Comparative experiences between 2 GRET projects: SRI practice dissemination in Northern Rakhine State (NRS) and Ayeyarwady Delta (Bogale Township)

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Introduction of Farmer Field Schools (FFS), Integrated Pest Management (IPM) and System of Rice Intensification (SRI) to restore food security and sustainable livelihoods in Myanmar

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Executive summary

GRET (*Groupe de Recherche et d'Echanges Technologiques*) has been working in the three Townships (Maungdaw, Buthidaung and Rathedaung) of Northern Rakhine State since 1996, implementing projects aiming at improving food security and livelihood promotion of Northern Rakhine State population.

Since 2004, GRET is supporting the introduction and dissemination of System of Rice Intensification practice, which has reached, after 4 continuous years of support, its critical mass and self-dissemination point. Such practice led to deep improvement of the paddy production at household level. Based on such successful experience, GRET has started to introduce SRI practice in Ayeyarwaddy Delta in the summer season 2008-09 taking into consideration the specificity of this area and targeting a different population of farmers.

System of Rice Intensification practice introduction in Northern Rakhine State: a long process for a successful dissemination and a deep impact on the local paddy production

Northern Rakhine State: a very specific context… highly suitable for SRI practice dissemination

NRS is one of the most populated areas of Myanmar. Extension of cultivable land has reached its limit. High proportion of the population is small land holders (or landless farmers) who can only partially ensure the household food security. NRS farmers are usually good at crop management but strongly lack any access to new practices and improved technologies. Field assessment showed that some agronomic practices in rice cultivation were needed to be improved or changed, such as deep transplanting, high density of seedlings per hill, pest and disease management, efficient management of soil fertility… Lastly, availability of agriculture inputs, such as quality seed and fertilizers, are poor because of remoteness from main land of the country.

System of Rice Intensification was a good opportunity for NRS farmers. GRET's objective in introducing SRI was mainly to increase the production of rice, targeting and supporting the most vulnerable farmer households.

An evolving methodology: from the introduction of a new practice toward the critical mass and self-dissemination point

From **Dry Season 2004-05 to Dry Season 2005-06**, GRET focused on the introduction of the new practice relying on a deep support and follow up of the project team with establishment of demonstration plots, open field experiments at farmers' plot level and compensation / bonus incentive mechanism (in cash). The objective was to convince farmers about the SRI and to increase the number of participants in the SRI Farmer Led Experiment (FLE) activities implemented by GRET.

Starting from **Rainy Season 2006**, GRET decided to re-orientate its strategy for disseminating SRI practice. Farmers were convinced by the technique but the acreage was remaining quite low. Shift was done toward more technical support and provision of dedicated agricultural tools.

After 4 years of activity implementation, visual observation at village level showed a wide spreading of the practice in the plots. Meanwhile, GRET has directly involved 4500 farmers in the SRI FLE activity and 1282 farmers in Farmer Field Schools addressing SRI practice in rainy and summer rice. Brief assessment conducted by project staff after summer paddy cultivation season 2008 in 36 Village Tracts from the Maungdaw and Buthidaung Townships has shown that 18% of farmers involved in summer paddy cultivation did SRI on 9.3% of the total acreage under cultivation.

Results, impacts and lesson learnt from SRI practice dissemination…

SRI has proven to be a very efficient technique to increase the paddy production in Northern Rakhine State (over 1 ton/ha in average compare to the traditional farmers' practices). Such technique has also proven to be replicable according to results over the years and places. Dissemination and quick adoption of the technique by NRS farmers was highly related to the specific context of NRS, the level of agriculture intensification (especially in term of labor) and the small land holding situation.

Based on the experience gained through NRS project, GRET is deeply convinced that introduction of SRI in Ayeyarwaddy Delta would be an important tool to support agriculture revitalization after the consequences of Cyclone Nargis.

System of Rice Intensification practice introduction in Ayeyarwaddy Delta (Bogale Township): a first attempt to measure the impact of a new technique on local farmers' practice

Bogale Township (Ayeyarwaddy delta): an ancient rice growing area with traditional rice cropping patterns seriously affected by Cyclone Nargis…

Bogale Township in Ayeyarwaddy delta is a rice growing area where thousands of acres of rainy season rice and summer rice are cultivated. However, after more than a decade practicing the same crop management (broadcasting very high seed rate in summer rice cultivation), farmers suffer from cumulative effects by outbreak of pests and diseases, weed destruction, soil degradation, and vulnerability to fluctuations of prices of paddy and inputs. The Cyclone Nargis gave a final blow to weaken farmers in the delta area. The situation calls for every assistance to remedy the deteriorated rice production of the rural population in the area.

Few demonstration plots set up at experienced farmers' level aiming at identifying ways to introduce SRI practices in the framework of existing crop production methods

Based on the experience learnt from NRS project, GRET decided to introduce some relevant principles of SRI in Ayeyarwaddy delta (Bogale Township) relying on some carefully selected collaborative farmers. The overall goals of GRET to introduce SRI were to **change some malpractices observed in crop management of rice** and to **provide better opportunities in rice production**. The objectives were to **find ways to adopt SRI practices in the framework of existing crop production methods**, to **reduce the costs of rice production** while revitalizing agriculture and to **improve the resources for rice production** such as good seed and soil fertility. Project targeted **medium farmers with experience and interest in experimenting new practices,** motivated to try new methods of cultivation and new tools, involved in seed production activity. Attention was also given to farmers who had planted or planned to cultivate summer rice by line sowing with drum seeder.

SRI practice was tested in 2008-09 summer paddy season. Principles of SRI and its **potential for being complimentary to quality seed production** were discussed with farmers in awareness meetings. Depending on their existing cultivation methods, relevant principles of SRI were selected to be demonstrated.

Brief analysis of the results and some lessons learnt as a conclusion….

SRI practices did not show inferior performance than conventional practices in all demonstration plots. Superior grain yield allowed insuring a good promotion of the innovative methods.

Seed rates in all demonstration plots were significantly lower than that of conventional broadcasted method (average of 2.2 baskets / acre in demonstration plots while farmers usually use 6 baskets / acre in summer rice). **Lower seed rate** used was found **very attractive** by most of farmers, especially taking into consideration that price of seed at the cultivation season are usually high.

Demonstration plots were conducted with transplanted method, direct hand seeded or drum seeded. They all showed different kind of results pointing out the main areas of improvement needed in the farmers' practices.

Indeed, GRET is of the opinion that the **introduction of relevant practices of SRI in the Ayeyarwaddy Delta has a lot of potential.** It implies to rely on **some adaptive strategies rather than focusing on all the SRI principles**. Introduction of some selected SRI principles would lead to some deep practice changes and better crop management. It concerns mostly s**eed rate, pest and diseases as well as weed control, fertility management**... Such improvement would decrease the paddy production cost for the farmers, increase their yield and contribute at improving their food security and livelihoods. In the meantime, it worth mentioning that application of **full SRI principles** would be highly recommended and suitable for **selection (purification) and multiplication of good quality seeds**. Indeed, SRI has already proven to be an efficient tool in **participatory plant breeding and seed multiplication**.

Main improvements to be undertaken and where SRI practice would be very efficient are

- **Nursery management** for **transplanted SRI**,
- Improvement of **drum seeder** to properly manage **seed rate** and **spacing** for **direct seeded SRI**,
- Better **weed control** with proper spacing and line seeding along with use of **iron rotary weeder**

Comparative experiences between 2 GRET projects, SRI practice dissemination in Northern Rakhine State (NRS) and Ayeyarwady Delta (Bogale Township)

Hla Min, Pierre Ferrand and Kyaw Zin Thant

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Since 2004, GRET is supporting the introduction and dissemination of System of Rice Intensification practice, which has reached, after 4 continuous years of support, its critical mass and self-dissemination point. Such practice led to deep improvement of the paddy production at household level. Based on such successful experience, GRET has started to introduce SRI practice in Ayeyarwaddy Delta in the summer season 2008-09 taking into consideration the specificity of this area and targeting a different population of farmers.

Thus, this paper is meant to present first the dissemination process of SRI in NRS, the impact of such practice and the lesson learnt from this experience. Then, one will describe the context in the Ayeyarwaddy Delta, the strategy designed in order to promote SRI in this area and the expected results of such approach and such new practice dissemination.

System of Rice Intensification practice introduction in Northern Rakhine State: a long process for a successful dissemination and a deep impact on the local paddy production

Background

System of Rice Intensification (SRI) practice has been introduced for the **first time** in Northern Rakhine State (NRS) by GRET during the **rainy season 2004** by setting up 8 demonstration plots (0.1 acre each) at village level. Encouraging results led GRET to disseminate SRI using Farmer Led Experiments (FLE) and Farmers Field Schools (FFS) approaches.

Taking into consideration the specific context of NRS (most farmers are very poor and landless[4] facing food insecurity because of high return payment for rented land and low crop yields due to limited access to improved production technologies) and the overall objective of the project to increase the food production, GRET targeted mostly small and landless farmers, without excluding the other ones. Landless poor were given chance to access land in the GRET assisted irrigation sites such as permanent and temporary dams during dry seasons. Numbers of farmers involved in the activity increased from 67 (in DS 2005) to 1,203 (in RS 2007) from Maungdaw, Buthidaung, and Rathedaung Townships, cumulating 4500 farmers at the end of the project in 2008.

Northern Rakhine State: a very specific context… highly suitable for SRI practice dissemination

NRS is one of the most populated areas of Myanmar[5], Maungdaw Township having one of the highest population densities after Yangon and Mandalay cities[6]. Extension of cultivable land has reached its limit. High proportion of the population is small land holders (or landless farmers) who can only partially ensure the household food security. Part of it comes from off farm jobs mainly related to forest products such as bamboo and firewood.

[4] Average of 68% of the Muslim population is landless (and up to 90% for the returnees) according to "*Strategic assessment and evaluation of assistance to NRS*", February 2007, EU report.

[5] Total population of the 3 Townships of Northern Rakhine State is about 910 000 inhabitants for a total area of 4900 square kilometres.

[6] Average NRS population density is about 185 inhabitants / km^2 while national population density is 68 inhabitants / km^2

Most of the farmers try to produce as much as possible from any unit of land available. They can invest their own labor practically at no limit. Besides, summer rice cultivation was introduced very early in the area (starting from1973-75), after that farmers learnt about this practice from Bangladesh[7]. As a comparison, summer paddy practice was promoted in other areas of Myanmar only in the early 1990s'. NRS farmers are usually good at crop management but strongly lack any access to new practices and improved technologies. Field assessment has shown that some agronomic practices in rice cultivation were needed to be improved or changed, such as deep transplanting, high density of seedlings per hill, pest and disease management, efficient management of soil fertility… Lastly, availability of agriculture inputs, such as quality seed and fertilizers, are poor because of remoteness from main land of the country.

System of Rice Intensification was a good opportunity for NRS farmers. GRET's objective in introducing SRI was mainly to increase the production of rice, targeting and supporting the most vulnerable farmer households.

An evolving methodology: from the introduction of a new practice toward the critical mass and self-dissemination point

Looking at the changes in the methodology over the years, one can identify mostly 2 main phases.

From **Dry Season 2004-05 to Dry Season 2005-06**, GRET focused on the introduction of the new practice. Such phase relied on a deep support and follow up of the project team with establishment of demonstration plots, open field experiments at farmers' plot level and compensation (in case of loss) / bonus (in case of success) incentive mechanism (in cash). The objective was to convince farmers about the SRI and to increase the number of participants in the SRI Farmer Led Experiment activities implemented by GRET. Such approach was implemented at field level all over the 3 townships of NRS (through a network of 9 GRET Agriculture Field Agents living in separate areas of NRS).

Starting from **Rainy Season 2006**, GRET decided to re-orientate its strategy for disseminating SRI practice. Indeed, it was noticed that farmers were more and more convinced about the practice, their number involved in the SRI FLE activity increasing, but the total acreage under SRI cultivation was remaining quite low. Taking into consideration the interest of the farmers for the new practice, GRET stopped the incentive system (in cash) implemented at the beginning and shifted its approach toward more technical support and provision of dedicated agricultural tools.

Farmer Facilitators (FF) were introduced at that moment with both objectives to de-multiply the numbers of farmers involved in the activity and reached by the SRI practice and to promote key farmers at village level with good technical capacities. Such FF had to support 20 to 50 farmers (4 to 5 groups of 5 to 10 farmers each) and organize at least 6 technical meetings per season with support from project: SRI concept, transplanting steps, 1st weeding, last weeding, flowering time (combined with pest control), harvest (and yield estimation).

Along with introduction of FF, GRET targeted especially landless and small farmers and supported compost making practice by providing fertilizers for 0.1 acre (5 kg Urea and 2.5 Kg TSP) when farmer was seriously involved in compost making, this latter being one of the SRI principle promoted by GRET. Such fertilizer provision was totally stopped starting from Rainy Season 2007 in order to decrease the dependency of farmers on project inputs and because such incentive was not needed anymore to involve farmers in the activity.

[7] **Philippe Lavigne Delville**, *Is there free access for summer crop? Access to land and water for summer paddy crop in North Rakhine State (Myanmar)*, Mission Report for the GRET/HCR project, Mai 2001

The table below summarizes the different steps in the methodology evolution:

	DS 2004-05 – DS 2005-06	RS 2006	DS 2006-07	RS 2007-RS 2008
Cumulative SRI FLE Farmers	688	1708	2911	4500
Village tracts	22	34	34	45
Technical guidance	GRET AFA follow up + Field visit to demo plots	GRET AFA follow up + 22 **Farmer Facilitators** + Field visit to demo plots	GRET AFA follow up + 42 **Farmer Facilitators** + Field visit to demo plots	GRET AFA follow up + 43 **Farmer Facilitators** + Field visit to demo plots
Project support	Iron rotary weeder (1/ group of FLE farmers)	Iron rotary weeder (1/ group of FLE farmers) 5 kg Urea and 2.5 Kg TSP for 0.1 acre plot (1 plot / farmers or 2 if compost making)	New type of iron rotary weeder (30% cheaper and locally available) (1/ group of FLE farmers) 5 kg Urea and 2.5 Kg TSP for 0.1 acre plot / farmer (only if compost making)	New type of iron rotary weeder (1/ group of FLE farmers) No more fertilizer provision
Incentive / compensation	Cash bonus / compensation to FLE farmers (0.1 acre plot)	2500 MMK / meetings for FF 6 meetings / season	2500 MMK / meetings for FF 6 meetings / season	2500 MMK / meetings for FF 6 meetings / season
Cumulative acreage under SRI	302	945	1743	2472

Last but not least, it was found out that the **availability and price of the *iron rotary weeder***[8] provided by the project (highly appreciated by farmers in order to improve deeply the efficiency of the weed control and the crop management) was the **main constraint in wider dissemination of SRI practice** and **increasing of total acreage under SRI**.

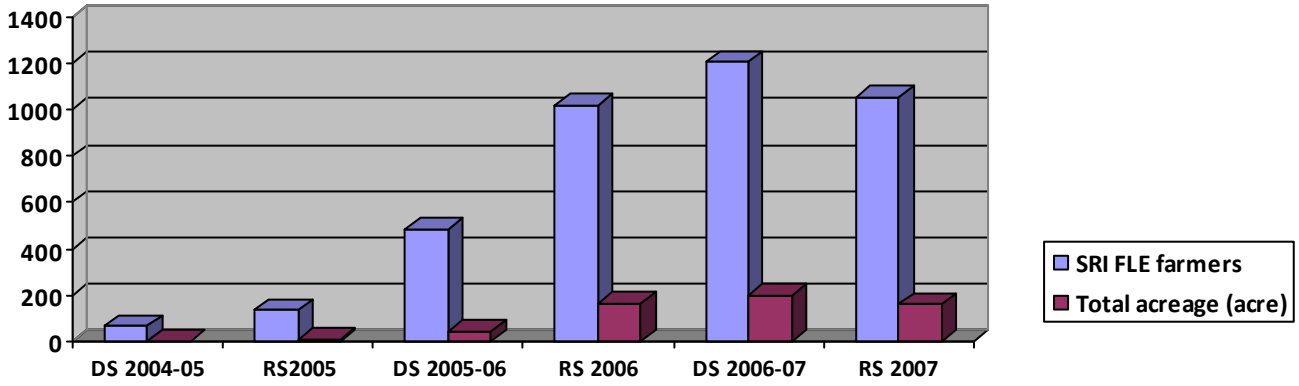
Thus, in 2007, GRET National Senior Agronomist designed new structure of weeder, lighter, technically appropriate to NRS plot conditions and with an affordable cost for farmers (8,000 MMK instead of 21-25,000 MMK). It was meant to develop a sustainable and local supply of iron rotary weeders, affordable for most of the farmers and able to answer the increasing demands. The new design was first produced by blacksmiths from Maungdaw and then, such design was also disseminated to local blacksmiths and artisans at Village Tract level. A wide range of iron rotary weeder designs can be nowadays found locally, from the cheapest and simplest one to the one with the fancy design introduced at the beginning.

See here, 3 kinds of iron rotary weeders (in the background, the original one while in the foreground, the latest and cheapest design).

[8] Agriculture mechanical tool facilitating the weeding by cutting weeds, burying them underground and aerating the soil

The following chart shows the increasing number of farmers involved in the SRI FLE activity over the years but also the increasing of the total acreage under SRI. It is interesting to note that the re-orientation of project approach for disseminating SRI practice in RS 2006 has led to an increasing in acreage / farmer under SRI practice.

Chart 1: Evolution of farmers involved in SRI and total acreage, 3 Townships of Northern Rakhine State of Myanmar



	DS 2004-05	RS 2005	DS 2005-06	RS 2006	DS 2006-07	RS 2007
SRI FLE farmers	68	134	486	1020	1203	1055
Total acreage (acre)	4.05	11.4	42.8	163.5	200	161.5
Average acreage under SRI / farmers	0.06	0.085	0.088	0.16	0.166	0.15

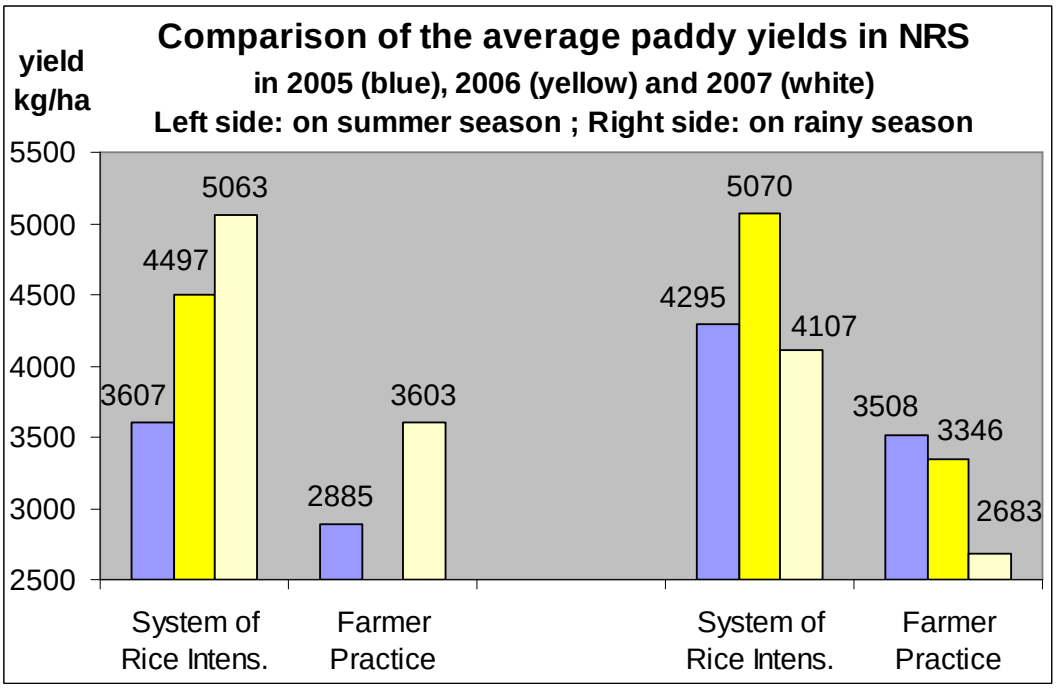
As far as dissemination of the practice is concerned, one can mention that visual observation at village level shows a wide spreading of the practice in the plots. Moreover, over the course of the project, GRET has directly involved 4500 farmers in the SRI FLE activity and 1282 farmers in Farmer Field Schools addressing SRI practice in rainy and summer rice. Lastly, a brief assessment was conducted by project staff after summer paddy cultivation season 2008 in 36 Village Tracts from the Maungdaw and Buthidaung Townships. Results show that 18% of farmers involved in summer paddy cultivation did SRI on 9.3% of the total acreage under cultivation. Although summer paddy season is the most suitable for SRI (easier water management and high yield expectation), such figures indicate a good dissemination of the practice over the 3 townships and one can assume that self-dissemination point has been already reached.

Results, impacts and lesson learnt from SRI practice dissemination…

GRET has been supporting farmers for paddy cultivation mainly by pioneering the introduction of System of Rice Intensification (SRI) since 2005. Every paddy cultivation season (summer and rainy), GRET collects harvest data from farmers directly involved in the activity (paddy yields with traditional farmers' practices and SRI practice).

The chart below presents the paddy yield evolution in Northern Rakhine State from 2005-2007 (Farmer practices versus System of Rice Intensification). It is based on the data of farmers involved in rice cultivation activity supported by GRET from the last 3 years[9]. It can be noticed that **the System of Rice Intensification allows an increase of the paddy production of over 1 ton/ha in average compare to the traditional farmers' practices**. Such increasing was about 700 kg/ha at the beginning of the activity in 2005 and it reaches nearly 1.4 t/ha in 2007 mainly due to a better capacity of the farmers to master the technique.

[9] Numbers of farmers involved in GRET activity has increased from 67 (in DS 2005) to 1203 (in RS 2007) from the 3 townships of Northern Rakhine State.



As shown in the chart, the results also points out the **constant increase of the paddy production** over the years mainly for System of Rice Intensification (both in rainy and summer season) and also for farmers' practices in summer season.

It also clearly shows **the impact of the bad weather conditions** of the last rainy season 2007 on the paddy yield. It has been estimated that the **average yield has dropped by 20%** in rainy season 2007 with both traditional farmer practices and System of Rice Intensification practices. In the case of the farmers' practices, average yield of 2.6 t/ha is considered as very low and its impact on landless and very small farmers was very serious. As far as SRI practice is concerned, it is worth saying that it manages to absorb the impact of a bad season by providing higher yields in any conditions. Even if the average yield dropped by 1 t/ha, it was still over 4 t/ha which can be considered as a good yield[10].

From a more general point of view, it has to be mentioned that activities in the field of agriculture extension such as the dissemination of new techniques like System of Rice Intensification (SRI) or Farmer Field Schools highly contribute to an overall increasing of the paddy production at the household level in NRS, which benefits directly to the most vulnerable of them. A survey from 2004[11] has pointed out that the average paddy yield was 2 t/ha in rainy season with a constant yearly increasing of the production of about 4%. In 2008, based on project records and close follow up of agriculture activities, it has been shown that the average paddy yield in rainy season has deeply increased and ranges from 3 to 3.5 tons/ha. This improvement is mostly explained by a better access to means of production (good quality seeds and other inputs) and introduction of improved tested technologies.

Lastly, project data collected about farmers involved in SRI practice have shown a deep impact of such technology on the most vulnerable farmers. Indeed, analysis of project data has highlighted for instance that during the Dry Season 2005-2006, the majority of the farmers involved in SRI FLE activity were landless, and during the rainy season 2006, the majority of the farmers were small and medium farmers (the access to the land during the rainy season is much more difficult for the landless farmers).

As a conclusion and lesson learnt, SRI has proven to be a very efficient technique to increase the paddy production in Northern Rakhine State (over 1 ton/ha in average compare to the traditional farmers' practices). Moreover, such technique has also proven to be replicable according to results over the years and places. As described before, such dissemination and rather quick adoption of the technique by NRS farmers was highly

[10] It is considered that average yield in NRS for rainy season range from 3 to 3.5 t/ha.
[11] undertaken by S. Royer in *local economy of paddy in NRS*, GRET mission report, 2004

related to the specific context of NRS, the level of agriculture intensification (especially in term of labor) and the small land holding situation.

Based on the experience gained through NRS project, GRET is deeply convinced that introduction of SRI in Ayeyarwaddy Delta would be an important tool to support agriculture revitalization after the consequences of Cyclone Nargis. However, it is important to take into consideration that socio-economic, topographic and agronomic context of the two areas are really different. The following part will focus on the specificity of the Delta context, and the strategy designed by GRET to test the introduction of some relevant principles of SRI aiming at improving rice production through decreasing seed rate and plant population density (which prevent outbreak of pests and diseases), improving weed control and soil fertility management.

System of Rice Intensification practice introduction in Ayeyarwaddy Delta (Bogale Township): a first attempt to measure the impact of a new technique on local farmers' practice

Bogale Township (Ayeyarwaddy delta): an ancient rice growing area with traditional rice cropping patterns seriously affected by Cyclone Nargis…

Bogale Township in Ayeyarwaddy delta is a rice growing area where thousands of acres of rainy season rice and summer rice are cultivated. Industry related to rice production booms in the area. In low lying flood prone area, receding rice is cultivated.

Summer rice was introduced in early 1990s and then spread to practically all the rice fields where fresh water is available from the rivers and canals after rainy season till March. Summer rice is cultivated with early maturing modern varieties, mainly Thee Dat Yin, and its grain yield is commonly two times higher than that with rainy season rice cultivated with local high quality rice varieties. Summer rice gives opportunity for farmers to earn high profit in a short time (about 4 months) despite the high investment cost on chemical fertilizers, high seed rate, irrigation, and pesticides. Farmers cultivate summer rice by broadcasting very high seed rate, as high as 5 to 6 basket per acre (about 260 to 310 kg per hectare), in order to suppress weeds growth. Besides, they expect panicles only from main culms rather than from tillers relying upon three time high plant density. They use 2 bags (100 kg) of Urea and 1 bag (50 kg) of TSP in order to achieve their optimum target grain yield of 100 baskets per acre (about 5 MT per hectare). In many case they even use extra 1 bag (50 kg) of Urea to get 120 baskets per acre (6 MT per hectare).

This kind of crop management resulted in creating a microclimate favorable to pest and diseases but not a healthy environment for the crop. High population of rice plants do not exclude the weed population, as they believed and expected, but allow some grass species which can coexist with rice plants to survive and colonize. Finally some farmers tried to use herbicides.

After more than a decade practicing the same crop management, farmers suffer from cumulative effects by outbreak of pests and diseases, weed destruction, soil degradation, and vulnerability to fluctuations of prices of paddy and inputs.

The Cyclone Nargis gave a final blow to weaken farmers in the delta area (beside the lethal effects to the whole population). The situation calls for every assistance to remedy the deteriorated rice production of the rural population in the area. Being aware that the socio-economic context and topographic and agronomic backgrounds of the area is very different from NRS, GRET has decided to introduce some relevant principles of SRI in this area in order to reduce the costs for seed and chemicals, and to improve the resources for rice production such as; good seed and the soil.

Few demonstration plots set up at experienced farmers' level aiming at identifying ways to introduce SRI practices in the framework of existing crop production methods

GRET project in Ayeyarwaddy delta, *Emergency support to revitalization of agriculture and livelihoods for vulnerable rural populations affected by cyclone Nargis*, funded by DFID, has started relatively late, at mid October 2008. General assessments were undertaken both from the cluster meetings and documents available at Yangon and field assessments carried out informally between May and September in Pyapon, Bogale, and

Mawlamyinegyun Townships. Formal assessment was done only in the first week of November 2008 after finishing recruitment of project staff. The understanding of the area was deeply facilitated by the recruitment of locally available experienced young people as agriculture and livestock field staff.
Then, based on the experience learnt from NRS project, GRET decided to introduce some relevant principles of SRI in Ayeyarwaddy delta (Bogale Township) relying on some carefully selected collaborative farmers. As part of the activities implemented by GRET, support to seed growers for high seed production was undertaken from October 2008 till May 2009 at Bogale and Mawlamyinegyun Township level. A total of 104 traditional seed growers were selected in both Townships. Discussions were organized with them about the opportunity to try SRI and set up some demonstration plots. 9 motivated seed growers agreed to collaborate and to test some innovative practices on demonstration plots. It is believed that their interest in testing new practices was genuine and disconnected to any kind of project incentive.

The overall goals of GRET to i**ntroduce SRI were to change some malpractices observed in crop management of rice** (which could help preserving the environment) and to **provide better opportunities in rice production**. The objectives were to **find ways to adopt SRI practices in the framework of existing crop production methods**, to **reduce the costs of rice production** while revitalizing agriculture and to **improve the resources for rice production** such as good seed and soil fertility.

In order to conduct these demonstrations, project has targeted medium farmers with experience and interest in experimenting new practices, motivated to try new methods of cultivation and new tools, involved in seed production activity. Attention was also given to farmers who had planted or planned to cultivate summer rice by line sowing with drum seeder.

SRI practice was tested in 2008-09 summer paddy season. Principles of SRI and its **potential for being complimentary to quality seed production** were discussed with farmers in awareness meetings. Depending on their existing cultivation methods, relevant principles of SRI were selected to be demonstrated. Common practices selected are **early weeding** and **inter-cultivation with weeder** (10 to 15 days after seeding for direct seeded rice, 10 days after transplanted rice) and at 7 days interval, **transplanting young seedlings** (<20 days after seeding), **shallow transplanting**, **few seedlings per hill**. Chemical fertilizer (Urea) was provided at 1 bag per acre basis. Spraying for insects and diseases was advised to be done with consent of project staff and Certified Pesticide Applicators (trained and supported by GRET). Grain yield and yield component have been recorded according to the instruction given to the participants by the project.

List of Farmers Participants, locations, plot size, and method of cultivation

Sr. No.	Tsp.	VT	Village	Farmer's Name	Plot size (acre)	Date of seeding	Method of cultivating
1	BGL	Malawt	Mayan Kwe	U Myint Zaw	0.33	14/12/2008	Transplanted, 9" x 9"
2	BGL	Magu	Pe Chaung Lay	U Myint Oo	0.25	31/12/2008	Direct seeding by hand in 9" x 9" pits
3	BGL	Aye Ywar	Pe Chaung	U Kyaw Oo	0.50	3/1/2009	Direct seeding by drum seeder, 8" rows
4	BGL	Aye Ywar	Auk Magyi	U Thet Tin Oo	1.00	8/1/2009	Direct seeding by drum seeder, 8" rows
5	BGL	Aye Ywar	Kanyin-1	U Khin Mg Myint	0.75	10/1/2009	Direct seeding by drum seeder, 8" rows
6	BGL	Aye Ywar	Kanyin-2	U Hla Tun	0.80	6/1/2009	Direct seeding by drum seeder, 8" rows
7	BGL	Aye Ywar	Kanyin-3	U Tun Win Latt	0.75	7/1/2009	Direct seeding by drum seeder, 8" rows
8	BGL	Aye Ywar	KunTheeChaung	U Aung Kyi	0.80	9/1/2009	Direct seeding by drum seeder, 8" rows
9	BGL	Aye Ywar	KyeePin Su	U Than Myint	0.50	29/12/2008	Direct seeding by hand in 6" x 6" pits
Total area of demonstration plots					**5.68**		

Beside technical guidance, GRET has supported each participant with provision of one rotary weeder, 1 bag (50 kg) of Urea, cash for transplanting cost (10,000 kyats) weeding cost (10,000 kyats to pay 4 man days of labor for working with weeder), and 100 ml of pesticide Decis.

One drum seeder was provided by a U Kyaw Oo, one of the participants. The seeder was shared by 6 participants including him. Use of the seeder was taught to the other farmers by him. He started to use 2 kinds of drum seeder for more than 3 years.

Monitoring visits to the demonstration plots were done only 3 times by the project staff along the growing period due to important workload. First time was at the time of seeding or transplanting, or within 10 days after seeding. Second time was within 30 to 50 days after seeding. Third time was at harvesting.

Main results of the demonstration plots

Farmer's Name	*Method of cultivating*	*Demo yield (basket / acre)*	*Farmer plots Yield (basket / acre)*	*Seed rate used for demo plot (basket/acre)*	*Important features of the plots during the growing season*
U Myint Zaw	Transplanted 9" x 9"	105	85	1.5	- No nursery, have to pull seedlings from already broadcasted plot, seedling age reached 25 days. - Average number of seedlings per hill was 2. - Initial growth of the plants was slow due to poor seedlings. After 3 weeding, tillers per hill reached 20 (25 days after transplanting, 50 days after seeding). Only few weed grew. - At flowering bacterial blight and brown leaf spots were observed.
U Myint Oo	Direct seeding by hand in 9" x 9" pits	92	75	2	- Number of seed per pit was high, number of plants germinated in a pit were 5 to 10. - At 56 days after seeding, tillers per hill reached 25. - No weed between rows. But weed growing inside the hills were difficult to remove. - At flowering time, weed within hills were seen flowering too.
U Kyaw Oo	Direct seeding by drum seeder, 8" rows	74	62	2.5	- Weeding was first done 10 days after seeding. 4 weeding were done until 40 days after seeding. - Number of plants in the rows was still high. Plants were removed to reduce number of plants. - Weeds were controlled between rows. But weeds within rows were hard to remove. - Flowering started at 70 days after seeding. - Weeds within rows were also blooming. - Rice ear bugs were observed after flowering.
U Thet Tin Oo	Direct seeding by drum seeder, 8" rows	72	60	2.5	- At 48 days after seeding, plot was seen with too high density of plants within rows. - Plants were growing well despite high density. - Surrounding plots were infested by root nematode. Plants in SRI plot had stronger growth and few infestation of nematode.
U Khin Mg Myint	Direct seeding by drum seeder, 8" rows	72	60	2.5	- Plot was too dry because of no irrigation for a week at 46 days after seeding. - Weeding was done only 2 times. Plant density was high in the rows.
U Hla Tun	Direct seeding by drum seeder, 8" rows	70	60	1.875	- At 50 days after seeding, plant density was closed to desirable number. - Root growth was good compared to neighboring plots. - Difference in root nematode infestation was observed.
U Tun Win Latt	Direct seeding by drum seeder, 8" rows	63	60	2.0	- Seeding by seeder was very poor due to lack of experience. Strips covered by the seeder were overlapped making too close rows of plants. - Weeding was not done by rotary weeder. - Plant growth was poor at 47 days after seeding.
U Aung	Direct	80	70	1.875	Plant growth at 49 days after seeding was good.

Kyi	seeding by drum seeder, 8" rows				
U Than Myint	Direct seeding by hand, 6"x 6" pits	70	55	3	Too many plants per hill.
Average		**77.5**	**65.2**	**2.2**	

In addition to demonstration plot grain yield data, records on yield component were also collected from a plot where direct seeding by hand in 9" x 9" pit was practiced. The results are stated below:

Average Number of productive tillers per hill = 24.14
Average Number of filled grain per panicle = 45.3
Harvested grain yield per acre = 92 basket/acre

Brief analysis of the results and some lessons learnt as a conclusion….

- In general, it was found that **SRI practices did not show inferior performance** than conventional practices in all demonstration plots. Superior grain yield, even if not that impressive, allowed insuring a good promotion of the innovative methods.
- Seed rates in all demonstration plots were significantly lower than that of conventional broadcasted method (average of 2.2 baskets / acre in demonstration plots while farmers usually use 6 baskets / acre in summer rice). **Lower seed rate** used was found **very attractive** by most of farmers, especially taking into consideration that price of seed at the cultivation season are usually high.
- **Transplanted SRI plot** was transplanted with seedlings pulled out from a 25 days old plot cultivated with seed broadcasting method. Seedlings were pulled from the more densely populated spots. Since the plot was not soft enough to pull seedling, roots of some of the seedlings were damaged. Early growth of the plants was so poor that intensive care was given to compensate the defects. The square spacing of the plants and rows allows weeding in two directions that also allow proper killing of weeds. **Fair grain yield with incredibly very low rate of seed** seems to be required, both the farmer and GRET have been convinced that **transplanted SRI is feasible, but labor intensive**.
- **Direct seeding by hand** in square spacing pits seemed to allow weeding in two directions. But the farmers were not feeling safe with sparse plant density and low seed rate in summer rice. They used excess number of seed to drop in the pits. It seems good for them by seeing the plot fully green with young plants. One farmer even used closed spacing, 6" x 6", to enjoy their experience with high plant density. They eventually learnt that they have underestimated the **exponential growth of the plants at tillering stage**. Weeds grown within the hills were found difficult to remove.
- Demonstration plots seeded by **drum seeder** revealed that the method is **applicable without failure in crop establishment**. Farmers were convinced that they have to learn more about such drum seeder management. Use of high seed rate and way to handle the tools were the most common malpractices found.

The table below summarizes the main findings from the different demonstration plots. It has to be mentioned that it relies only on 9 small plots but was meant to experiment and assess the feasibility of initiating a proper dissemination of SRI practices in the Ayeyarwaddy Delta area.

Lastly, it is worth adding that an exchange visit has been organized in March 2009 between farmers involved in GRET activities (for SRI demonstration) and farmers involved in SRI Farmer Field Schools organized by Welt Hunger Hilfe. Direct seeding practice was highly appreciated by farmers.

	Transplanting method	Direct seeding by hand	Direct seeding with drum seeder
Average grain yield	105 baskets / acre	81 baskets / acre	72 baskets / acre
Average seed rate	1.5 basket / acre	2.5 baskets / acre	2.2 baskets / acre
Main observations / findings	Very low seed rate needed	Farmers rely on high plant population density	Seed rate can be highly reduced
	Allows 2 directions weeding with mechanical weeder	Difficult to control weed population	Spacing is important for better weed control
	Labor intensive method	Farmers underestimate exponential growth of the plants at tillering stage	Drum seeder is a proper way to establish crop
Lesson learnt / practice improvement needed	Nursery management and seedling age control need to be improved	Decreasing of seed rate and better weed control highly needed	Drum seeder management and design improvement are needed

As a conclusion, GRET is of the opinion that the **introduction of relevant practices of SRI in the Ayeyarwaddy Delta has a lot of potential.** It implies to rely on **some adaptive strategies rather than focusing on all the SRI principles**.

Indeed, as already mentioned above, such practice being **labor and care intensive**, it may not be suitable for everyone but could be adapted to fit according to the local practices. Introduction of some selected SRI principles would lead to some deep practice changes and better crop management. It concerns mostly s**eed rate, pest and diseases as well as weed control, fertility management**... Such improvement would decrease the paddy production cost for the farmers, increase their yield and contribute at improving their food security and livelihoods.

In the meantime, it worth mentioning that application of **full SRI principles** would be highly recommended and suitable for **selection (purification) and multiplication of good quality seeds**. Indeed, SRI has already proven to be an efficient tool in **participatory plant breeding and seed multiplication**.

Thus, main improvements to be undertaken and where SRI practice would be very efficient are

- **Nursery management** for **transplanted SRI**,
- Improvement of **drum seeder** to properly manage **seed rate** and **spacing** for **direct seeded SRI**,
- Better **weed control** with proper spacing and line seeding along with use of **iron rotary weeder**
- Application of **full SRI principles** for good **quality seed purification** and **multiplication**

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