VIETNAM NATIONAL IPM PROGRAM

Plant Protection Sub Department (PPSD), Ha Tay Province

REPORT

Demonstration and dissemination of community-based SRI utilization model in Ha Tay Province, Vietnam, 2007

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Grant Summary

The project aims at demonstrating and disseminating community-based application of SRI methods with the participation of local authorities, farmers, women and youth unions, and the farming community. A Field Demonstration Day at the end of the season was assisted by the farmers in the field to report results and to introduce the implementation process.

Implementing agency

Plant Protection Sub Department (PPSD), Ha Tay Province

Implementing site:

Dai Nghia Commune, My Duc District

Background information

Vietnam has been implementing the Integrated Pest Management (IPM) programme since 1992 in order to solve pest problems and problems related to overuse of pesticides due to the lack of farmers' knowledge in managing crops and agroecosystems. The main purpose of the IPM Programme is to improve farmers' decision-making capacities by enhancing their knowledge and skills to secure more effective production conducive to human health and environment protection.

The IPM Programme is conducted with the Ministry of Agriculture and Rural Development (MARD) and its Plant Protection Department (PPD) as the management and implementation agencies, respectively. During implementation, PPD has been receiving direct support from many entities including a variety of FAO-funded IPM programmes (for rice, vegetable, cotton), the IPM component of the Agriculture Sector Programme Support (ASPS), the Biodiversity Use and Conservation in Asia Programme (BUCAP), and some other NGOs.

IPM includes the four following principles: a) grow a healthy crop, through applying certain appropriate treatments that include using a good variety, suitable transplanting timing and density, balanced fertilizer application, prompt care for resistance against pest and unfavorable conditions of rice plants, b) conserve natural enemies, being aware of and protecting natural enemies in the field, c) conduct regular field observations to learn about the ongoing field status for timely actions, and d) farmers become experts -- based on the knowledge and skills the acquire, farmers become the core force to support the whole community.

The Farmer Field School (FFS) is the foundation for and the first step in developing of knowledge and skills of farmers. The training course equips farmers with basic and thorough knowledge and skills for raising for each designated crop. It is a firm foundation for the farmers to self-study and to learn more about their household production and to work out the improvements to be done. Meanwhile, the school enables farmers to increase their cooperation with each other that in turn sets a good basis for establishing an interest group later. Thanks to the received knowledge and skills, farmers become more confident and willing to contribute their ideas to local authorities in production recommendations as well as to develop the sustainable agricultural development strategy.

Following the FFS experience, farmers actively participate in many activities to maintain a sustainable programme in their hamlet. The most popular activities include field studies (resistant-variety selection, variety rehabilitation, transplanting density, fertilizer volume, community management of rats and golden snails, farmer-led training for farmers, etc.). The IPM Club is an organization established by farmers with permission by the local authority. The clubs which have been maintained in many areas are a forum for farmers to share experiences and to support each other in production as well as to tackle other issues related to community development.

For the rice production in Vietnam in general, and in the Northern delta in particular, there is an existing problem of overuse of chemical fertilizer (especially nitrogen) and of seed. High applications of nitrogen and high transplanting density have become major reasons for the rice crop's vulnerability to pests, resulting in decreased yield, les economic efficiency, and deteriorating environmental quality. Overuse of chemicals (fertilizer, pesticide, etc.) will pollute the environment, affecting the environment's health. In order to solve this situation, since 2003 the National IPM Programme has been introducing the *System of Rice Intensification (SRI)* to IPM farmers for experimentation. Based on SRI principles, IPM trainers and IPM farmer groups together studied and developed the training procedures for farmers to apply SRI.

In 2005, SRI was applied on a larger scale, ranging 2-5 ha for each site in 14 provinces across the country. In 2006, SRI was applied in 17 provinces with the participation of 3,450 farmers (*see attached annex*). The results showed that due to SRI application, seed volume can be reduced by 70 or 90% in comparison to conventional farmers' practice with some increase in yield. The volume of nitrogen applied has been reduced by 20-25%, with average yield increased by 9-15%. The healthier crop leads to better resistance against pests and diseases, and to a significant reduction of pesticide use in the field. The profit from SRI-applied fields has been increased on average by more than 2 million VND/ha, while the cost of paddy production per kilogram has been reduced from 520 VND to 342 VND, a one-third reduction. Moreover, farmers can save around one-third of the volume of irrigation water that they previously applied. The results of SRI application have showed that this technical system plays an important role in the sustainable development of irrigated rice cultivation. SRI should be disseminated further and widely, allowing many more farmers to benefit from this new technology.

Goal and Objectives

The project aims at demonstrating and disseminating community-based SRI application with the participation of local authorities, men and women farmers, women and youth unions, and the farming community in general. A Field Day at the end of the season, held in the field and assisted by farmers, to report results and to introduce the implementation process has been a key event.

Objectives: The ***Community-Based SRI Application Model*** is designed to disseminate knowledge of the effectiveness and necessity of SRI application for sustainable irrigated rice cultivation in the northern provinces, as well as to prove the value of farmers' role in study work to develop science and to improve farming practices in local areas, thereby reaching the overall goal of ***increasing the support from different agencies of all levels to scale up SRI application.*** Specific objectives as the following: a) demonstrate the effectiveness of SRI principles in wet rice cultivation, b) introduce the methods to organize community-based SRI application, and c) show SRI effectiveness and farmers' role to local authorities for their valuable support.

This report consists three parts:

- Report on a field demonstration day
- Technical report on community-based SRI utilization model in Dai Nghia Commune in summer cropping season 2007.
- Financial report.

NOTE: The draft report made to Oxfam America for the 2008 cropping system [System of Rice Intensification -- Advancing Small Farmers in Mekong Region (VIE 034/07)] reported that in Ha Tay Province in the following year (2008), there were 33,000 hectares of SRI use, by 95,000 farmers. Since average farm size is about 0.4 ha, this indicates that these farmers were using SRI methods on almost their whole rice-growing area.

This confirms the effectiveness of the methods reported here. It does not mean that they cannot be improved upon; they can be and will be improved upon as experience is gained. But we are seeing that this community-based utilization model can, with trained and motivated staff and with well-organized and well-motivated farmers, be quite successful in spreading knowledge about and practice of the System of Rice Intensification.

A. TECHNICAL REPORT ON COMMUNITY–BASED SRI UTILIZATION MODEL IN DAI NGHIA COMMUNE IN SUMMER CROPPING SEASON 2007

With the financial support by Oxfam America, Ha Tay PPSD cooperated with Dai Nghia cooperative to carry out the model of community-based SRI utilization in summer cropping season 2007. The model had the involvement of over 1,000 farmers, mass organizations (Farmers Union, Women's Union, Youth Union) with strong support from local authorities and the cooperative. The model proved to be fruitful.

I – Objectives and requirements

1 – Objectives:

- To raise the awareness of technicians and farmers about the relations between transplanting rates, young seedling transplanting, and necessary water regulation and major pests as well as impact on rice yield in order to change the direction in rice production.
- To introduce the effectiveness of SRI in sustainable farming of irrigated rice, and to prove the value of farmers' role in participation in study, development and improvement of community production in order to enhance the support from different agencies and sectors for SRI expansion.
- To demonstrate the large-scale utilization of SRI on 180 ha with over 1,000 farmers involved.

2 - Requirements

- To transplant young seedlings at the stage of 1.5 – 3.5 leaves
- To transplant 1 seedling/hill
- To regulate water applications: drain the field to dry and aerate the soil intermittently during the vegetative stage; keep water level low (3-5cm) during reproductive stage; and dry out the field again when the rice is f_rm ripe.

II – Time and location

1. **Time:** summer-autumn cropping season 2007
2. **Location**: Dai Nghia agro-cooperative, Dai Nghia town, My Duc district, Ha Tay province.

III – Field arrangements

1. Field study: 6 field studies were carried out on an area of 10,000 m^2. Each study had five treatments, without repetitions. Each treatment was conducted in 240 m^2.

- Study 1: Learning about transplanting rates (implemented twice), with evaluation of five. Rate I: 11 hills/ m^2 (30cm x 30cm), Rate II: 16 hills/ m^2 (25cm x 25 cm), Rate III: 25 hills/ m^2 (20 cm x 20 cm); Rate IV: 34 hills/ m^2 (17 cm x 17 cm); Rate V: farmers' traditional transplanting 45 hills/ m^2 (15.5 cm x 14 cm).

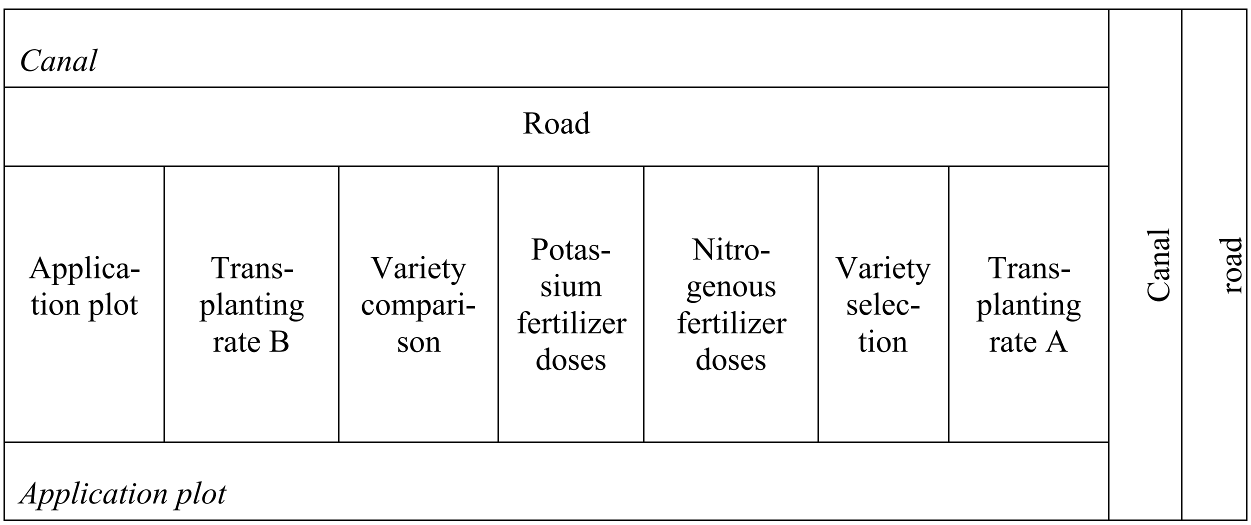
- Study 2: Selecting farmers' favorite varieties to create materials for multiplication in the following crop season.

- Study 3: Learning about the influence of nitrogenous fertilizer doses: Dose I: 0 kg N/ha; Dose II: 25.5 kg N/ha; Dose III: 51.1 kg N/ha; Dose IV: 76.6 kg N/ha; Dose V: 102.2 kg N/ha.

-**Study 4**: Learning about the influence of potassium fertilizer doses: Dose I: 0 kg K_2O/ha; Dose II: 28 K_2O/ha; Dose III: 56 K_2O/ha; Dose IV: 83 K_2O/ha; Dose V: 111 K_2O/ha.

- Study 5: Comparing 5 varieties being and to be used from various localities: Variety I: TB 21; Variety II: Khang Dan 18; Variety III: DB5; Variety IV: Nghi Huong 2308; Variety V: N46.

*** Diagram of Experiment Field**



*** Experiment conditions.**

- Experiment field was arranged on medium-lying land.
- Sowing date: 4th June 2007
- Transplanting date: 10th June 2007
- Seedling age: 1.5 leaves
- Remove seedlings from nursery and transplant them shallow on the same day.

2. Application plots: All the rice area of the cooperative (178 ha) was applied with SRI and local varieties were used.

- Sowing date: 4th June 2007
- Transplanting date: 12th – 16th June 2007
- Seedling age: 2 - 3.5 leaves
- Remove and transplant seedlings shallowly on the same day.

3. Fertilizer use:

The use of fertilizers was improved. Amount and type of fertilizers were decided by the study group on the basis of farmers' investigation, discussion and procedure formulation.

Table 1: Amount and type of fertilizers used

Type	Experiment plot	Application plot	Traditional plot
Animal manure (quintal/ha)	55	-	-
Nitrogenous fertilizer (kg N/ ha)	51	42.2	89.4
Potassium (kg K_2O/ha)	69.4	58.0	69.4
Phosphorous fertilizer (kg P_2O_5/ha)	-	26.7	44.5
NPK (kg/ha)	-	149.8	-

Table 2: Amount and type of fertilizers used in nitrogenous fertilizer experiment

Type	I	II	III	IV	V
Animal manure (quintal/ha)	55	55	55	55	55
Nitrogenous fertilizer (kg N/ ha)	0	25.5	51.1	76.6	102.2
Potassium (kg K_2O/ha)	69.4	69.4	69.4	69.4	69.4

Table 3: Amount and type of fertilizers used in potassium experiment

Type	I	II	III	IV	V
Animal manure (quintal/ha)	55	55	55	55	55
Nitrogenous fertilizer (kg N/ ha)	51.1	51.1	51.1	51.1	51.1
Potassium (kg K_2O/ha)	0	27.7	55.5	83.3	111.1

Table 4: Fertilizer use (%)

Type	Application method	Experiment plot		Application plot		Traditional plot	
		Application time (days after transplant)	**(%)**	**Application time** (days after transplant)	**(%)**	**Application time** (days after transplant)	**(%)**
Animal manure	Basal dressing	Before transplanting	**100**	**-**	**-**	**-**	**-**
NPK	Basal dressing	-	**-**	Before transplanting	**100**	**-**	**-**
Phosphorous fertilizer	Basal dressing	**-**	**-**	Before transplanting	**100**	Before transplanting	**100**
Nitrogenous fertilizer	Basal dressing	Before transplanting	25	Before transplanting	25	Before transplanting	50
	Side dressing 1	6	50	6	50	15	50
	Side dressing 2	39	25	39	25		
	Total		**100**		**100**		**100**
Potassium	Side dressing 1	6	40	6	40	-	-
	Side dressing 2	39	60	39	60	45	100
	Total		**100**		**100**		**100**

4. Water regulation -- for experimental and application plots

Water was mainly regulated during the vegetative stage. The plots were dried out for the first time from the tillering stage until the panicle initiation stage. The lots were let dried up intermittently for 26 days. This could save 2-3 times of irrigation supply in comparison with the number of times with traditional farming (3-4 times of irrigation during this period). This experiment is of significance to the local irrigated rice farming as well as for water saving. Normally the water level was maintained in the fields during panicle initiation and flowering stages. They were dried out only before ripening until harvest.

5. Monitoring indicators and methods

a. Experimental plots:

**** Indicators***:

- Amount of fertilizers and application methods for each experiment.
- Weather: weather factors such as temperature, rainfall, sunny hours, and humidity during the whole cropping season.
- Growth indicators measured:

+ Number of actual hills/m^2.

+ Maximum number of tillers/hill.

$$\text{+ Percentage of productive panicles } \% = \frac{\text{No. of panicles/hill}}{\text{Maximum no. of tillers/hill}} \times 100$$

- Major pests and natural enemies:
  + Time of outbreak and peak
  + Density: number of pests/m^2, percentage (%) of damage.
  + Percentage of area affected by diseases (%).

- Yield:
  + Number of panicles/m^2, number of grains/panicle, number of full grains/panicle, percentage of empty grains.
  + Sampled yield (quintals/ha) – calculated as described below.

**** Monitoring time and methods:***

- Monitoring time: every 7 days
- Monitoring methods:

+ Fertilizers and farming measures: keeping field records

+ Major pests and natural enemies, and rodents: in each plot, investigating three equidistant points, each point was 5 rows from the inside protection row. At each point, investigating 10 hills, counting all the pests, major natural enemies, withered tillers, tillers affected by rodents, and all the tillers in 10 hills.

+ Diseases: in each plot, investigating three points, observing stems, leaves and panicles (for such diseases as sheath blight, leaf blight, bacterial disease, and at each point, investigating number of tillers in the next 5 hills.

+ Tillering: in each plot, investigating three fixed points. At each point, investigating five consecutive hills.

+ Number of panicles/hill: in each plot, investigating three equidistant points. At each point, investigating 10 consecutive hills.

+ Yield factors: in each plot, investigating three equidistant points. At each point, investigating 5 consecutive hills to count total number of grains/panicle and percentage of empty grains.

+ Sampled yield: in each plot, harvesting a representative 3 m^2, harvesting all the hills in the designated square/rectangle that is 3 m^2 in area. Drying, cleaning and weighing the harvested rice, and converting the weight to quintals/ha.

b. Application and traditional plots:

**** Indicators***:

- Amount of fertilizers and application methods for each experiment.

- Growth indicators measured:
  + Number of actual hills/m^2.
  + Number of tillers/hill.
  + Age of seedlings used.
- Major pests and natural enemies:
  + Time of outbreak and peak
  + Density: number of pests/m^2
  + Damage percentage (%).
- Yield:
  + Factors: number of panicles/m^2, number of grains/panicle, number of full grains/panicle, and percentage of empty grains.
  + Sampled yield (quintal/ha).

**** Monitoring time and methods:***

- Monitoring time: same main stages
- Monitoring methods:
  + Fertilizers and farming measures: keeping field records.
  + Major pests and natural enemies, and rodents: in each plot, investigating three equidistant points, each point was 5 rows from the inside protection row. At each point, investigating 10 hills, counting all the pests, major natural enemies, withered tillers, tillers affected by rodents, and all the tillers in 10 hills.
  + Diseases: in each plot, investigating three points, observing stems, leaves and panicles, for such diseases as sheath blight, leaf blight, bacterial disease. At each point, investigating number of tillers in the next 5 hills.
  + Number of panicles/hill: in each plot, investigating three equidistant points. At each point, investigating 10 consecutive hills.
  + Yield factors: in each plot, investigating three equidistant points. At each point, investigating 5 consecutive hills to count total number of grains/panicle and percentage of empty grains.
  + Sampled yield: in each plot, harvesting 3 m^2, harvesting all the hills in the designated square/rectangle that is 3 m^2 in area. Drying, cleaning and weighing the harvested rice, and converting the weight to quintals/ha.

IV. Experiment results

The study in summer-autumn crop season in Dai Nghia agro-cooperative had the following results. Note that two parallel sets of evaluations were done on different kinds of soil, designated here **A** and **B**, which could give a better idea of the range of possible results with SRI methods.

1. Results from experimental plots

TRANSPLANTING RATE EXPERIMENTS

Table 1: Tillering process (tillers/hill)

Investi-gation dates	**I (11 tillers/m^2)**		**II (16 tillers/m^2)**		**III (25 tillers/m^2)**		**IV (34 tillers/m^2)**		**V (45 tillers/m^2)**	
	A	**B**	**A**	**B**	**A**	**B**	**A**	**B**	**A**	**B**
18/6	1.3	1.3	1.3	1.3	1.6	1.5	1.1	1.4	1.2	1.2
26/6	4.1	4.1	4.1	3.7	4.4	4.5	4.1	4.4	4.0	6.5
2/7	10.9	7.0	9.2	9.0	7.6	8.4	7.7	8.3	7.2	8.4
9/7	11.8	12.2	12.8	13.6	10.6	11.4	9.2	10.8	8.4	10.8
16/7	17.1	24.5	**16.2**	21.8	**12.7**	15.8	**10.3**	14.2	**8.7**	12.6
23/7	22.7	30	15.5	**24.2**	11.1	**17.6**	9.7	**14.9**	8.5	**14.6**
30/7	**22.8**	**31.8**	14.6	24.1	11.5	16.6	8.7	14.6	8.5	14.4
No. of panicles/hill	**15.4**	**17.6**	8.8	13.9	7.1	9.3	6.7	8.3	5.6	6.8
Percent of productive tillers (%)	**67.5**	53.3	54.3	57.4	55.9	52.8	65.0	55.7	64.4	46.6

Remarks: Low rate of transplanting (11 hills/m^2) results in longer tillering period, the most tillers/hill (22.8 in experiment A, and 31.8 in experiment B), and the most panicles/hill (15.4 in experiment A, and 17.6 in experiment B).

Table 2: Sheath blight prevalence (%)

Investi-gation dates	**I (11 tillers/m^2)**				**II (16 tillers/m^2)**				**III (25 tillers/m^2)**				**IV (34 tillers/m^2)**				**V (45 tillers/m^2)**			
	A		**B**		**A**		**B**		**A**		**B**		**A**		**B**		**A**		**B**	
	Dis-ease Ratio	Dis-ease Indx	Dis-ease Ratio	Dis-ease Indx	Dis-ease Ratio	Dis-ease Indx	Dis-ease Ratio	Dis-ease Indx	Dis-ease Ratio	Dis-ease Indx	Dis-ease Ratio	Dis-ease Indx	Dis-ease Ratio	Dis-ease Indx	Dis-ease Ratio	Dis-ease Indx	Dis-ease Ratio	Dis-ease Indx	Dis-ease Ratio	Di ea In
30/7													2.5	0.4	1.5	0.4	2.8	0.9	2.1	0.5
6/8									1.7	0.3	1.1	0.2	3.4	1.7	3.5	1.2	5.7	2.1	4.5	1.5
13/8	3.5	0.6	2.4	0.3	3.9	0.8	2.9	0.4	5.2	1.5	3.3	0.9	9.7	3.8	7.1	2.8	12.8	4.2	9.8	3.1
20/8	7.4	2.6	4.7	0.8	8.9	3.1	5.8	1.2	11.7	4.5	6.5	2.1	20	5.7	11.0	4.3	27.4	8.3	18.1	6.5
27/8	9.5	5.2	8.6	2.3	12.5	6.2	10.7	3.1	20.5	7.2	12.3	3.9	3.8	10.2	18.3	6.9	45.3	15.9	30.5	11
3/8	17.3	8.1	15.3	4.1	23.4	10.2	18.5	5.9	31.2	11.9	20.9	7.1	56.1	16.4	29.4	9.5	69.6	21.4	45.3	17

Remark: The higher rate the transplanting, the earlier sheath blight appears, and the more seriously it damages the crop.

Table 3: Yield factors and sampled yield

Indicators	I (11 tillers/m²)		II (16 tillers/m²)		III (25 tillers/m²)		IV (34 tillers/m²)		V (45 tillers/m²)	
	A	**B**	**A**	**B**	**A**	**B**	**A**	**B**	**A**	**B**
No. of hills/m^2	11	11	16	16	25	25	34	34	45	45
No. of panicles/hill	15.4	17.6	10.8	13.9	7.6	9.3	6.7	8.3	5.6	6.8
No. of grains/panicle	222.3	185.4	201.0	155.5	168.6	160.1	114.8	124.7	100.1	100.9
No. of full grains/panicle	205	171.2	184.3	145.4	157.4	148.0	102.6	111.9	86.9	87.9
No. of full grains/m^2	34,727	33,144	31,847	32,337	29,906	34,410	23,272	31,578	2,898	26,897
Percentage of empty grains	7.3	7.7	8.3	6.5	6.7	7.6	10.6	10.3	13.2	12.9
Sampled yield (quintals/ha)	76.4	72.9	70.1	71.1	65.8	75.7	51.4	69.5	48.2	59.2

Table 4: Economic analysis of the experiment field (1000 VND/ha)

Indicators	I (11 tillers/m²)		II (16 tillers/m²)		III (25 tillers/m²)		IV (34 tillers/m²)		V (45 tillers/m²)	
	A	B	A	B	A	B	A	B	A	B
Separate expenses	1,711	1,711	1,711	1,711	2,019	2,019	2,476	2,476	2,694	2,694
- Nitrogenous fertilizer	550	550	550	550	550	550	550	550	550	550
- Seed	50	50	50	50	80	80	120	120	200	200
- Seedling preparation	4167	4167	4167	4167	556	556	833	833	833	833
- Transplanting	694	694	694	694	833	833	972	972	1,111	1,111
Shared expenses	3,695	3,695	3,695	3,695	3,695	3,695	3,695	3,695	3,695	3,695
Total expenses	5,406	5,406	5,406	5,406	5,713	5,713	6,170	6,170	6,389	6,389
Total revenue	26,748	25,515	24,535	24,885	23,030	26,495	17,990	24,325	16,870	20,720
Profit	21,342	20,109	19,129	19,479	17,317	20,782	11,820	18,155	10,481	14,331
Production cost (1000 VND/ quintal)	70.8	74.2	77.1	76.0	86.8	75.5	120	88.8	132.5	107.9

Remark: **Lower rate of transplanting (11-25 tiller/m²) results in higher economic returns and lower production costs.**

NITROGENOUS FERTILIZER EXPERIMENTS

Table 1: Tillering process (tillers/hill)

Investi-gation dates	**I** 0 N	**II** 22.5 N	**III** 51 N	**IV** 77 N	**V** 102 N
18/6	1	1	1.1	1.3	1.4
26/6	3.3	3	3.7	4.3	4.3
2/7	5.7	5.7	7	7	7.6
9/7	8.4	8	9	10.2	10
16/7	11.5	11	11	11.6	11.7
23/7	**11.2**	**12**	**12.1**	**13**	**13.3**
30/7	10	12	10.4	11	12
No. of panicles/hill	**7.2**	7.5	7.8	**8.0**	7.2
Percentage of productive panicles (%)	**64.3**	62.5	64.5	61.5	54.1

Remark: The more fertilizer applied, the better tillering (102.2 kg N/ha resulted in 13.3 tillers/hill), but 76.6 kg N/ha resulted in the most panicles (8 panicles/hill). Note that **zero nitrogen** resulted in as many panicles achieved with 102.2 g N/ha.

Table 2: Sheath blight prevalence (%)

Investi-gation dates	**I** 0 N		**II** 22.5 N		**III** 51 N		**IV** 77 N		**V** 102 N	
	Dis-ease ratio	**CSB**	**Dis-ease ratio**	Dis-ease index	**Dis-ease ratio**	Dis-ease index	**Dis-ease ratio**	Dis-ease index	**Dis-ease ratio**	Dis-ease index
30/7							3.6	0.7	5.8	1.1
6/8	1.9	0.5	2.8	0.9	3.5	1.2	9.2	1.8	11.5	3.2
13/8	4.7	1.2	6.1	1.8	9.3	2.1	15.6	3.8	20.0	5.2
20/8	9.2	2.5	15.2	3.9	18.7	4.5	25.4	6.5	27.5	8.3
27/8	14.3	4.0	23.5	5.6	30.5	7.0	40.5	10.3	49.3	14.6
3/9	22.5	6.7	31.3	8.7	45.0	10.2	60.8	15.9	71.6	17.1

Remarks: The more nitrogenous fertilizer applied, the earlier does sheath blight appear, and the more seriously it damages the crop.

Table 3: Yield factors and sampled yield

Indicators	I 0 N	II 22.5 N	III 51 N	IV 77 N	V 102 N
No. of tillers/m^2	25	25	25	25	25
No. of panicles/hill	7.2	7.5	7.8	8.0	7.2
No. of grains/panicle	131.4	167	169.3	171.6	158.3
No. of full grains/panicle	117.5	147	149.6	144	130.3
No. of full grains/m^2	21,150	27,562	29,172	28,800	23,454
Percentage of empty grains	10.6	10.9	11.6	16.1	17.7
Sampled yield (quintals/ha)	46.5	59.8	64.2	63.4	51.6

Remarks: 51 kg N/ha results in the most full grains/m^2 and the highest yield. This is only an agronomic comparison; see following benefit-cost comparison.

Table 4: Economic analysis for the experimental field (1000 VND/ha)

Indicators	I 0 N	II 22.5 N	III 51 N	IV 77 N	V 102 N
Separate expenses		277	550	831	1,108
- Nitrogenous fertilizer		277	550	831	1,108
Shared expenses	5,163	5,163	5,163	5,163	5,163
Total expenses	5,163	5,440	5,713	5,994	6,271
Total revenue	16,275	20,930	22,470	22,190	18,060
Profit	11,111	15,489	**16,756**	16,195	11,788
Production cost (1000 VND/quintal)	111.0	91.0	**89.0**	94.5	121.5

Remarks: 51 kg N/ha resulted in the highest economic return and lowest production cost.

POTASSIUM EXPERIMENTS

Table 1: Tillering process (tiller/hill)

Investi-gation dates	**I** 0 K_2O	**II** 28 K_2O	**III** 56 K_2O	**IV** 84 K_2O	**V** 111 K_2O
18/6	1.1	1.1	1.3	1.2	1.4
26/6	3	3	4.4	4.2	4.4
2/7	5.3	7	7.6	7.7	8
9/7	7.4	9.2	9.6	10.6	9.9
16/7	12	15.5	12.8	15.4	12.6
23/7	**12.8**	**16.4**	**13.1**	**15.5**	**13.8**
30/7	11.8	15.4	12.7	14.6	13.6
No. of panicles/hill	7.0	7.6	8.0	**8.5**	8.2
Percentage of productive panicles (%)	57.7	46.3	61.0	54.8	59.4

Table 2: Sheath blight prevalence (%)

Investi-gation dates	I 0 K_2O		II 28 K_2O		III 56 K_2O		IV 84 K_2O		V 111 K_2O	
	Dis-ease ratio	Dis-ease index	Dis-ease ratio	Dis-ease index	Dis-ease ratio	Dis-ease index	Dis-ease ratio	Dis-ease index	Dis-ease ratio	Dis-ease index
30/7									4.2	1.1
6/8							3.5	0.8	10.1	2.3
13/8	1.5	0.4	3.2	0.9	4.5	1.2	8.5	1.7	18.2	4.5
20/8	4.5	1.5	7.2	2.1	14.3	3.5	15.2	3.9	38.5	8.5
27/8	11.0	3.8	15.5	4.5	22.5	6.7	29.3	7.5	55.8	14.9
3/9	18.5	6.3	23.5	8.4	32.0	10.7	42.2	15.3	80.1	20.4

Remarks: The more potassium (84-111 kg K_2O/ha) was applied, the earlier did sheath blight appear, and the more seriously it damaged the crop.

Table 3: Yield factors and sampled yield

Indicators	I 0 K_2O	II 28 K_2O	III 56 K_2O	IV 84 K_2O	V 111 K_2O
No. of hills/m^2	25	25	25	25	25
No. of panicles/hill	**<u>7.0</u>**	7.6	8.0	**<u>8.5</u>**	8.2
No. of grains/panicle	142	157	160	153	144
No. of full grains/panicle	115	138	145	131	119
No. of full grains/m^2	20,125	26,220	29,000	27,837	24,395
Percentage of empty grains	19	12.5	9.4	14.4	17.4
Sampled yield (quintals/ha)	44.3	57.7	**<u>63.8</u>**	61.2	53.7

<u>Remarks</u>: 56 kg K_2O/ha resulted in the most full grains/m^2 and in the highest yield.

Table 4: Economic analysis for the experiment field (1000 VND/ha)

Indicators	I 0 K_2O	II 28 K_2O	III 56 K_2O	IV 84 K_2O	V 111 K_2O
Separate expenses	-	277	550	831	1,108
- Potassium	-	277	550	831	1,108
Shared expenses	5,0219	5,0219	5,0219	5,0219	5,0219
Total expenses	5,021	5,298	5,571	5,852	6,159
Total revenue	15,505	20,195	22,330	21,420	18,795
Profit	10,484	14,892	16,759	15,568	12,636
Production cost (1000 VND/quintal)	113.3	91.8	87.3	95.6	114.7

<u>*Remarks:*</u> 56 kg K_2O/ha resulted in the highest economic return and the lowest production cost.

VARIETY COMPARISON EXPERIMENTS

Table 1: Tillering process (tillers/hill)

Investi-gation dates	**I** (TB 21)	**II** (KD 18)	**III** (DB 5)	**IV** (Lai TQ)	**V** (N46)
18/6	1	1.2	1	1	1
26/6	3	3.6	3.7	3.5	3.3
2/7	6.1	7.4	7.1	7.7	5.4
9/7	11	10.2	11.6	9.4	9
16/7	18.1	15.6	20	14.5	14.6
23/7	**18**	**17.5**	**22.2**	**15.7**	17.9
30/7	16.7	15.8	18.6	15.4	**18.2**
No. of panicles/hill	7.7	9.3	**10.4**	9.9	9.8
Percentage of productive panicles (%)	42.8	53.1	46.8	63.0	53.8

Remark: Variety DB5 has the highest tillering, followed by N46, TB21, KD, and hybrid variety. DB5 resulted in the most panicles/hill.

Table 2: Sheath blight prevalence (%)

Investi-gation dates	I (TB 21)		II (KD 18)		III (DB 5)		IV (Chinese hybrid)		V (N46)	
	Dis-ease ratio	Dis-ease index	Dis-ease ratio	Dis-ease index	Dis-ease ratio	Dis-ease index	Dis-ease ratio	Dis-ease index	Dis-ease ratio	Dis-ease index
30/7	1.5	0.3								
6/8	5.7	1.5								
13/8	11.5	3.1	2.8	0.9	2.9	0.5			1.8	0.4
20/8	20.5	5.8	4.9	1.5	4.5	1.1	2.5	0.5	4.7	1.2
27/8	37.5	10.5	8.3	2.1	6.8	2.4	5.4	1.2	8.5	2.5
3/9	65.4	20.1	15.8	5.6	12.7	5.1	8.5	2.7	11.6	4.6

Remarks: TB 21 is seriously affected by sheath blight; hybrid rice was less affected by blight.

Table 3: Yield factors and sampled yield

Indicators	**I** (TB 21)	**II** (KD 18)	**III** (DB 5)	**IV** (Lai TQ)	**V** (N46)
No. of hills/m^2	25	25	25	25	25
No. of panicles/hill	7.7	9.3	**10.4**	9.9	9.8
No. of grains/panicle	168	161	165	119	142
No. of full grains/panicle	143	142	135	101	103
No. of full grains/m^2	27,604	33,049	**35,178**	25,0728	25,186
Percentage of empty grains	14.8	11.8	17.8	15.1	27.8
Sampled yield (quintals/ha)	63.5	72.8	**77.4**	55.2	55.4

Remarks: DB 5 resulted in the most full grains/m^2 and the highest yield.

Table 4: Economic analysis for the experiment field (1000 VND/ha)

Indicator	**I** (TB 21)	**II** (KD 18)	**III** (DB 5)	**IV** (Chinese hybrid)	**V** (N46)
Separate expenses	80	80	80	350	80
- Seed	80	80	80	350	80
Shared expenses	5,633	5,633	5,633	5,633	5,633
Total expenses	5,713	5,713	5,713	5,983	5,713
Total revenue	22,225	25,480	27,090	19,320	22,160
Profit	16,512	19,767	21,377	13,337	16,447
Production cost (1000 VND/quintal)	90	78.5	73.8	108.4	103.1

Remarks: DB5 resulted in the highest economic return and the lowest production cost, followed by Khang Dan, TB 21, N46, and the Chinese hybrid, respectively.

2. SRI application fields

Table 1: Production situation

Indicators	**SRI field**						***Traditional field***					
	H 1	H 2	H 3	H 4	H 5	**Ave-rage**	H 1	H 2	H 3	H 4	H 5	**Ave-rage**
Seed	KD	KD	KD	KD	KD		KD	KD	KD	KD	KD	
Transplanting date	12/6	12/6	12/6	12/6	12/6		16/6	16/6	16/6	16/6	16/6	
Seedling age (leaves)	2-2.5	2-2.5	2-2.5	2-2.5	2-2.5	**2-2.5**	3-3.5	3-3.5	3-3.5	3-3.5	3-3.5	**3-3.5**
Density (hills/m^2)	23	24	21	26.8	25.6	**24**	34	32	43.5	32	34	**35.1**
No. of seedlings/ hill	1	1	1	1	1	**1**	2.5	2.5	2.5	2.5	2.5	**2.5**
Nitrogenous fertilizer (kg N/ha)	57.5	0	64	64	25.5	**42.2**	89.4	89.4	89.4	89.4	89.4	**89.4**
Phosphorous fertilizer (kg P_2O_5/ha)	0	0	89	44.5	0	**26.7**	44.5	44.5	44.5	44.5	44.5	**44.5**
Potassium (kgK_2O/ha)	69	0	83	69	69	**58**	69.4	69.4	69.4	69.4	69.4	**69.4**
NPK 5-10-3 (kg/ha)	0	333	0	0	416	**149.8**	0	0	0	0	0	**0**
Affected by sheath blight	+	+	+	+	+	**+**	++	++	++	++	++	**++**
Plant protection (number of sprays)	0	0	0	0	0	**0**	1	1	1	1	1	**1**

Remarks: Traditional field was transplanted at a higher rate, with more tillers/hill, and used double the amount of nitrogenous fertilizer. It also had pesticides applied, while the SRI field did not.

Table 2: Yield factors and sampled yield

Indicators	SRI field						*Traditional field*					
	H 2	H 3	H 2	H 3	H 2	H 3	H 2	H 3	H 2	H 3	H 2	H 3
No. of hills/m^2	23	24	21	26.8	25.6	**24**	34	32	43.5	32	34	**35.1**
No. of panicles/hill	8.6	9.1	10.2	8.7	10.6	**9.4**	7.6	5.6	5.0	5.0	5.4	**5.7**
No. of grains/panicle	**170**	**169**	**168**	**150**	**150**	**162**	**146**	**168**	**153**	**180**	**163**	**162**
No. of full grains/panicle	145	146,9	151,4	120	127.4	**138,1**	116,8	131,2	130,4	156.9	133,5	133.8
No. of full grains/m^2	28,681	32,083	32,430	27,979	34,571	31,149	30,181	23,511	28,362	25,104	24,511	26,334
Percentage of empty grains	**14.8**	**13.1**	**10.0**	**20.0**	**15.3**	**14.6**	**19.9**	**22.0**	**15.0**	**12.8**	**18.0**	**17.5**
Sampled yield (quintals/ha)	63.1	70.6	71.3	61.6	76.1	**68.5**	66.4	51.7	62.4	55.2	53.9	**57.9**

Remark: SRI practices resulted in more grains/m^2 and higher yield.

Table 3: Economic breakdown (1000 ®/ha)

Indicators	**SRI field**	***Traditional field***
Separate expenses	2,034	2,679
Seed	80	320
Nitrogenous fertilizer	458	971
NPK	749	-
Phosphorous fertilizer	167	278
Cloride potassium	580	694
Pesticides	-	415.5
Shared expenses	3,363	3,363
Total expenses	5,397	6,042
Total revenue	23,975	20,265
Profit	18,578	14,223
Production cost	78.8	104.4

Remark: SRI practices resulted in higher economic returns and lower production costs.

V- Conclusions and Recommendations

1- Conclusions

- SRI proves that rice plants have high tillering capacity, and transplanting seedlings at a lower rate promotes tillering, reduces pests, increases number of grains/panicle, and raises economic returns.
- 51 kg N/ha nitrogenous fertilizer dose resulted in the highest economic returns and lowest production cost.
- 56 kg K_2O/ha potassium dose resulted in the highest economic returns and lowest production cost.
- SRI helped reduce production costs overall and increased yield and economic returns in comparison with farmers' current practices.
- SRI should be expanded.

2- Recommendations:

- In plots where irrigation and drainage are easy, 16–25 hills/m^2 rate should be applied during spring crop season, and 20 – 25 hills/m^2 rate during summer-autumn crop season, with 1 seedling/hill and 1.5-2.5 leaves/plant. The field should be dried up and wetted intermittently during the vegetative stage until panicle initiation.
- DARD, all sectors and districts/town should give support at the local level to apply SRI widely. The PPD and National IPM Program should continue to provide favorable conditions for Ha Tay province to carry out more studies in the coming years.

B - REPORT ON A FIELD DAY

Upon the request by the Ministry of Agriculture and Rural Development (MARD), the Plant Protection Department (PPD) cooperated with Ha Tay Provincial People's Committee (PPC) and Oxfarm US to organize a field day on the **application of SRI** in My Duc district, Ha Tay province, in order to derive lessons for future replication of this model in other provinces. 270 participants came to the field day.

Chairmen:

1- Mr. Nguyen Quang Minh, Director General, PPD, authorized by MARD to serve as the Chairman of the field day,
2- Mr. Trinh Duy Hung, Vice Chairman, Ha Tay PPC, and
3- Mr. Brian Lund, Director for East Asia, Oxfam US (donor of the model).

Participants:

- **International organizations and NGOs:** Vegetable IPM program (FAO), Oxfam US, Oxfam Quebec, SRD, and Japan Overseas Cooperation Volunteers.
- **Central government agencies:** Science and Technology Department of MARD (officer); Emulation Section of MARD (officer), PPD of MARD (Director-General, Vice Director, leaders, officers); Vietnamese Academy of Agricultural Sciences (officers); National Institute for Soil and Fertilizers (Director and officers); Plant Protection Research Institute (Director); Food Crops Research Institute (Director and officers); Institute of Policy and Strategy for Agriculture and Rural Development–IPSARD (officers); Hanoi Agricultural University No.1 (Agronomy Department teachers).
- **Local agencies:**

+ Ha Tay province: Ha Tay PPC, leaders and officers of Finance Department and DARD and their subordinates, Farmers' Union, Women's Union, My Duc district Communist Party Committee, DPCs, some communes, and farmers involved in the SRI model;
+ Other provinces: leaders and officers of DARDs and PPSDs of such provinces as Hanoi, Nam Dinh, Thai Binh, Ninh Binh, Yen Bai, Hoa Binh, Thai Nguyen, Phu Tho, Nghe An, and Ha Tinh.

- **Mass media:**

+ Central mass media: VTV2, *Nhan Dan* (the People's Newspaper), *Nong Nghiep Viet Nam* (Vietnam Agriculture Newspaper), and *Nong Thon Ngay Nay* (Today's Rural Areas Newspaper);
+ Local mass media: Radio broadcasting and television of Ha Tay province, Ha Tay newspaper.

I- CONTENT

1- Opening: Mr. Nguyen Quang Minh, Director General of PPD, delivered the opening speech on behalf of MARD.

2- Speech delivered by Ha Tay PPC: Mr. Trinh Duy Hung welcomed the field day and briefly introduced the socio-economic and agricultural situation of the province. He emphasized the important role of IPM in the provincial production of rice and vegetables during the past years. He summarized the results of SRI application in Ha Tay:

Ha Tay has obtained good rice harvests for the past few years. Since 1997, the yield of rice has increased by 15.2 quintals/ha in spring crop season and by 16.1 quintals/ha in summer-autumn crop season. As a result, rice production has risen by 23,000 tonnes/year. This achievement can be attributed to the policies on investing in and encouraging application of technological advances, including IPM.

In 2005 and 2006, with support from the PPD and National IPM Program, Ha Tay PPSD implemented SRI in various locations. This system has been highly appreciated and should be applied more widely. Ha Tay PPC understands that SRI is a significant option to implement MARD Directive 24/2006/CT-BNN, dated 7th April 2006, on enhancement of the "*3 Reductions, 3 Gains*" program. In 2007, Ha Tay invested 482 million VND in SRI application in 14 districts/town/city.

In summer-autumn crop season 2007, SRI was applied to a total of 3,000 ha. Chuong My district trained farmer trainers from 32 communes/towns, with 3 farmers from each commune/town. The trained farmers in turn organized farmer field schools (FFSs) and implemented the application model in their communes/towns.

Up to date, 22 out of the 32 communes/towns have had their own trial plots, study groups, or application models. The province plans to continue and expand quickly the "3 Reductions, 3 Gains" program in 2008 and coming years. Districts, towns, cities and sectors should consider the program as their important duty that needs investing and specifically instruction.

Mr. Trinh Duy Hung also had some recommendations:

- MARD should direct its subordinates to have technical study and evaluation in order to define appropriate policies on promotion of SRI application.
- MARD, PPD, central-level agencies and international organizations should continue their support and cooperation with Ha Tay to implement the "3 Reductions, 3 Gains" program.

3- Visit to SRI demonstration field: After the speech delivered by Mr. Trinh Duy Hung, Vice Chairman of Ha Tay PPC, the participants visited the 180-ha demonstration field of Dai Nghia cooperative, My Duc district. In summer-autumn crop season, the amount of seed used for this field was reduced by 75%, and nitrogenous fertilizer was reduced by 35%. Particularly, farmers have not applied pesticides as the field is not much affected by pests. Its yield was 6.85 tonnes/ha -- an 18% increase -- and production costs were decreased by 10.7%, with farmers' net profit rising by 30.6% (4,355,000 VND/ha). Production cost of 1 kg of rice was reduced by 25% in comparison with traditional farming methods. In addition, irrigation was reduced by 4 times during the crop season.

4- SRI application in Vietnam:

Implementation status: Overuse of chemical fertilizers, particularly nitrogenous fertilizer, and high transplanting rate, requiring a lot of rice as seed, are major causes for having weak rice plants. Consequently, the plants are vulnerable to pests, resulting in low yield and low economic returns. The overuse of chemicals (fertilizers, pesticides…) also pollutes the environment and adversely affects the community's health.

To help farmers solve the said problems, with the support from some international organizations, the National IPM program in 2003 introduced SRI for trial. SRI was implemented on areas of 2-5 ha in each applied location of 14 provinces nationwide in 2005. It was expanded to 17 provinces in 2006. In

2007, SRI was applied in totally 4,000 ha. The models of 5-10 ha were implemented in various provinces, including Ha Tay.

SRI is based on certain principles: to transplant young seedlings to promote tillerage, and transplanting at a low rate to facilitate ventilation for roots, and thereby to control pests; to dry out and irrigate the paddy soil rotationally in early growth stages of the plants, and to turn over the soil to help roots develop widely and deeply, thereby increasing activity of the roots and reducing lodging risks for the plants.

Results:

The results of SRI application in 2005–2006 in various provinces showed that the amount of seed can be reduced by 50-80% in comparison with traditional farming practice; and nitrogenous fertilizer is beneficially decreased by 20-25%. Average yield was increased by 9-15%. The resulting plants could resist well against pests and diseases as they were veryt healthy. Consequently, application of chemicals (pesticides, fungicides) could be remarkably reduced. The profit from SRI fields increased by more than 2 million VND/ha on average. Production cost was reduced by 342-520 VND per kg of paddy rice. In addition, 1/3 of irrigation water was saved.

5- Rural Development Centre of IPSARD presented its survey on "cooperation of farmers and institutions in SRI application". The study group carried out a survey in some provinces that were implementing SRI, including Yen Bai and Ha Tay, to reach an objective evaluation of potential SRI application in Vietnam and to use this as the base for future SRI expansion in Northern provinces.

Remarks:

- SRI is a technical advance in rice intensification. It should be continuously improved.
- SRI emphasizes participatory approaches. Technical demonstration is carried out at community (village) level to persuade farmers. Cooperation model between the farmers who apply technological advances and the network of farmer groups can be obviouly seen.
- To transfer SRI model, farmer trainers need training so that they can teach other farmers in their villages/communes.
- For an effective transfer, there must be agreement among the People's Committees, mass organizations, cooperatives, and involved farmers.

Major impacts of SRI:

- SRI paves a way for a clean agriculture in rice farming: pesticides are reduced by 70-100%.
- Irrigation water is saved.
- SRI combines valid technical measures defined in previous programs like IPM program and the high quality seed program.
- SRI has positive impacts on gender and poverty reduction in rural areas: payment in rice farming can be increased from 10,000 VND/workday to 20,000-25,000 VND/workday; women's technological knowledge is enhanced; their working conditions are improved with SRI, and their health is protected; their integration into the community through cooperative activities in SRI implementation is also promoted.
- In addition, the presentation also mentioned potentials of SRI application in Vietnam in the future.

6- Presentation by the National Institute for Soil and Fertilizers on "SRI– A New Approach to Rice Farming and Application Potential in Northern Region". The presenter asserted that SRI is a set of ideas, not a technical package. To apply SRI, technical indicators should be adapted to the actual conditions (farming pattern, crop season, seed, farmers' qualification…). It is farmers who directly participate in the field trials to find out suitable technical procedures for their own plots and their local fields.

The presenter briefly introduced the SRI effectiveness and estimated profit from SRI application in Northern region: if SRI is applied in 5-10% of the area in Northern region by 2010, the profit can increase to thousands of billions of VND.

7- Speech by Mr. Brian Lund, Director in East Asia, Oxfam US: He said that he was profoundly impressed with Vietnam's progress in rice production that has become more and more important to the world. From a net rice importer, Vietnam had positioned itself as the second largest rice exporter. Oxfam US aimed to support Vietnam for the sustainable agricultural development strategy, paying attention to improving the living conditions of the poor in rural areas. Especially, Oxfam US would continue to help Vietnam expand SRI application in the future. It was willing to cooperate with relevant agencies of MARD, provinces and farmers to implement SRI effectively.

II- CONCLUSIONS

Mr. Nguyen Quang Minh, PPD Director, concluded the field day:

- In May 2007, the Science Council of MARD temporarily recognized SRI as a scientific advance. The Science and Technology Department of MARD was requested to advise MARD in order to issue an official request to DARDs in Northern region for SRI expansion. An official recognition was made in October, 2007.

- MARD should closely cooperate with the Cultivation Department, the National Agro-Extension Centre, the Science and Technology Department, and relevant agencies to advise MARD in formulating policies and guidance on implementation.

- PPSDs should report to DARDs to have plans for increase the number of SRI application points so that farmers could see and learn. At the same time, they should report to PPCs and PPD for its synthesis and report to MARD.

- Oxfam US and international organizations should keep their support for Vietnam.

- Mass media should introduce timely the success of SRI models.

- PPD will synthesize the field day results and report to MARD, and propose to MARD the plan for SRI expansion in the coming winter-spring crop season.