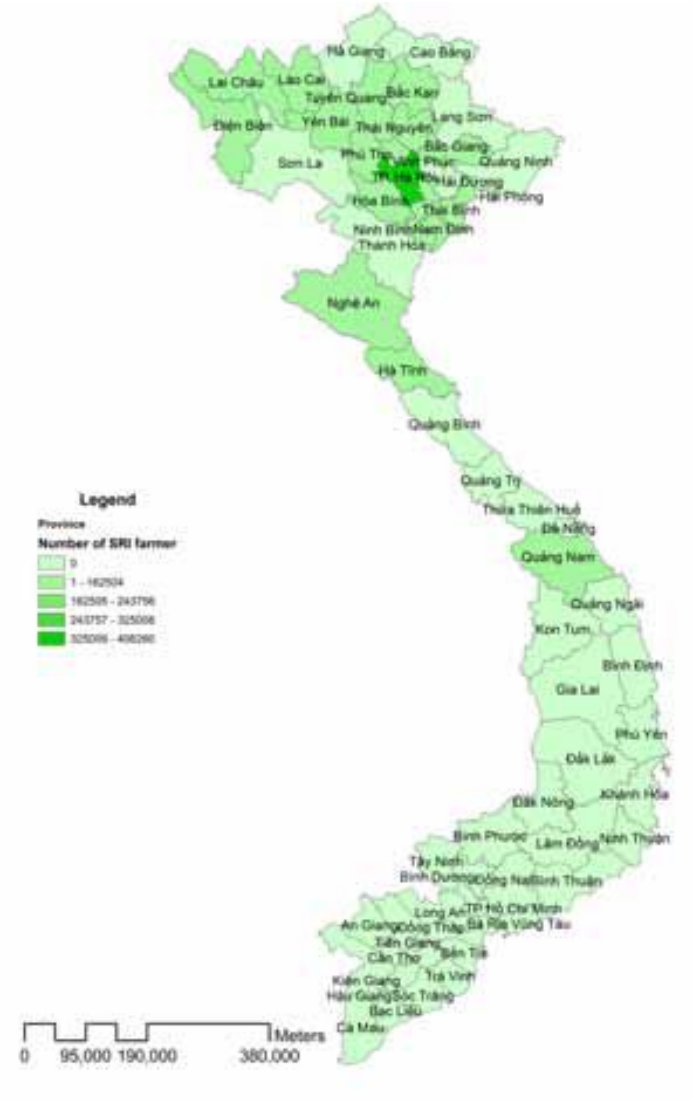

Figure 2: Number of SRI farmers by WS 2011 crop season

By 2012, over a million farmers (69% women) in 22 provinces[2] had applied SRI on **292,449** hectares. Viet Nam has received assistance from other programmes, international projects, different national and international NGOs and research agencies on SRI promotion. These include:

- FAO Regional IPM Programme
- Danida: IPM component of Agriculture Sector Support Program (ASPS)
- Oxfam America, Quebec, Belgium
- SEARICE through its Biodiversity, Use and Conservation in Asia Program (BUCAP)
- Asian Institute of Technology (AIT)
- Thai Nguyen University
- Agriculture University of Ha Noi
- German Agency for International Cooperation (GIZ)
- Sustainable Rural Development (SRD)
- Japan International Volunteer Center (JVC)
- World Vision
- Initiatives on Community Empowerment and Rural Development (ICERD)

With the good results of SRI activities supported by these organizations, on 14 November 2012, the Plant Protection Department (MARD) received the "Vietnam Golden Rice Panicle" award from the Vietnam Government.

Figure 3: Mr. Ngo Tien Dung, National IPM Programme Coordinator receiving award on behalf of PPD for its work on SRI, Hanoi, November 2012

[2] Ha Noi, Ha Tinh, Nghe An, Phu Tho, Thai Nguyen, Yen Bai, Bac Kan, Bac Giang, Dien Bien, Ha Nam, Hai Phong, Hoa Binh, Hung Yen, Lai Chau, Lao Cai, Nam Dinh, Ninh Binh, Quang Nam, Thai Binh, Tuyen Quang, Vinh Phuc, Lang Son

RECOMMENDATIONS

1) MARD should have a long-term plan for support to and dissemination of SRI adoption by farmers in the field and supervision of SRI activities at provincial level.
2) Department of Agriculture and Rural Development (DARD) in provinces and centrally-managed cities in northern Viet Nam should provide guidance to different levels (commune, district and provincial) on SRI adoption consistent with MARD's decision No.3062/QD-BNN-KHCN issued on 15 October 2007 on the "Application of SRI as a technical advancement in northern provinces".
3) MARD-PPD/National IPM Programme should coordinate with public media in expanding communication, dissemination and promotion of practice-based efficient SRI models.
4) National IPM Programme in partnership with local CSOs and Universities should develop and diversify SRI-based and IPM-based sustainable intensification models for different crops.
5) National IPM Programme in partnership with local CSOs and Universities should increase the number and strengthen capacities of IPM Trainers and farmers to facilitate adaptation of SRI practices for upland rice production systems.

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