Increasing Water Use Efficiency by Using Mulch under SRI (System of Rice Intensification) Management Practices in NE Thailand

A Challenge Programme for Water and Food (CPWF) Funded Small Grant Project No. 504.

First Project Report of Pre-Participatory Action Research Phase of the Project
Covering Period 1ST April- 30TH June 2006

Asian Institute of Technology (AIT) and Thai Education Foundation (TEF)
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CGIAR Challenge Program on WATER & FOOD

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List of abbreviations

AIT	Asian Institute of Technology
AWD	Alternate Wetting and Drying
AFD	Alternate Flooding and Drying
cm	Centimetre
CPWF	Challenge Program for Water and Food
DANIDA	Danish International Aid Agency
DAT	Days after Transplanting
DNFE	Department of Non-Formal Education
DOAE	Department of Agriculture Extension
ELC	Experiential Learning Cycle
FAO	Food & Agriculture Organization of the United Nations
FFS	Farmer's Field School
FP	Farmer's Practice
Fig	Figure
GO	Governmental Organization
GR	Glutinous Rice
kg	Kilogram
LEISA	Low External Input Sustainable Agriculture
NG	Non-Glutinous Rice
NGO	Non-Governmental Organization
NPK	Nitrogen Phosphorus and Potash
PAR	Participatory Action Research
SRI	System of Rice Intensification
Std	Standard
TEF	Thai Education Foundation

Summary

This is the first report of CPWF funded small grant project 504 covering period of 1 April – 30 June 2006. As proposed, this phase of the project focussed on basic preparatory works like village selection, farmer selection, baseline survey, problems understating, development of the action research plans, design of the data collection etc. leading to setting of the action research. Through an intensive process Bang Change village of district At Samart of Roi-Et province; this is one of the poorest province of Thailand, was selected as project site along with 30 enthusiastic rice farmers to be part of the season long action research.

Field office and logistics for the PAR was set-up in the village and on 15 -19 June transplanting of the experiments were completed witnessed by the provincial Governor and around 170 farmers from nearby village.

Based on the survey and secondary data sources and their subsequent analysis two major topics were used to develop PAR, i.e. Effect of two water regimes and effects of intercropping with green manure crops (beans) under SRI managed rice to learn their effect of overall water use efficiency, yields of rice etc. In addition weekly Farmer's Field School is being organised to work on several other water use related topics like composting, living soil, root physiology etc. First weekly FFS was organised on 28 June covering the early growth and development tropic of rice.

Key words: PAR, CPWF, Roi-Et Province, Ban Chaeng, AIT, TEF, Water-use efficiency

1. Introduction

The north-eastern Thailand contributes over 55% share in total Thai rice production. The rice cultivation is severely constrained by lack of irrigation water, inadequate water management techniques, flash floods and droughts. The increasing demand on available water and increasing international demand and higher net return from organic rice have compelled farmers' group to explore alternative crop management options using LEISA (Low External Input Sustainable Agriculture) concepts. This has attracted scores of farmers to grow their rice using principles of the System of Rice Intensification (SRI). Since SRI and other water saving techniques are evolving; these techniques requires adaptation and localisation at farmer's field before they could become better options for the rice farmers.

The Asian Institute of Technology (AIT) - a Bangkok based regional post-graduate institute along with its partner NGO, Thai Education Foundation (ThaiEd) won small research grant from CPWF in February 2006 to work in NE Thailand. The AIT and Thaied in collaboration with Department of Non-Formal Education (DNFE) selected the village Ban Chaeng; District; At Smart; Roi-Et to be the site of Participatory Action Research (PAR). The PAR design is taking successful elements form practices of the SRI (Systems of Rice Intensification) i.e., alternate flooding and drying and other successful local innovation e.g., using green mulch to increase the water use efficiency for rice crop production with a group of 30 man and women rice farmers and NGO partner. Furthermore, it aims to create knowledge base/understanding among rice farmers, non-government organizations (NGOs) and government organizations (GOs) in the areas of water conservation, environmental issues etc; so that these knowledge and understanding on these issues may be later taken up through various other extension means by the larger cross sections of the farming community in the country and beyond.

In addition to the action research, a weekly farmer's field school (FFS) will be organised to further strengthen the knowledge base of the participating farmers like information on rice roots, composting, water issues, fertilisers, insects-pests. The concept of crop ecosystem analysis was introduced during first FFS day on 28 June and through regular crop monitoring using AESA (Agro-Ecosystem Analysis) concept their decision making skills would be further enhanced so as to help them decide better about crop production and protection aspects and especially the water and water related issues for rice productivity.

2. Ground Work

The preparatory activities for the PAR started in March and the pace of activities picked-up in the months of April and May 06 to start the PAR during the wet season of rice from June onwards. A series of preparatory work was carried out before actual translating in the fields. In this section we could provide some brief information on some of the preparatory activities carried out in connection with setting of the project and some basic information on the project area.

2.1 The Project Site

The partner NGO, ThaiEd has been closely working with rice farmers in the NE Thailand for long time along with the Department of Non Formal Education (DNFE), helping educating farmers through various projects. In close consultation with the DNFE, village Ban Chaeng; District – At Samart, Roi-Et Province is selected to be the project site.

Fig.1. Location of Roi-Et province, Thailand

2.1.1. Geography of the Roi-Et Province

Most part of the province is covered by plains about 130-160 meters above sea level, drained by the Shi River (=Chi River). In the north of the province are the hills of the Phu Phan mountain range, with the Yang River as the major river. In the south is the Mun river, which also forms the boundary to the province of Surin. At the mouth of the Shi River where it enters the Mun River, a big flooded basin provides a good rice farming area. A piece of information on soil resources and their general suitability for rice production from local Roi-Et government is attached in annex-1.

Fig. 2. Location of the project village

2.2. Crops and Cropping in Roi-Et Province

The Rice is major food crop grown by the farmers in this province. Two kinds of rice i.e. glutinous and non-glutinous are commonly grown. The Roi-Et province is famous for producing the Thai Jasmine Rice; 'Hom Mali' (see table 1). However, the entire production system is based on low input-low output. Despite the impressive growth in availability of irrigation water through canals and other means in the recent year, the major rice production depends on the rain water as irrigation source.

Similar to the larger production trends of the province, rice dominated the production scene of the At Samart district. Besides rice there is a limited no. of tree crops, vegetable etc. are grown. Also some farmers grow mulberry for the sericulture purpose (see table 2 for more details).

2.2.1 The Rice Crop Production in Ban Chaeng

The village Ban Cheng sub district of At Smart district is predominantly a rice growing village and over 90% of the cultivated area (19,244 rai[1]) annually devoted to the rice production in two seasons i.e. wet and dry season of the year (see fig.3).

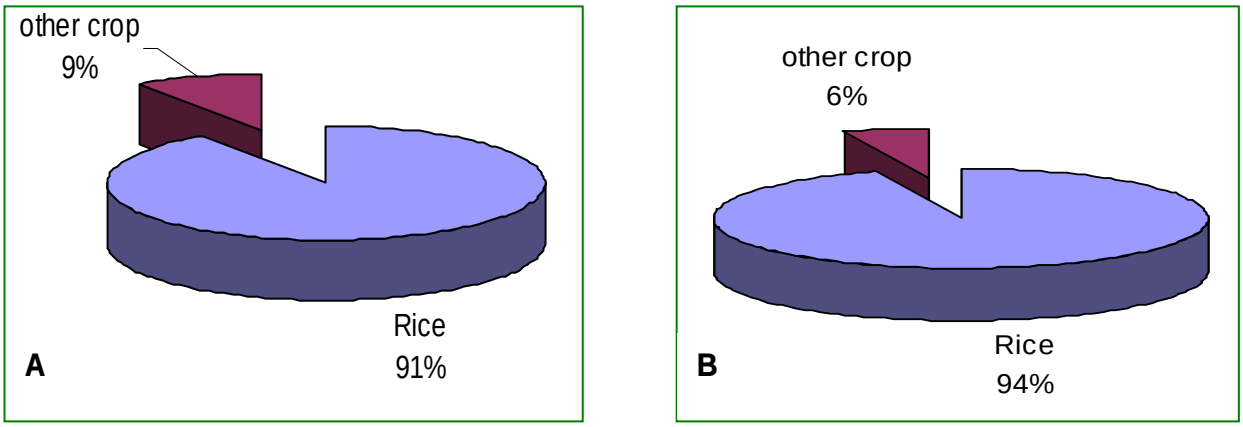


Fig. 3. The % share of rice crops to the total cultivated area, A. Sub district- Ban Chaeng; B. Village Ban Chaeng[2]

[1] 1 Rai is local Thai land measurement unit. One Rai is equals to 1600 square meter
[2] Data source: District Office, At Samart, Roi-Et Province, 2006

Table 1: Total Area of Rice Production at Roi-Et Province in Wet Season

No. of farming household	Total area for rice prod.	Area for normal rice prods. (Rai)					Area for organic rice prod. (Rai)		Total area of rice prod. (Rai)		Production (kg)					Total (kg)	Average (kg/Rai)
		Non-glutinous rice (NG)			Glutinous rice (GR)						Normal rice			Organic rice			
		Jasmine 105	RD 15	other	RD 6	other	NG	GR		% of rice prod. area	Jasmine 105	NG	GR	NG	GR		
182,465	3,055,671	1,578,141	77533	3,354	751,549	3,492	413,630	204,278	3,031,977	99.22	714,838,613	35,795,732	343,681,856	176,782,622	85,894,810	1,383,993,633	453

Table 2: Crops Grown in the At Samart District, Roi-Et Province

crop	Irrigated area			Non-irrigated area				Total area
	No. of farmers	Cultivated area (Rai)	Ave. prod. (kg./Rai)	No. of farmers	Cultivated area (Rai)		Ave. prod. (kg./Rai)	No. of farmers
					Pumped water-area	Water from other source-area		
Rice-dry season production	312	5,212	746	5,234	26,953	8,286	725	5,546
NG (Supan 1, Chainat,RD 23 & others)	312	5,212	746	4,869	25,724	7,596	725	5,181
GR (RD2,RD10 & others)	-	-	-	365	1,229	690	-	365
Field crops	829	2,032	-	8,375	2,714	21,233		9,204
Corn (forage, baby, sweet)	200	779	2,000	977	1,238	1,110	2,000	1,187
legumes(groundnut, soybean, mung bean	333	842	178	1,384	1,503	2,533	233	1,717
others	286	411	-	6,014	-	17,590	-	6,300
vegetables	1,550	7,370	-	20,349	30,116	36,493	-	21,899

Data source: District DoAE office, At Samart, Roi-Et Province

2.3 The formation of working team

After final agreement with the CPWF, a series of planning meeting was organized with the partner NGO to develop a close functional team to begin project work. The team consists of one field officer and one translator from ThaiEd and one research specialist from AIT under close guidance of the AIT and TEF project leaders. The contact details of the team working closely for the project at Roi-Et are attached as annex- 2.

2.4 Initial visits and setting of the project at Ban Chaeng

The setting of the project started with appointment of Mr. Manop, a very experienced farmer's trainer by the Thaied in March 06. Mr. Manop has been trained under FAO's and DANIDA season long training of trainers courses and worked with farmers in various parts of Thailand for over a decade using non-formal education methods and has wide ranging experience of running Farmer's Field Schools (FFS) for Rice crops.

Informal meetings with farmers of the Ban Chang village started after meeting with district NFE and other local officials. Mr. Manop in close consultation with the district NFE office started meeting the farmers in early April to explore the village and get first hand information on the rice production in Ban Chaeng village.

Fig 4. Informal meeting with rice farmers in Ban Chaeng Village

The village is predominantly depends on the agriculture and rice plays very important part in the lives of the farming community here. The population of the village is 971 peoples and other demographic details could be seen in table 3.

Fig.5. Group of women rice farmers

Table 3: Basic demography of the Ban Chaeng, At Samart district, Roi-Et Province, Thailand[3]

No. of household in village	Farming household	Population		
		Male	Female	total
177	162	505	466	971

2.5 Farmers and Farmers leader selection

After detail information collection and several meetings with the farmers informally, the idea of the project were shared with them and their opinion on the topic were sought. Idea of a field work leading to solving some the pertinent problem got good response and several farmers came forward to be the part of the PAR work. However, again in close consultations with the local Govt. officials and experiences from the previous farmer's training programmes, following set of criteria were decided to select farmers.

Those included:

- Interest to participate and commitment to attended weekly meeting;
- Willing to participate in discussions and support the PAR work;
- Have several years of experience of rice growing and planning to grow rice in coming wet season;
- Physically and mentally fit;
- Women rice farmers are especially encouraged to participate.

[3] Source: District Office, At Samart, Roi-Et Province, 2006

Initially over 60 farmers were interested to join the PAR work. However, 30 were randomly selected representing all layers of socio-economic condition.

In turn the group of farmers themselves selected their leaders for better coordination for group work and facilitation of the field work. Women farmers were especially encouraged to participate in the PAR work and the current group of PAR farmers have appropriate participation from women rice farmers in the village. However, at the same time it was made abundantly clear to other farmers that they are welcome to join the weekly sessions and other project related activities. The list of farmers participating in the PAR and profile of their leaders could be seen in the annex-3 A & 3.B.

2.6. Baseline Survey

A three step baseline survey were conducted to understand the cause-effect relationship regarding water use efficiency and rice production in the Ban Change involving 20 farmers. These steps were:

- A draft questioner were prepared using prior experiences and preliminary discussions with farmers
- Translation in to Thai language and mock survey was done involving few farmers
- Survey formats were improved to conduct final survey

The survey formats used could be seen in the annex 4.

Fig. 6. The Baseline Survey Process conducted at farmers household

In addition to the survey, data were gathered formally and informally form the other available sources like the local governments, department of agriculture extension and other provincial and district offices to understand the rice farming situation in detail.

Some of the key findings form the survey are summarised here:

2.6.1. Age, Gender, Education, Crops Grown and other Background situation

All most all interviewed farmers were the agriculturist and agriculture was their prime occupation; mostly governed by rice farming in two seasons, dry season and wet season of the year. The average age of rice farmer interviewed was 52±12 years.

The younger generation of village folks seeks the non-agriculture source of income by working in large cities or in fishing industry in down south to supplement the family income. This migration patterns reversed during the rice planting season, when the transplanting and other field operation are supported by the returnees. Women are equal partner in the rice cultivation and they share equal responsibility in all farming activities i.e. form seedling raising until harvesting (see fig. 7). However the gender ratio was slightly in favour of male farmers, who constituted around 59% of the total interviewed farmers. Majority of the interviewed farmers were able to read and write and received their basic education until Std. IV (see fig. 7). Most of the farmers interviewed owned less then 10 rai of the land (see fig. 8.) and a small fraction of them owned over 30 rai of the land.

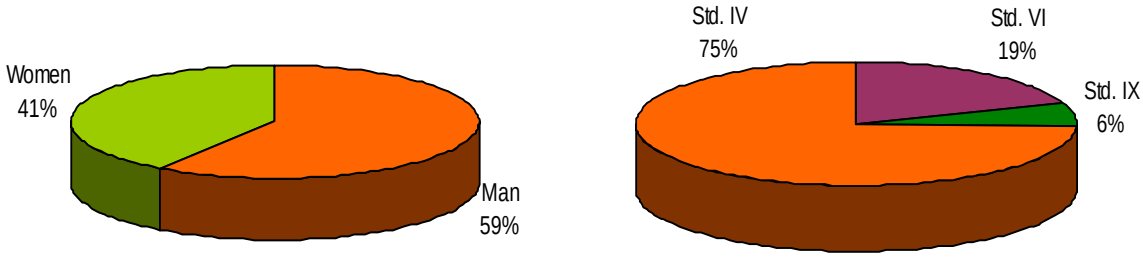


Fig. 7. Gender and Education of the Rice Farmers

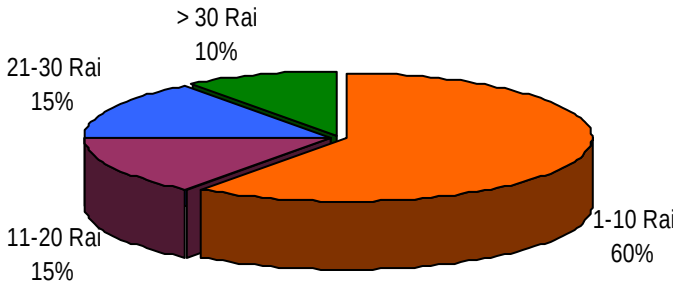


Fig. 8. Average area used for rice cultivation by the farmers

2.6.2. Rice cultivation aspects

Seedbed and Seedling raising

All interviewed households in Ban Chaeng are the rice farmers growing two crops of rice per year; one during wet Season (June – December) and second during dry Season (Jan-April). However, the wet season rice cultivation is practiced by all most all farmers; whereas, 7% farmers do not grow crop during dry season. Over 50% farmers practiced the direct seeding method of rice cultivation and seed-rate per rai varies from 12-30 kg and it was hard to find the reasons for this extreme variability. One possible cause could be the lower germination percentages of home-kept rice seeds all most all farmers use their own seeds for cultivation. The wet bed method of seed-bed raising is common for all farmers and none interviewed used the dry seed-bed or other methods of seedling raising. The seedling age used by the interviewed farmers varies from the 25 to 45 days. A majority (over 85%) uses the 30-35 days old seedling and over 10% uses over 35 days (see fig.9). Similarly the depth of the seedling transplanting varies (see fig. 9) among interviews farmers. However, most of them prefer to transplant at 10-15 cm depth.

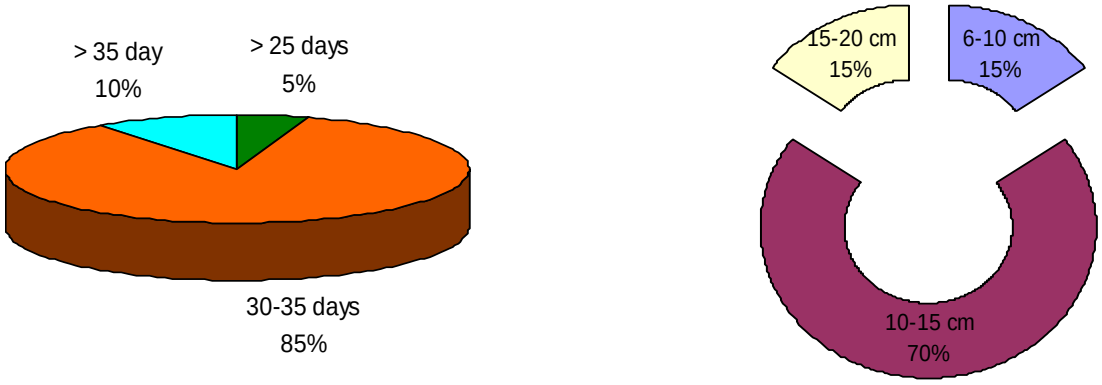


Fig. 9. The age of seedling and depth of transplanting

Prior to transplanting, majority of the rice farmers cut the root and shoot of the transplants (over 75%) and detach the soil from rice root by repeated washing and shaking (see fig.10).

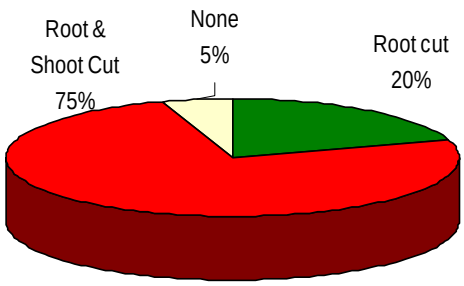


Fig. 10. Seedling trimming practices

Main field for rice cultivation (field preparation and fertilizers)

The field preparation followed by burning of the rice straw from the previous season rice. All most all rice farmers employ small power tillers to achieve a shallow ploughing followed by flooding of the field and pudding either a day or in some cases (less then 10%) 3-4 day before transplanting rice.

Use of compost for rice cultivation is extremely uncommon among farmers and only one respondent said that he applies compost as basal dose (see fig. 11). Similarly, only one farmer uses the basal dose of inorganic NPK as basal dose.

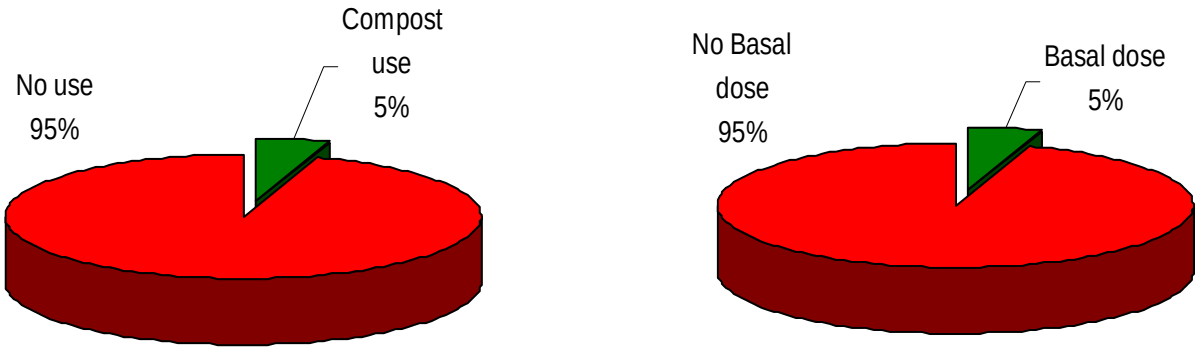


Fig. 11. Use of Compost or basal doses of fertilizers

Box 1: It was apparent from the discussions with the farmers that despite the availability of cattle and crop waste (suitable composting materials); the farmer lacks the skills to turn these bio-wastes into excellent source of plant nourishment. Along with PAR, Experiential Learning Cycle based sessions on composting would be carried out with farmers in coming weeks to address this issue.

Inorganic fertiliser (16:16:8 and 46:0:0; NPK) are two source used by all most all rice farmers in the village. However the total amount of inorganic fertilisers varies from 20 kg to 50 kg/rai ranges (16:16:8 and 46:0:0 in ratio of 2:1). The first dose of fertiliser was applied after 2-3 weeks of transplanting in case of transplanted rice and again at 55-60 DAT (days after transplanting) at flowering stage.

Organic fertilisers are normally represented by the cattle manures and many farmers directly collect the dung from the cattle pan. It was also found that most of the farmers do not prepare the compost properly. Some farmers applied the dried cow dung @ 60 kg per rai as basal.

Clearly the fertiliser use and use of organic manures were one of the areas; where clarity and understanding was absent among the interviewed farmers.

Water source for rice crop

Rice production in the village is heavily dependent on the water. Chi-River flows near the village (fig. 12 A) and through a community owned large electric motor; water is regularly pumped out and made available to the rice farmers on payment. The fields located near the pump-house costs less to irrigate, (average 60 Baht[4] per rai for one flood irrigation of 15-20 cm depth). However the fields away from pump-house cost more. The total cost of irrigation varies from the 60 – 300 Baht/rai/season for the farmers opting to grow crops as rainfed to irrigated crops respectively. Farmers groups completely lacked the idea on the crucial stages of crop growth, where lack of irrigation could seriously affect the yields. None of the answers were comprehensive and satisfactory when compared with the recommendations by the local agriculture department.

Apart from the river, shallow ponds are dug near the rice fields to supplement irrigation (fig. 12 B). These shallow ponds also add dietary variety in forms of small fish to the local diet and possibly some additional income. However, for household use, normally rain water is collected in big earthen pots and used (fig 12 C).

Fig. 12. Various water sources for crop and household use

[4] 38-40 Thai Baht = 1 US $ (Average)

As far as the irrigation practice for the rice cultivation is concerned, no specific rules could be given. It is very difficult to summarise the irrigation practices. However, it was clear that farmer pay less attention to the water quantity needed for the irrigation. Over 90% of the interviewed farmers maintained a constant depth of 15-20 cm water after transplanting in their rice fields.
The synchronised planting/transplanting in nearby fields by a group of farmers facilitates water buying through a common un-lined canal (earthen), which further connects other fields in the same area. Once rice fields in a given area are flooded with water, the total cost of pumping of water from the river is divided per head on acreage basis.

The function of existing 'water users group' is limited to cost sharing only and until now they have not been targeted for other water related trainings or other purposes. This provides the proposed action research in the village an exciting opportunity to expand the sphere of the group by involving them in the action research.

Use of mulch and other water saving interventions

Use of any kind of mulch either organic (e.g. green mulch) or inorganic (plastic, rice straw etc.) are not used by any farmers in this community as rice is grown under 10-15 cm standing water. However, many SRI Rice farming community in North Thailand is incorporating green mulch with rice. So clearly, the incorporation of green mulch in an improved aerobic rice culture presents an interesting experimental topic for the rice farmers in this community.

Box 2. Green Mulch

Green mulch using beans can not be incorporated in the existing system of flooded rice cultivation. Therefore, a change to alternative water management systems (from flooding to alternate wetting and drying) is needed to incorporate green mulch so as to increase the water use efficiency. Therefore, farmers at Ban Chaeng have decided to go for wider-spacing, use of inter-row for bean crops and use to organic manures to reduce water use for rice crop.

SRI Methods of Rice Cultivation

The interviewed farmers were vaguely aware about some practices of the SRI system of rice cultivation but none of them actually practiced it. However, from empirical experiences, many farmers confirmed that practices like younger seedlings, split dose of fertilisers etc. generally contributes to the higher yield. However, due to lack of risk willingness they have not tested it in their fields and as such no recommended practices of this sort are available in farmer's knowledge domain in their area.

Pests and Chemical Use

Apparently little to no chemicals is used for either weed to insect-pests by the interviewed farmers. Only in the cases of outbreak situations, some pesticides are used by the farmers. Stem borers, Brown Plant Hoppers and Rice Bugs are occasionally occurred. No plant protection measures are employed. Weeds are the major problems mainly for the direct seeded rice and bit less for the transplanted rice. Weeds of grass family are serious problems and in some cases they cause heavy loss to the yield. However little or no efforts are employed by the farmers except some occasional hand weeding.

Cost –Benefit from Present Rice Farming

The present system of rice cultivation is based on low input-low output systems with very low yields. The average yield on hectare basis is only little more than 2 tons. Farmers grow rice more for subsistence rather on commercial basis. At present the major costs are directed towards the cost of seeds, fertilisers, water and cost of machine use. On an average farmers get only 1027 Baht/rai as net return (see fig.13 and annex 5 for more details).

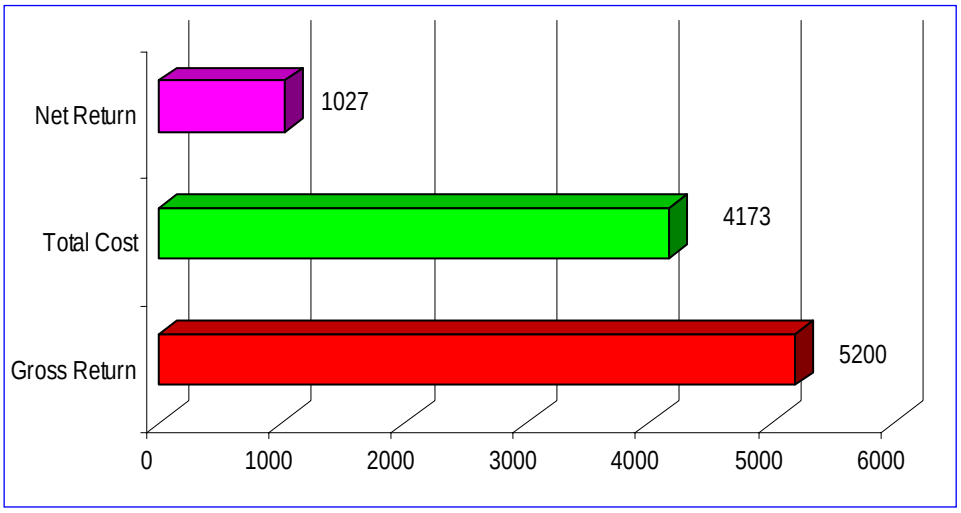


Fig.13. Cost-Benefit from Rice Cultivation (In Thai Baht)

2.7. Crop Calendars

The select information form the baseline were summarised on a time scale and crop calendars were developed to compile major crop related information. Later the crop calendar was presented to the farmers groups and information collected was revalidated and cause-effect relationships for use of each input use for rice production were established.

Following major leading questions were used to discus with farmers

1. Why standing water is needed to grow rice? Is any other methods are you aware with?
2. Why yield levels are so low?
3. In your experience since last 20 years, what is the pattern of rainfalls? Is it normal?
4. What will happen, if flow of water in Chi River reduced and less water is available for rice cultivation?
5. How the rice can be grown with less water?
6. How many of heard about the SRI systems of rice cultivation?
7. What elements of SRI are feasible under the methods you use to grow rice?
8. Can you list the major problems?

Box 3: Major Problems as Concluded by Rice Farmers:

a. Low Yields
b. Weed Problems
c. Heavy dependence on rain and water sources like river; un predictability of the monsoon rains
d. Reducing soil fertility
e. Reducing net returns form the rice cultivation
f. High price for organic rice
g. Quality of produce

A summary crop calendar is attached an annex 6 for information. Based on the discussions two major areas were prioritised for the wet season (June – Nov. 2002) PAR work:

1. Comparison of the two water regimes (Flooding versus Alternate Flooding and Drying; AFD)
2. Effect of mulching with various bean on the water use efficiency under SRI management practices

Fig. 14.Soil Sampling by the farmers.

3. Synthesis and details of the PAR Experiments

3.1. Background

SRI is based largely on the principles of ecological farming to achieve "more crops with less seed and less water" with environmental sustainability. The recent research finding shows that two major principles of SRI i.e. alternate wetting and drying (AWD) during vegetative stage and the use of organic fertilizers have potential to increase rice yield with less use of water compared to conventional practices. However, in Thailand, those farmers who grow rice using SRI principles experience weeds as a major yield constraint and so a greater number of labour units is required than conventional methods. Therefore, in spite of the potential SRI yield advantage over conventional methods, farmers do not follow this management practices on a larger scale. To combat this situation some farmers have come-up with innovative practices to manage their weed problems by intercropping a green manure crop in inter row spaces; and then followed by flooding the field and mixing it in to the soil at the time when rice canopy closes. This practice provides mulch to cover the exposed soil surface at early growth stage of rice (since rice seedlings are widely transplanted under SRI practice), which reduces weed problems and conserve soil moisture as well. At the later growth stages, the mulch seems to enrich soil fertility since this practice increases rice yield by almost double compared to conventional methods. However, due to lack of any intervention on a larger scale this SRI/mulching practice has remained in the domain of few farms only. In addition, clarity regarding the selection of appropriate/suitable green manure crop species is yet to be established, particularly by farmers' communities on a location by location basis.

Ongoing PAR experiments aims to validate and upscale these innovative techniques with rice farmers and NGO partners using Participatory Action Research (PAR) methodology in Ban Chaeng village, Roi-Et Province Northeast Thailand. Furthermore, it aims to create knowledge base/understanding on the discussed issues for the rice farmers, non-government organizations (NGOs) and government organizations (GOs) working in area in order to create awareness and disseminate information, that may be later taken up through various other extension means by the larger cross sections of the farming community in the country and beyond.

3.2. Overall Objectives

- To innovate and localize the agronomic practice suitable to increase water use efficiency i.e. flooded rice to AFD rice by using SRI management practices with a group of 30 man and women farmers in Ban Chaeng.
- To integrate SRI practices with the local innovations like use of green manure crops as intercrops, so that suitable mulching could be achieved within the framework of existing production practices.
- To collect and share information with farmers, Govt. officials and others on the water harvesting techniques and other pertaining issues so as to increase water use efficiency for rice production like participatory knowledge on soil ecology, Rice Root physiology and ecology etc. and how these scientific knowledge could be helpful for farmers in NE Thailand

3.3. Target Area

The PAR is being carried out in Ban Chaeng, District – At Smart, Roi-Et Province in close collaboration with the Provincial and district office of the Department of Non-formal Education (DNFE) and Department of Agriculture Extension (DoAE). DNFE has deputed three of its staff teachers to be part of the weekly meetings and other leanings activities initiated by the project so as to learn and integrate these new ideas on rice production in their other regular farmers support extension in other villages and districts. The attendance of DNFE official form various districts of the province and enthusiastic support from the provincial DNFE head will ensure longer term sustainability of the idea and learning for the rice farmers in the province in eventually in all areas facing similar problems in NE Thailand.

Box 4: Department of Non Formal Education
Department of Non-Formal Education of Govt. of Thailand is actively engaged in various forms of non-formal education based programs for the farmers in Thailand. The district DNFE office has deputed 3 of its staff teachers: Mr. Chammony Sonkharin, Ms. Phansi Wichai, and Ms. Juthamart Ritporn to be the part of the program. These staffs are learning, supporting and engaged in the project since first day and would carry forward the new technologies learnt after completion of the project.

3.4. Activity and Scope

The objective of first season PAR activities (wet season 2006) would be to evaluate and to integrate SRI practices using 3 different green manure bean crop and its comparison with the local practices of transplanted rice cultivation vis-à-vis water use efficiency and yield potential of rice. Since, water use efficiency of any crop is a complex phenomenon and depends on the various factors related to soil and plant physiology; therefore, a series of Experiential Learning Cycle (ELC) based sessions like on soil properties, root physiology etc. would be introduced so as to increase the scientific understanding leading to change in attitude and practice towards water use in rice crop. In nutshell, these efforts should also help to develop a practical curriculum for the season long farmers training, which may be taken up by the local DNFE and other participating NGOs for incorporation into their regular farmers training program. A thorough evaluation at the time of harvesting will be followed by development of the plans for the coming season, where the farmer participants will conduct experiments (individually and in groups) to continue to evaluate and integrate these practices of the SRI especially plant density, use of various organic and non-organic mulches and water management.

Fig.15. Transplanting of PAR experiments, 16-June (Exp. 1) and 19 June for Exp. 2

3.5. Experiments for Wet Season 2006

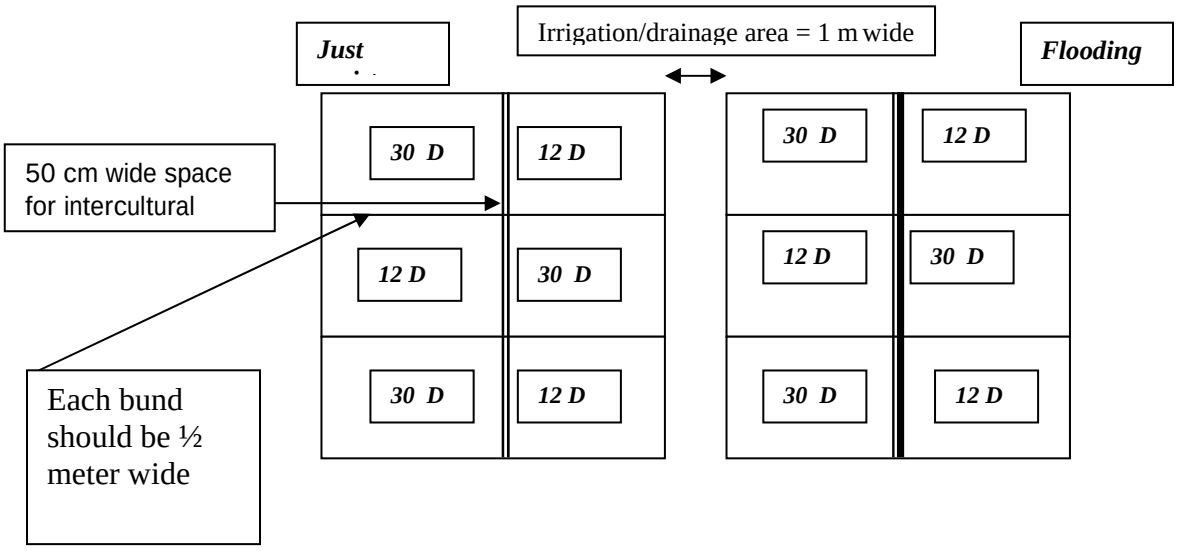
For the wet season of 2006, two major experiments will be conducted with farmers at the research site in Roi-Et Province.

Experiment 1: Participatory Action Research: Effect of Different Water Regimes on Rice Yield under SRI (System of Rice Intensification) and Farmer's management practices

Specific Objectives: A two factor experiment with different seedling age and water regime would be established to learn their effect on water use efficiency and performance

Experimental Layout:

Field 1



Where: 12 D = 12 days old seedling grown as per the specification of SRI; 30 D – As per the farmers practice. Just moist – field kept moist

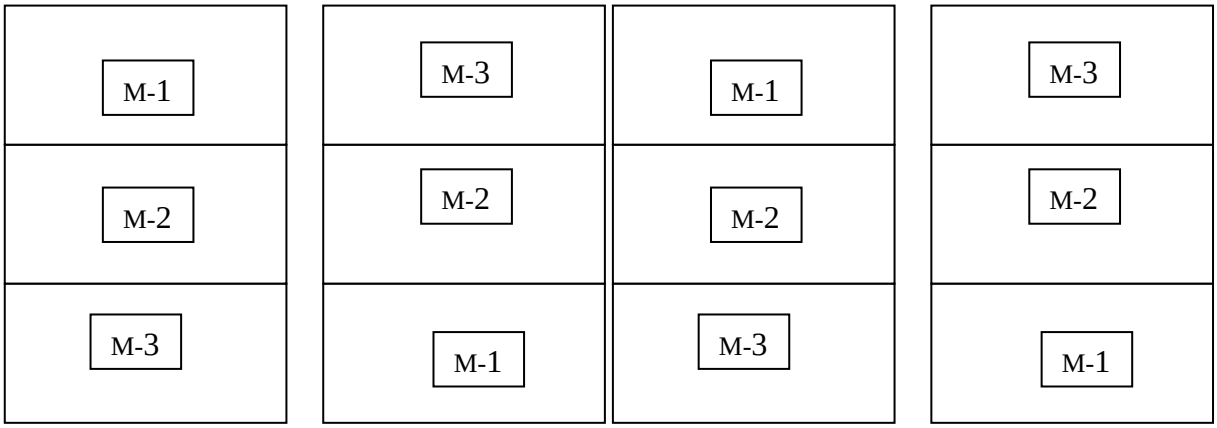
Treatments and details:

Attributes	**Just Moist**	**Flooding (Farmer's Practice)**
No. of seedling/ hill	1 seedling	8 seedlings
Spacing	10 x 15	10 x 15
Irrigation	Just moist: keep field moist no standing water. Apply thin layer of water	As Farmers practice
Fertilizer	same	Same as per FP
Manure	Same	Same

Experiment 2- Participatory Action Research on increasing water use efficiency by using mulch under SRI (System of Rice Intensification) management practices in Northeast Thailand

Specific Objectives: Single factor experiments to compare the relative performances of 3 different green manure crops on the water use efficiency and yield performance of rice under SRI management

Experimental Layout:



Where: M1 – Mung Bean; M2 – Cow Pea M3 – Jack bean

Treatments and details:

Attributes	SRI
No. of seedling/ hill	1
Spacing	25 x 25
Irrigation	Just moist: keep field moist no standing water. Apply thin layer of water until 45 DAT Followed by incorporation of mulch into the soil and then maintain shallow (5 cm) water level
Fertilizer	16-16-8 46:0:0 12.5 kg 16:16:8 as basal dose 8 kg 46:0:0:0 each at 15, 30 and 45 DAT 12. 5 kg 16:16:8 at 60 DAT

3.6. Data Collection

A. Data collection at tillering stage: (30 DAT)

a. Leaf colour chart – colour index
b. Plant Height – cm
c. No. of leaf per tiller
d. No. of tiller / hill

B. Data collection at flowering stage:

a. Days to 50% flowering in each plot (treatment)
b. Leaf colour chart – colour index
c. Plant height – cm
d. No. of leaf/tiller
e. No. of tiller / hill

C. Data collection at harvesting stage:

e. Leaf colour chart – colour index
f. Plant Height – cm
g. No. of productive tillers/hill (tiller bearing panicles having grains)
h. No. of productive tiller / m^2
i. NO. of unproductive tiller / hill
j. NO. of unproductive tiller / meter square
k. Length of the panicle
l. Total no. of grain/panicle
m. Filled grain/panicle
n. 1000 seed weight
o. Yield /plot

D. Supporting data:

1. How much water (litres?) - Irrigation how much (times x volume of water). Discharge outlet/minute how many litres and then time.
2. Frequency of irrigation in flooded and JM condition.
3. Economic data sheet (provided) should be regularly updated so as to calculate cost-benefit analysis.
4. Weekly AESA data to include insect-pests and natural enemies

Note: 3 fixed plants form each plots for agronomic data and 3 randomly selected plant for biological data.

3.7. Mid Season and End Season Farmers evaluation workshop

Two farmers evaluation of the proposed research work will be carried out. First; a mid term evaluation (August 06); and second an end season evaluation (October 06). The final results will be analyzed at two levels; first at level of farmers using indicators like yield, water use efficiency etc.; whereas the second analysis would be done at the researchers level to look deep into the interactions and finer details as planned in the proposal. In addition to the evaluation of the PAR, the knowledge level of participating farmers will also be tested at two times; pre season (7-10 June 2006) and as post-season (October 06) covering the following important areas:

a. Soil and Nutrients (organic and inorganic) related
b. Rice plant part functions and physiology
c. Water issues
d. Environmental issues

The questions will be of multiple choice type (if written) and also related to identification, carefully designed so as to ensure smooth participation of farmers.

3.8. New practices so far

3.8.1 Technical Backstopping, Training on problem identification, analysis and experimentation SRI methods of seedling raising

As a first step to the PAR, concept of SRI methods of seedling raising was introduced to the farmers on the 2 June 2005. A hand on session was organized, where the participating farmers were trained in the methods of raising SRI seedling. The SRI method of seedling consumed far less seeds and water and seedling are only grown for 12-14 days. To further reduce the water use; organic manure was mixed in the seedbed. Details on SRI seedbed could be seen in the annex 7. Through the exercises of the baseline, crop calendar and other participatory tools; the trainers and farmers were imparted the idea and practical ways to analyze and understand the farm problems leading to setting off of trials to find solution. Detail training was provided to the NGO staff and the staffs from the DNFE. The pre PAR Ballot Box tests were carried out to test farmer's present level of knowledge and would be compared with post PAR scores to judge individual learning etc.

4. Project Awareness activities in Roi-et Province

Two major events were organised since the beginning of the project in Roi-Et province;

4.1. The Inception Workshop

First was an Inception Workshop at the provincial headquarters of the DNFE and was opened by its director Ms. Wilawan Sornkin. The concept of the project was introduced by the AIT and TEF to the all district staffs (20 in number) from the Roi-et province and 10 farmer's representative form the PAR village along with the village head. Ms. Wilawan requested their district staffs from other district to join and learn form the project. She profusely thanked CPWF to funding the project for farmers in NE Thailand. The power point presentation used could be seen in the annex 8 and fig. 16. .

Fig.16. The Inception meeting of the CPWF funded project in Roi-Et

4.2 The transplanting ceremony

An opening day ceremony in the PAR village was organised to create awareness about project objectives among farmers and provincial government officials coinciding with the transplanting of the rice in PAR fields for the purpose to create awareness among farmers and officials in the At

Samart district. The provincial governor, Mr. Nophon Chanthrathong along with the Project Leader Prof. Vilas M. Salokhe opened the ceremony. Ceremonial rice transplanting was done along with some 200 farmers and district officials to open the PAR trials (see annex 9).

Fig.17. Transplanting by the governor, officials and farmers in PAR

4.3. Training to the farmer's trainers form DNFE

In consultation with the DNFE province office, the project agreed to train 10 farmer's trainer in understanding the concept of the PAR, various participatory tools used for problem sensing, analysis and researching on the water issues along with the ongoing field experimentation at Ban Change. These framers trainers will participate in weekly training and submit report to DNFE on monthly basis about new learning etc. List of farmer's trainers attached to the PAR could be seen in the annex-11.

5. Major Project Activities & Future Plans

The project activities begun in March this year and then in the months of April and May several preparatory activities were undertaken so as to start the PAR experiments in the main wet season (see table 4).

Table 4: List of Activities undertaken (1 March – 30 June 2006) by the AIT-TEF for the CPWF Project

Sl.	Activity	Date	Remarks
1	Project Proposal to CPWF	October 2005	
2	Revisions and negotiations with CPWF	Nov 05 – January 2006	
3	Funding available	March 2006	
4	Project operation consultation meeting	March 2006	AIT and TEF
5	Preliminary consultation with the farmers	March 2006	
6	Field Office set-up and appointment of field officer form TEF	March 2006	
7	Informal Exchanges and selection of village	April 06	
8	Baseline survey, Crop Calendar development	April 06	
9	Inception meeting	May 06	
10	Baseline information analysis, Crop Calendar preparation, presentation, re-validation of information and cause-effect analysis		
11	Pre PAR Ballot Box test	See annex 10 For Ballot Box Scores and more details	
12	Development of the PAR design and Seedling raising for Farmer's Practice	May-June 06	
13	SRI seed bed	June 06 (2ND June)	
14	Transplanting and Opening day for the PAR	15-18 June 06	
15	First FFS day	28 June	

At the time of preparing report, the first FFS day is completed (28Th June 2006) and a weekly learning curriculum and appropriate session guides are being prepared. Also plans are being put forward to collect information on economic analysis of the trails. In next reporting period major activities would focus on weekly FFS meetings and agro-ecosystem analysis, PAR data collection, mid-season evaluation etc. (more pl. see table 5).

Table 5: List of Planned Activities (1 July – 30 November 2006) by the AIT-TEF for the CPWF Project

Sl.	Activity	Date	Remarks
1	Weekly FFS meeting (14 weeks)	4 FFS /months	
2	PAR data collection & backstopping	July – Nov.	
3	Mid-season PAR and FFS evaluation	September 06	
4	All data collection, entry and analysis (statistically as well as for farmers)	October 06	
5	Organisation and preparation or the final field day	November 06	
6	End-season field day	November 06	
7	Planning for the next season	November 06	
8.	Next report to CPWF	Mid December 06	

Annexes

Annex 1: Soil Resources and Utilization of Soil, Roi-Et Province

Due to the fact that geographical location of Roi Et province is situated in the Khorat Basin, which is shaped similar a dish extending to the southwest, whereas, the base rock under this basin is mostly made up of sandstone formations, pebbles and slit embedded with multiple layers of rock salt, and it is these multiple layers that create the various types of surface soils found in this province, which is seismic categorized in to 3 types of surface soils according to their geology and origin as follows:

1. Low Plains: Generally found in areas where rives and streams transverse the low undulating plains, and where the water carries dry sandy-soil, sand and pebbles to deposit them in layers to create the river basin. Geographically, there are 3 main rive basins in Roi Et province, namely,

- The Chi River Basin, which flows from northeast and transverses the province to the southeast, and the type of soil found on the river banks is made up of loose soil or sandy-soil, and the next under layer is made up of various types of fine sediment soils, which is mostly found in areas of Changhan district, Chiang Khwan Sub-district, Thawatchaburi District, Selaphum District, Art Samat District and Phanom Phrai District.

- Low Flat Plains to the South of the Province: This area of low Flat plains is flanked and shaped by the Lam Siew Yai and the Lam Plav-pla rivers, which gradually widens until these two rivers join up with the Moon river. The convergence of these rivers had created a flat mud plain known as Tung Kula Rong Hai, which is normally inundated for long periods during the Monsoon Season. The top soil found on the river banks are usually dry loose soil and sandy soil, while the deposits found in the top soil of the low plain is mud mixed with quite a high percentage of rock salt. This type of soil is found in Chaturaphak Phiman, Pathum Rat, Kaset Wisai, Suwanaphum, Pone Sai District and Nong Hi Sub-district.

- Lam Nam Young River Basin: This basin forms a narrow low flat land area located in the north-eastern region of the province, covering areas in Moei Wadi, Phon Thong and Selaphum districts. In these areas, the top soil is normally made up of loose and sandy soil carried by the torrents of water flowing down from adjacent hills and mountains and deposited in the low lands of the river basin.

2. Undulating Plains. This geological feature is created by the deterioration of various layers rock under lying the earth's surface in prehistoric times, which caused the unevenness of the ground, which can be identified in 2 specific areas, namely,

- The Low Flat Plains which are found as an adjoining areas to a number of river basins. The top soils found in these low flat plains are made up of loose soil and sandy soil, created by sediments being carried by the torrents flowing down from the highlands to the north, and can also be found in the undulation plains. This type of top soil is found the municipal district of Roi Et, Thawatchaburi, At Samat, Suwanaphum districts and in Nong Hi Sub-district.
- Low Undulating Plains.These undulation plains, which feature low rolling hills, are situated in several of the province. The rolling hills and are created by the various paths taken by rivers which, upon changing its course, had left shallow gorges etched into the earth's surface, which today, may or may not retain it feature as a river or stream. The top soil found in these areas are usually made up of loose soil, sandy soil, and gravel in some locations, created by deterioration of the bed rock, which in certain area the bed rock can be found less than 1 meter below the surface, but on average, bed rock is found 1-3 meters below the surface. This includes areas in Pho Chai, Phon Thong, Nong Phok, Si Somdet, Pathumrat and At Samat district.

3. Mountain Side and Mountainous Areas. High grounds and mountainous areas are only found in the northern region of the province. These high grounds or mountainous areas have an average height of 200-600 meters from mean sea level, and covers areas in Pho Chai, Phon Thong and Nong Phok districts, where top soil texture is normally made up of loose and sandy soil, while plateaus are main geographical feature of the northern region of this province.

Suitability of the Soil Texture for Agriculture. Differentiation of the type of each unit of top soil, in accordance with their to suitability for cultivation of various species of crops, is determined by tests and evaluation of the quality of the soil texture and mineral components of soil samples collected during surveys in such areas, which includes for example, tests on texture of top soil, depth of deposits, water absorption, mineral components, including geographical features and weather conditions are taken into account to determine the suitability between soils and cash-crops, as follows:

1) Areas Suitable for Rice Cultivation. Such areas must be featured by low flat plains, or nearly flat plains, which is easily developed and transformed into paddy fields or reservoirs. The top soils in

such areas have very low or low drainage qualities, made up of medium or high content of minerals and low quantity of rock salt or less than 2,000 micrograms, these include soil samples from Manorom, Nakhon Prathom, Raja Buri, Bang Hara, Chiang Rai, Chum Saeng, Derm Band, Hand Dong etc., most of these areas are located within the Chi River Basin, with a total area of 1,531,093 rai, or approximately 29.14 per cent of the total provincial area.

2) Areas suited for Rice Cultivation. Problems concerning flooding and inundation of wide tracts of land, as well as the excess content of rock salt should first be resolved, while sandy soil in these areas should be specially prepared for cultivation, such requirements are indicated by soil samples from Hin Kong, Kula Rong Hai, Lom Kaow, Roi Et etc. Most of these areas are situated in the southern part of the province covering an approximate area of 2,040,692 rai, or 39.34 per cent of the provincial area.

3) Areas suited for Cultivation of Cash-crops which include most short rooted cash-crops which do not like to grow in high moisture or water logged areas, i.e, maize, barley, peas, potatoes etc. The texture of soil in most areas is made up of loose and sandy soil, which includes soil samples from Dong Yang Ane and Roi Et collected from high grounds, as well as soil samples from Choom Puang, Lopburi, Sam Pah Tong, Sa-tuk etc., which accounts for an approximate area of 1,512,056 rai, or 29.15 per cent of the total provincial area, located in the northern part to the province.

Source: http://www.roiet.go.th/kro/eng/ch_13.htm

Annex 2. The AIT-ThaiEd Project Team for CPWF Project Work

Sl.	Person	Organisation	Address
1.	Prof. V. M. Salokhe Project Leader Lead Institution	Asian Institute of Technology	Professor & Coordinator Agricultural Systems and Engineering FOS School of Environment, Resources & Development Postal Address: Klong Lunag, PO Box – 4; Pathumthani 12120, Thailand Email: salokhe@ait.ac.th Telephone number: : +66-2-524-5479 Mobile: +6618330209
2.	Dr. Prabhat Kumar Research Specialist	Asian Institute of Technology	Agricultural Systems and Engineering FOS School of Environment, Resources & Development Postal Address: Klong Lunag, PO Box – 4; Pathumthani 12120, Thailand Email: pkipm@ait.ac.th Telephone number: : +66-2-524-5477 Mobile: +6660978283
3.	Mr. Marut Jatiket Director Partner Organisation	Thai Education Foundation	Postal Address: 28, Piboonwattana 7; Rama VI Road, Samsen-nai, Phayathai, Bangkok 10400 Email: thaied@inet.co.th Telephone number: (land line and mobile):+66-2-279-1381, 618-6694 Fax - +66-2-811-9644
4.	Mr. Manop Saiphet Farmer's Trainer	Thai Education Foundation	Field Office for the CPWF Project c/o At Samart District Non-Formal Education Office, At Samart, Roi-Et Province Mobile: +6662370150 Email: saiphet_manop@hotmail.com
5.	Mr. Aroon jitsamorn Lecturer (Translator from Thai –English)	Thai Education Foundation	C/o Thai Education Foundation 28, Piboonwattana 7; Rama VI Road, Samsen-nai, Phayathai, Bangkok 10400 Email: frogfoxen@yahoo.com Mobile: +6646199196

Annex 3.A. List of participating farmers

Sl	Name	Age	Education	Address
1	Mr. Charoen Boonchan	60	Grade 4	18 Moo 1 BanChaeng
2	Mr. Sunee Teehuatone	67	Grade 4	15 Moo 1 BanChaeng
3	Mr. Satit Wongchandaeng	42	Diploma	17 Moo 1 BanChaeng
4	Mr. Sing Suksamer	64	Grade 4	7 Moo 1 BanChaeng
5	Mr. Yian Boriboon	56	Grade 4	118 Moo 1 BanChaeng
6	Mr Prapong Srinonyang	55	Grade 6	58 Moo 1 BanChaeng
7	Mr. Prapat Noibudee	37	Grade 9	157 Moo 1 BanChaeng
8	Mr. Serin Wongchandaeng	65	Grade 4	100 Moo 1 BanChaeng
9	Mr.Buddee Promsorn	64	Grade 4	104 Moo 1 BanChaeng
10	Mr. Chaowalit Thongsit	36	Grade 6	21 Moo 1 BanChaeng
11	Mr. Samarn Sarayota	47	Grade 4	93 Moo 1 BanChaeng
12	Mr. Wasana Wongchandaeng	58	Grade 4	72 Moo 1 BanChaeng
13	Mr. Amnuay Silpaksa	60	Grade 4	119 Moo 1 BanChaeng
14	Mr. Uaychai Saket	35	Grade 9	11 Moo 1 BanChaeng
15	Mr. Kaew Wandee	69	Grade 4	39 Moo 1 BanChaeng
16	Mr. Moon Khankhaeng	62	Grade 4	70 Moo 1 BanChaeng
17	Mr. Somwang Potong	52	Grade 4	50 Moo 1 BanChaeng
18	Mrs. Fuangfa Promsopa	42	Grade 4	98 Moo 1 BanChaeng
19	Mrs. Supee Pimpan	51	Grade 4	52 Moo 1 BanChaeng
20	Mrs. Sommart Supeekam	56	Grade 4	85 Moo 1 BanChaeng
21	Mrs. Bubpha Yatsamrong	45	Grade 4	130 Moo 1 BanChaeng
22	Mrs. Boonpeng Muangkudrua	38	Grade 6	3 Moo 1 BanChaeng
23	Mrs. Suchitra Suksamer	42	Grade 6	88 Moo 1 BanChaeng
24	Mrs. Dao Prommongkon	33	Grade 6	140 Moo 1 BanChaeng
25	Mrs. Boonmee Wongchandaeng	47	Grade 4	68 Moo 1 BanChaeng
26	Mrs. Somporn Saengsisom	58	Grade 4	122 Moo 1 BanChaeng
27	Mrs. Thongda Khunhom	53	Grade 4	66 Moo 1 BanChaeng

28	Mrs. Puttra Boriboon	47	Grade 6	113 Moo 1 BanChaeng
29	Mrs. Noo Khunhom	59	Grade 4	97 Moo 1 BanChaeng
30	Mrs. Wan Titapornma	50	Grade 4	91 Moo 1 BanChaeng
31	Mrs. La-iad Silpaksa	51	Grade 4	119 Moo 1 BanChaeng

Annex 3.B. Profiles of the group leaders

GROUP 1: Leader profile

Name: Mr. Chawalit Thongsit
Age:36

Profile:

- Married
- 2 children
- Total family member is 7
- 11 yrs of experience working for rice production
- 12 rai of rice field
- Water used from Chi River through pumping system
- Part time job : house painting
- Reason for joining the project: is to improve his agricultural knowledge and learn new technologies for rice production

Other Members of the Group:

1. Mr. Sunee Teehuatone
2. Mr. Satit Wongchandaeng
3. Mrs. Supee Pimpan
4. Mrs. Sommart Supeekam

GROUP 2: Leader profile

Name: Mr. Wasana Wongchandaeng,
Age: 58

Profile:

- Married
- No children
- Total family member is 5
- 33 yrs of experience working for rice production
- 25 rai of rice field
- Water used from Chi River through pumping system
- Part time job : mushroom farming
- Reason for joining the project: is to improve his knowledge on new method of rice production

Other Members of the Group:

1. Mr. Prapong Srinonyang
2. Mr. Yian Boriboon
3. Mrs. Bubpha Yatsamrong
4. Mrs. Boonpeng Muangkudrua

GROUP 3: Leader profile

Name: Mr. Prapat Noibudee
Age: 37

Profile:

- Married
- 3 children
- Total family member is 5
- 15 yrs of experience working for rice production
- 7 rai of rice field
- Water used from Chi River through pumping system
- Other job: construction contractor
- Reason for joining the project: is to improve his agricultural knowledge and to develop himself

Other Members of the Group:

1. Mr. Sing Suksamer
2. Mr. Serin Wongchandaeng
3. Mrs. Suchitra Suksamer
4. Mrs. Somporn Saengsisom
5. Mrs. La-iad Silpaksa

GROUP 4: Leader profile

Name: Mr. Amnuay Silpaksa
Age: 60

Profile:

- Married
- 3 children
- Total family member is 5
- 35 yrs of experience working for rice production
- 10 rai of rice field
- Water used from Chi River through pumping system
- other job : raising cattle
- Reason for joining the project: is curious to learn new technologies and water saving techniques to grow rice

Other Members of the Group:

1. Mr. Charoen Boonchan
2. Mr. Samarn Sarayota
3. Mrs. Dao Prommongkon
4. Mrs. Thongda Khunhom

GROUP 5: Leader profile

Name: Mrs. Puttra Boriboon
Age: 60

Profile:

- Married
- 4 children
- Total family member is 7
- 25 yrs of experience working for rice production
- 25 rai of rice field
- Water used from Chi River through pumping system
- Part time job : cloth weaving
- Reason for joining the project: is to prove how good the project is to solve problems of rice cultivation and increase yield of rice.

Other Members of the Group:

1. Mr. Uaychai Saket
2. Mr. Kaew Wandee
3. Mrs. Noo Khunhom
4. Mrs. Wan Titapornma

GROUP 6: Leader profile

Name: Mrs. Fuang Promsopa
Age: 42

Profile:

- Married
- 2 children
- Total family member is 7
- 11 yrs of experience working for rice production
- 32 rai of rice field
- Water used from Chi River through pumping system
- Part time job : house painting
- Reason for joining the project: is to study new technology

Other Members of the Group:

1. Mr.Buddee Promsorn
2. Mr. Moon Khankhaeng
3. Mr. Somwang Potong
4. Mrs. Boonmee Wongchandaeng

Annex 4 Questionnaire for Baseline Farmer's survey

Name: ……Status in family……..

Household No……Village……Tambon …… Amphor Province……

Date of Interview……

Name of Interviewee……

Remarks:……

……

……

1. General Information

1.1 Household Member Information

No.	Gender	Relation (HH)	Age	Marital status	Educt	Occupt	Farm Experience (Y /N)

Instructions;

Gender: F- Female. M- Male.

Relation with household: H- Head. W- wife/Husband. S- Son. D- Daughter. O - Others

Marital status: S- Single. M- Married. W- Widowed. SP- separated.

Education: I- Illiterate. P- Primary school. S- Secondary school. A- Above S.

Occupation:

A- Agriculture

AO- Agricultural off-farm. S-Salary, NW- not working

Cultivation Practice: R- Rice crops only, RL/ O- Rice followed by legumes/ other crops

1.2 Land holding or farm size

Land type	**Area (m^2)**	**Crop grown**	**Yield (kg/h)**	**~~Levelled (Y/ N)~~**	**Cropping pattern**
Home garden					
Agricultural land (other than rice)				xxxx	
Area under rice				xxxxx	

crop					
				xxxxx	

1.3 Rice cultivation

1.3.1 Basic information

1. How long have you been growing rice in this area (Year) ……

2. What is the total land of rice growing area in this village (rai)…….

3. How many hectare each family grows rice for one season (rai)…….

4. How many growing season for rice ……

5. How many farmers is growing rice in this village? ……

6. What is the main crop of this village? .....

7. What is the main growing season? .....

8. What is the seed rate/rai for planting? (g/ kg. (Direct seeding).....

Seedling raising

8.1. Seed-bed: How much seed for one rai land?

8.2. One rai what is the size of seed-bed? (in meter)

8.3. Age of seedling at transplanting? (day?)

a. 25-30d b. 31-40d c. 45d and more

8.4. How you pull seedling?

a. Put water before pulling b. As it is c. not specific

8.5. Do you cut root and shoot before transplanting?

a. root b. shoot c. root and shoot d. none

8.6 Depth of transplanting

a. 0 – 5 cm. b. 6-10 cm. c. 10- 15 cm. d. 15 – 20 cm. e. >20 cm

9. Do you grow Rice suing SRI management practice? (Yes/ No)……

10. Why you grow Rice using SRI Practices? ……

11. What is the percentage SRI land with respect to total rice acreage?.....

1.3.2 Land preparation

1. What are the land preparation activities before planting?

……

……

……

2. No. of ploughing and harrowing……..

3. When do you do puddling (on the day of transplanting or before?)……..

4. Do you level your land (Yes/ No)……..

5. Do you mix organic matter or any basal dose of fertilizer? If yes then what and how much…(per rai) ?

OM ?

N ?

P ?

K ?

6. How do you prepare SRI land? Do you follow similar practice like conventional rice land preparation? If No then how do you do it?.....

.....

.....

.....

7. Do you do deep ploughing?.....

1.4 Mulching/Green Manure

1. Do you use mulch for rice cultivation?
2. If yes, then what material (rice straw, plastics etc.)?
3. Why you use mulch?
4. Do you use any green manure crop as mulch?
5. If so then what crop?
6. How you place these crops with rice (row, broadcast)?
7. Do you have some experience using more then one crop? If so then what would be your conclusion?
8. How much irrigation does the use of green manure crops saves on an average?
9. How Green manure crops save weeds problems?

1.5. Irrigation Schedule (specific) Non SRI

Determinants	Rank	
Crop Growth stage	**Shallow irrigation (2-3 cm depth)**	**Completely flooded (> 5cm depth)**
Seedling establishment stage (at transplanting)		
Tillering stage		
Booting stage		
Flowering stage		
Grain filling stage		
Ripening stage		

1.6 Irrigation Schedule in SRI method

1. How do you irrigate SRI field?.....

2. Do you follow Alternate wetting and drying (AWD) or Alternate Flooding and Drying (AFD).

……..

3. How do you practice AWD?

(detail).....

.....

……

……

……

4. Do you drain the field after flooding (Yes/ No)……

5. If yes then

How?.....

……

6. If not than why

not?.....

……

7. What is the frequency of irrigation in AWD when you follow drainage……

8. What is the frequency of irrigation when do you follow AFD (no drainage)……

9. When do you reapply water (when cracks develop in soil) Yes/ No……

10. If not then how do you

decide?.....

……

……

11. Do you follow AWD/ AFD for whole crop period (Yes/ No)…….

12. If not then how long you follow AWD/ AFD (indicate crop growth stage)…….

……..

13. If you follow AFD/AWD during vegetative stage then what is the common water depth (shallow irrigation or flooding)……..

14. Any problem in practicing AWD?.....

……..

15. Any problem in practicing AFD?.....

……

1.7 Irrigation Schedule (specific) in SRI

Determinants	Rank
AWD during vegetative stage	
Draining field after irrigation	
Shallow irrigation	
Reapplication of water when cracks develop in the soil	
Maintaining shallow water depth during reproductive stage	

1.8. Weed Control

1. Are any pre-planting activities part of weed management?.....

……

2. How do you do it? (Method).....

……

3. Why only this method; any advantage?.....

4. Different type of weed management (alternative option)……..

……

5. When do you start to weed?.....

6. Frequency of weeding……

7. Do you use Herbicides (Yes/ No)……

8. If yes then when (crop growth stage)……

9. In SRI method do you have more weed problem……

10. If yes then how do you manage? (herbicides/ manual)……

11. How many times weeding is required in SRI plot……

1. 9. Fertilizer main crop

1. When do you start to apply fertilizer? ……

2. Amount and type of fertilizer……

3. How much in basal dose and how much in split dose?.....

……

4. How do you do it (placement, spraying, broadcasting) ……

……

5. Recommended dose of

fertilizer?.....

6. Do you apply compost (Yes/ No)……..

7. Amount of compost……

8. Do you purchase ……

9. If yes then from where and how much do you spend (per ton)……

10. When do you apply compost (aduring land preparation, b.durin g transplanting, c.after transplanting……b……..

11. Type of compost……..

12. Do you apply manure……Amount……Type……

13. How do you prepare manure……

14. When do you apply manure……

15. Tell us the average dose of inorganic and organic fertilizer……

2.0 Pesticide use in pest management

Name of Pesticide	Source	Cost	Dosage	No. of spray	No. of application	Labor cost	No. of pesticide mixed	Purpose

Note: No. of spray is referred to total amount of solutions sprayed per time/unit area.

3.0 Cost and Return from Conventional / SRI Rice Farming

Item	Unit	Quantity	Unit Price Baht	Total Value Baht
Return				
Product	Kg			
By-Product	Kg			
Variable cost none cash				
Manure	Kg			
Seed	Kg			
Irrigation fee	Baht			
Land tax	Baht			
Others				
Variable cost in cash				
Fertilizer (NPK)	Kg			
Pesticides in SRI	Baht			
Pesticides in Non SRI				
Compost In SRI	Kg			
Compost in non SRI	Kg			
Hired labour (planting, harvesting, weeding) in SRI	Man-day			
Hired labor (planting, harvesting, weeding) in non SRI	Man-day			

Land preparation in SRI	Baht			
Land preparation in non SRI				
Others				
Family labour	Man-day			

Total Cost and Net Return from rice cultivation with conventional rice management practices

4. Irrigation

4.1 Source of irrigation

a. Pond b. tube well c. River d. canal e. rain fed

4.2. Drainage facility available (Y /N)?

4.3. How many total irrigation needed for wet season rice crop?

4.4 What is the cost of one irrigation for one rai rice crop?

4.5. Total cost for irrigation (4.3 x 4.4) in baht.

4.6. What are the critical growth stages of rice for irrigation point of view?

4.7. How do you save rain water (harvest rain water)?

4.8. What is traditional knowledge available for the water conservation in the village?

4.9. What information would be interesting related to water use for crops by the farmers?

4. 10. Are you part of any 'water user group' in the village? If yes then for how long?

4.11. If so then what are the activities of this group?

Annex 5: Average Cost-Benefit for one rai of rice, Ban Chaeng

Sl.	Items (หัวข้อ)	ปริมาณ	ราคาต่อหน่วย	รวม
1.	**Fixed cost (ต้นทุนคงที่)**	**Unit**	**Unit Cost (Baht)**	**Total (Baht)**
2.	land tax (ภาษีที่ดิน)	1 Rai	3	3
3.	any other tac (ภาษีอื่นๆ)			0
4.	***Variable cost (ต้นทุนผันแปร)***			
5.	Seedbed for transplant (แปลงเพาะกล้าเพื่อการย้ายปลูก)	500 sq.m		
6.	Cost of seed (ค่าเมล็ดพันธุ์)	10 kg	12	120
7.	Cost of seedbed preparation			
8.	(ค่าเตรียมแปลงเพาะกล้า)	500 sq.m	0.8	400
9.	Cost of manure and fertilsier for seedbed			
10.	(ค่าปุ๋ยคอกและปุ๋ยเคมีสำหรับแปลงเพาะกล้า)			
11.	-inorganic fertiliser	50 kg/Rai	12	600
12.	Cost of plant protection measures in seedbed			
13.	(ค่าดูแลรักษาแปลงเพาะกล้า)	25 days	20	500
14.	Main field (แปลงนาดำ)			
15.	Ploughing (ค่าไถ)	1 Rai	250	250
16.	Lelvelling (ค่าปรับพื้นที่)	1 Rai	180	180
17.	Puddling (ค่าทำเทือก)	1 Rai	100	100
18.	Cost of pulling seedling (ค่าถอนกล้า) for trasplanting field of 1 Rai		300	300
19.	Cost of transplanting (ค่าปักดำ)	1 Rai	450	450
20.	Irigation cost (ค่าชลประทาน)			130
21.	Basal fertisers - Manures (ค่าปุ๋ยรองพื้น - ปุ๋ยคอก)			
22.	NPK (ค่าปุ๋ยเคมี)	50 kg/Rai	12	600
23.	Any other soil ammedments(ค่าปรับปรุงบำรุงดินอื่นๆ)			0
24.	Cost of weeed management (ค่าป้องกันกำจัดวัชพืช)			0
25.	Cost of Pesticides (ค่าสารป้องกันกำจัดแมลง)			0
26.	cost of harvesting (ค่าเก็บเกี่ยว)	1 Rai	540	540
27.				
28.	***INOCME (รายได้)***			3500
29.	**Total yield (ผลผลิตที่ได้ทั้งหมด (ก.ก.))**	**650 kg/Rai**	**8**	**5200**
30.	**Rice Paddy unit cost (ต้นทุนต่อหน่วยพื้นที่ (ไร่))**	**1 Rai**	**4173**	**4173**
31.	**Total retrun (รายได้ทั้งหมด)**			**5200**
32.	**Net return (รายได้สุทธิ)**			**1027**

, , , ,
Note: All costs should be of the transplanted wet season rice for one Rai land in Baht.,
หมายเหตุ ต้นทุนทั้งหมดเป็นการปลูกข้าวนาปีโดยการดำในพื้นที่ 1 ไร่ / บาท, ,

Annex 6: Summary of information form crop calendar

Summary Information from Cropping Calendar for Transplanted Rice, Ban Cheng, Amphor - At samart ;Roi et Province

No. (ลำดับที่)	Management Practice (การปฏิบัติและจัดการ)	Week (สัปดาห์)	-4	-3	-2	-1	1	2	3	4	5	6	7	8	9	10	11	12	13
33.	Crop duration: 4 month (ระยะเวลาปลูก 4 เดือน)	Day (วัน)	-30	-21	-14	-7	7	14	21	28	35	42	49	56	63	70	77	84	93
34.	***Seedling Stage* (ระยะกล้า)***																		
35.	Seed var: (ชื่อพันธุ์ที่ใช้) KoKho 6 (RD 6)																		
36.	Seed Source: (แหล่งเมล็ดพันธุ์)																		
37.	11th Plant Propagation Center,RoiEt																		
38.	Seed germination test: (Y/N), if yes, how? No																		
39.	(ทดสอบความงอกของเมล็ดก่อนหรือไม่ ถ้าใช่ ทำอย่างไร)																		
40.	Seed Treatment (มีวิธีการเตรียมเมล็ดก่อนงอกหรือไม่) No																		
41.	If, Yes, Chemical & dose: (ถ้ามี ทำอย่างไร สารอะไร ปริมาณเท่าไร)																		
42.	Seed rate (per rai): (อัตราการใช้เมล็ดพันธุ์(ต่อไร่)) 10 kg/Rai																		
43.	**Seedbed: (แปลงเพาะกล้า)**																		
44.	Size of Seedbed:(ขนาดของแปลงเพาะกล้า) 500 sq.m																		
45.	Organic manure (Kg /sq. meter) & when: No																		
46.	(ปุ๋ยคอก (ก.ก./ ตร.ม.) ใช้เมื่อไหร่)																		
47.	NPK (Kg/sq met) and when:																		
48.	NPK (ก.ก./ตร.ม.) ใช้เมื่อไหร่) 40 kg of 16-16- 8/Rai																		
49.	Method of sowing: (line /bordcast) Broadcasts																		
50.	(วิธีการหว่านเมล็ด (เป็นแถว หรือหว่านทั่วแปลง)																		
51.	Seed-soaking done*: (วิธีการแช่เมล็ด ทำหรือไม่)																		
52.	Yes (See Footnote)																		
53.	Irrigation: (การชลประทาน)																		
54.	from Chi River through canal																		
55.	Occurrence of insect-pests:																		
56.	(การระบาดของแมลง) army worm																		
57.	green planthopper																		
58.	leaf roller																		
59.	Occurrence of diseases:																		

60.	(การระบาดของโรค)																			
61.	Use of Chemical pesticides:(การใช้สารป้องกันกำจัดแมลง)																			
62.	Spray of ??? How much: (ฉีดพ่น / ปริมาณเท่าใด)																			
63.	How seedlings are pulled:(ถอนกล้าโดยวิธีการใด)																			
64.	pulling by hand																			
65.	Age of Seedlings at transplanting: 20-25 days																			
66.	(อายุของต้นกล้าในวันปักดำ)																			
67.	Grading of seedlings done:(มีการคัดเลือกต้นกล้าหรือไม่) No																			
68.	Cleaning of seedling before transplanting: Yes																			
69.	(มีการทำความสะอาดต้นกล้าก่อนปักดำหรือไม่)																			
70.	**B. Main field stage (แปลงปักดำ)**																			
71.	***Land Preparation: (การเตรียมดิน)***																			
72.	. Plowing: ?? Times (การไถ กี่ครั้ง) 2 times																			
73.	. Harrowing & levelling: ?? Times, 1-2 times																			
74.	(การคราด และการปรับพื้นที่ กี่ครั้ง)																			
75.	. Row interval: ? 15-20bCm (ระยะการปลูกระหว่างแถว (ซม.))																			
76.	. P-P interval: ? Cm (ระยะระหว่างต้น (ซม.)) 20 cm																			
77.	Puddling : (การทำเทือก)																			
78.	at the day of - or 1 day after pulling seedlings																			
79.	***Fertilizer Application (การให้ปุ๋ย)***																			
80.	Urea (ปุ๋ยยูเรีย) 5 kg /Rai																			
81.	16 - 16 - 8 10กก/ไร่																			
82.	KCl: (โปแตสเซียมคลอไรด์)																			
83.	Basal Dose: 25 kg of pelletted biofertiliser/Rai (twice)																			
84.	***Compost/manure: (ปุ๋ยหมัก / ปุ๋ยคอก)***																			
85.	***Irrigation: CANAL Irrig.(การชลประทาน (คลอง)) Yes***																			
86.	***When (เมื่อไหร่)***																			
87.	***Weeding: How (Manual/Weedicide)***																			
88.	***(การกำจัดวัชพืช : ทำอย่างไร ใช้คน / ใช้สารปราบวัชพืช)***																			
89.	***manual or ignore if not reach economic level***																			
90.	***Important weeds : Jungle rice (weedy rice)***																			
91.	***(วัชพืชที่สำคัญ)***																			
92.	***Insect-Pest (แมลง)***																			
93.	***Rice army worm***																			
94.	BPH (เพลี้ยกระโดดสีน้ำตาล)																			

95.	stem borer killed by Furadan																			
96.	***Diseases (โรค)***																			
97.	leaf rot,brown leaf spot, leaf blast																			
98.	leaf blight, yellow orange leaf																			
99.	***Chemical Insecticide use: No***																			
100.	(การใช้สารป้องกันกำจัดแมลง)																			
101.	***Fungicide application : In general, no use***																			
102.	(การใช้สารป้องกันกำจัดเชื้อรา)																			
103.	***Others (อื่น ๆ)***																			
104.																				

*** How soaking done and for how many hours?(การแช่เมล็ดทำอย่างไร และแช่นานกี่ชั่วโมง)**

Mostly, seeds soaked for 24 hrs. inside a sack made from flax, then water drained and leave the moist seeds for 1-2 days before sowing.

Note: All information in Rai (1600 sq. meter) basis.

หมายเหตุ : ข้อมูลทั้งหมดให้ยึดหลักในพื้นที่ 1 ไร่ (1600 ตร.ม.)

Annex 7. Hands on Training on SRI seed-bed preparation

Fig. a. Field Preparation for the SRI seed-bed

Fig. b. Raised seed-bed were prepared by farmers

Fig. c. 24 hrs soaked rice seeds were sown followed by watering

Fig.d. Its time to tell what we have done!!!!

Fig. e. Watering before completing the SRI seedbed for the translating after 12 day

Annex 8. Power Point Presentation Used in the Inception workshop, 8TH May, Roi-Et

Inception Workshop

8 May 2006, Roiet, Thailand

An Asian Institute of Technology (AIT) &
Thai Education Foundation Project

Funding source:
Challenge Program for Water and Food (CPWF),
IWMI, CGIAR

Project Title

Increasing water use efficiency by using mulch under SRI (System of Rice Intensification) management practices in Northeast Thailand

Scheme of Presentation

- Background
- Rational of project
- Objectives
- Major steps in PAR
- Time frame
- Local logistics

Background

- A collaborative project of AIT and TEF
- Geographical area – North East Thailand
- Project Duration – 1 2 + 6 months
- Project Crop – Transplanted Rice
- Target groups: 25-30 Rice farmers (man and women farmers) in Roi et (Ban Cheng)
- Principal Investigator : Prof. V. M. Salokhe
- Project partner : Mr. Marut, TEF
- Major focus is on water productivity issues

Rational of Project (water focused)

- Rice production severely constrained by water management
- Reducing water availability
- Increasing international demand and higher net return from organic rice
- SRI rice is widely adopted
- Weeds are major problems under SRI

Water Productivity Issues / Objectives

- Innovation & localization the agronomic practice using SRI management practices.
- Use of green manure crops as intercrops and mulch
- Information on water harvesting techniques and how more water available would be conserved ?

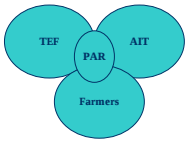
Major Steps in project cycle - I

- Village Immersion
- Baseline Survey
- Crop Calendar development
- Final Crop calendars and search of options
- Problems listing, prioritization and development of the action research plans

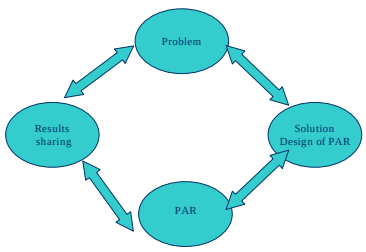
Major Steps in project cycle - II

- Action research
- Weekly farmers meetings
- Mid –term evaluation
- Harvest-day/Field day
- Workshops

Conceptual framework



PAR Cycle



Time –Frame (May – November 06)

Work	May	June	July	Aug	Sept	Oct	Nov.
BS Survey							
Crop Calendar							
PAR Development							
PAR							
Mid Season Evaluation							
Filed Day							
Reporting							

Expected outputs

- A localize water productivity based alternate management methods of Rice cultivation.
- Experience and idea on the researching and finding solutions of the local problems
- Suitability of green manure crops to manage weeds
- Awareness and solution of water productivity to the local collaborators

Thank you for patient hearing!

More information could be collected at:

Dr. Prabhat Kumar
Agriculture Systems & Engg. FOS
School of Environment Resources and Development
Asian Institute of Technology, Po Box-4; Khlong Lunag
Pathumthani 12120, Thailand
Email: pkipm@ait.ac.th
Phone: 02-524-5477 ; Fax: 02-524-6200

Annex 9. List of some attendees for the Transplanting day ceremony

Sl.	*Name*	*Position*
1.	Mr. Nophon Chanthrathong	Governor of Roi Et Province
2.	Mr. Somkiat Ratanametathon	At Samart District governor
3.	Ms. Wilawan Sonsin	Director of provincial NFE Office
4.	Mr. Pinit Yutikarn	Director of At Samart NFE Office
5.	Mr. Chalermchai Chanwichit	At Samart District Developer
6.	Mr. Somporn Kiangsri	Representative from At Samart Agriculture Office
7.	Mr. Kampad Pimchaisri	Head of Tambol* Administration Office
8.	Mr. Boonchu Boriboon	Head of Tambol* Banchaeng
9.	Mr. Tawee Chaisit	Head of village (Moo) 2
10	Mr. Prapat Khankhaeng	Head of village (Moo) 3
11	Mr. Prasit Koteboonmee	Head of village (Moo) 4
12	Mr. Charoen Srisongkram	Head of village (Moo) 5
13	Mr. Chalee Maiwan	Head of village (Moo) 6
14	Mr. Boonriang Moonmanat	Head of village (Moo) 7
15	Mr. Tongdee Wongchampa	Head of village (Moo) 8
16	Mr. Likhit Wacharakawisin	Head of village (Moo) 9

Annex 10. Questions for Pre-PAR Ballot Box Test

1. For each soil you see, from where it taken.

   Bag 1 Bag 2 Bag 3 Bag 4

2. For each fertilizer you see, what formula of it.

   Bag 1 Bag 2 Bag 3 Bag 4

3. Which one is not usefulness of fertilizer?

   a. make soil fine b. Increase soil fertility c. control of insect and disease

4. Which one is usefulness of puddling?

   a. weed control
   b. levelling and ease of drainage
   c. rapid root anchorage into soil
   d. all correct

5. Which one is a difference between rice and weed?
   a. rice has auricles for insect protection but not in weed
   b. rice has auricles for precipitation protection but not in weed
   c. a. and b. correct
   d. all incorrect

6. What is the role of rice leaves?
   a. photosynthesis
   b. respiration
   c. nutrient absorption
   d. a. and b. correct

7. What is the role of primary and secondary roots?
   a. primary - for anchorage and secondary roots for nutrient absorption
   b. secondary roots for anchorage and nutrient absorption
   c. Both for anchorage and nutrient absorption
   d. all correct

8. What is the function of a green part of rice?
   a. photosynthesis
   b. food storage
   c. respiration
   d. water absorption from air

9. What is the benefit if we can maintain lower leaves of rice?
   a. good for more photosynthesis, more production
   b. good for more tillering
   c. not good for plant food competition
   d. all incorrect

10. When does rice start the tillering stage?
    a. 5 - 10 days of age
    b. 10 - 20 days of age
    c. 20 – 30 days of age
    d. 30 days or more

11. What soil component that helps to improve water holding capacity.
    a. minerals
    b. Stone and sand
    c. organic matters
    d. all correct

12. What materials do you have in your village can improve water holding capacity?

    a. rice husk b. rice straw c. manure d. all correct

13. What happens if there is no mulching within rice inter-spaces?

    a. Weed problem
    b. Good growth of rice
    c. Increase of tillering
    d. Weed problem and less moisture

14. How aerobic and anaerobic soil environment conditions have effects on growth of rice?

    a. rice is susceptible if aerobic
    b. rice is susceptible if anaerobic
    c. rice grows well if aerobic
    d. rice grows well if anaerobic

15. What condition is best for rice growth?

    a. warm b. Warm and moist c. cold d. cloudy

16. From where most of oxygen do plants take?
    a. soil b. water c. air d. all correct

17. Which is correct for the cycle of water?
    a. water comes from living and non-living things on the earth and goes up to the sky
    b. earth – sky – cloud – rain
    c. from the sky to the earth
    d. all incorrect

18. From where can you have water for rice cultivation?
    a. river
    b. canal
    c. rain
    d. all correct

19. What is a name of insect?

Bag 1 Bag 2 Bag 3 Bag 4

20. What is the function of the insect?

Bag 1 Bag 2 Bag 3 Bag 4

21. Which one is damaged by rice leaf rollers?

Bag 1 Bag 2 Bag 3 Bag 4

22. Which one is brown plant hopper?

Bag 1 Bag 2 Bag 3 Bag 4

23. Do you know what kind of insect that causes the rice shoots dead and easily pulled out?

a. brown planthopper
b. rice stem borer
c. rice army worm
d. rice leaf roller

24. What and how many groups of insect can you classify?

a. 2 groups: beneficial insects and enemies
b. 3 groups: insects with wings, without wings, and with hair
c. 4 groups: caterpillars, wasps, grasshoppers and butterflies
d. all incorrect

25. Which kind of root system would be better for rice for better water use efficiency?

a. shallow
b. deep
c. none
d. both

Ballot box result

Sl.	Name of the farmers	Score	% obtained
1	Mr. Charoen Boonchan	8	32
2	Mr.Sunee Teehuatone	8	32
3	Mr. Kammee Suksamer	12	48
4	Mr. Sing Suksamer	10	40
5	Mr. Narong Wongchandaeng	7	28
6	Mr. Chatree Kaentao	14	56
7	Mr. Prakaad Noibuddee	17	68
8	Mr. Serin Wongchandaeng	12	48
9	Mr. Buddee Promsorn	10	40
10	Mr. Wichian Wongchandaeng	11	44
11	Mr. Wasana Wongchandaeng	9	36
12	Mr. Amnuay Silpaksa	8	32
13	Mr. Uaychai Saket	10	40
14	Mr. Kaew Wandee	8	32
15	Mr. Moon Khan khaeng	10	40
16	Mr. Somwang Pothong	9	36
17	Mrs. Fuangfa Promsopa	13	52
18	Mrs. Supee Pimpan	8	32
19	Mrs. Sommart Supeekam	10	40
20	Mrs. Boonpeng Muangkudrua	13	52
21	Mrs. Suchitra Suksamer	15	60
22	Mrs. Dao Prommongkol	16	64
23	Mrs. Ery Supeekam	8	32
24	Mrs. Somporn Saengseesom	12	48
25	Mrs. Tongda Khunhom	11	44
26	Mrs. Puttra Boriboon	20	80
27	Mrs. La-iad Silpaksa	9	36

Note: Score 50% + = 7 farmers, 50% - = 20 farmers out of 25 questions.

Annex 11: List of DNFE farmer's trainers attached to the PAR project

Sl	Name	Age	Education	Address
1	Mr. Charoen Boonchan	60	Grade 4	18 Moo 1 BanChaeng
2	Mr Prapong Srinonyang	55	Grade 6	58 Moo 1 BanChaeng
3	Mr. Prapat Noibudee	37	Grade 9	157 Moo 1 BanChaeng
4	Mr. Wasana Wongchandaeng	58	Grade 4	72 Moo 1 BanChaeng
5	Mrs. Boonpeng Muangkudrua	38	Grade 6	3 Moo 1 BanChaeng
6	Mrs. Boonmee Wongchandaeng	47	Grade 4	68 Moo 1 BanChaeng
7	Mrs. Puttra Boriboon	47	Grade 6	113 Moo 1 BanChaeng