Farmers' evaluation of the System of Rice Intensification in the middle mountains of Nepal

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Abstract

The System of Rice Intensification (SRI) developed in Madagascar some 20 years ago could bring new hope for smallholder farmers in the Hindu Kush-Himalayas (HKH). The concept can be applied in any region where irrigated rice is cultivated, including the

Himalayas. Initial findings in PARDYP have showed that this innovative approach to rice cultivation could work in the middle mountains of Nepal.

In a previous set of on-farm trials conducted by PARDYP, SRI was tested with 6 farmers in 2003 and with 24 farmers in 2004 in the Jhikhu Khola Watershed (JKW) with the primary objective of evaluating whether SRI is technically feasible in Himalayan middle mountain situations.

Evaluation of their 2004 SRI results by SRI farmers in the JKW was very encouraging. According to them, yield was higher compared to that of traditionally-cultivated rice. Reduced frequency of irrigation, decreased rates of riser collapse, reduced conflict during irrigation times, and improved soil environment were some of the interesting learning shared by the farmers. Results were good with up to 67% yield increase. Therefore, the research was extended within the watershed, using participatory action research approaches so that recommendations for promoting SRI in Nepal and in the other potential areas in the HKH could be made.

SRI research conducted in 2005 following a PR&D approach was more systematic compared to the approach adopted in the previous years. SRI Farmer Field Schools (FFSs) were set up in 15 villages, with more than 100 farmers participating. Lead farmers were trained and used as facilitators for these FFSs.

Farmer Field School (FFS) activities were a key component of the participatory research approach. **A**gro **E**co**S**ystem **A**nalysis (AESA) approach was also integrated into the village-level FFSs. Hands-on training on joint problem identification, analysis, and problem-solving approaches enhanced the capacity of farmers to understand (a) basic concepts of SRI and its practices, (b) methods for comparing traditional practices with SRI, and (c) observing, analysing and presenting the findings and observations more systematically. An informal farmer-learning network was therefore established in JKW through FFS.

To involve a large number of village participants in the research process, participants' exchange visits were found to be a very effective activity. Exchange visits provided farmers with a platform for sharing their knowledge with other participants and facilitators and for observing the performance of SRI in different locations/conditions, at the research station, and in Department of Agriculture/HMGN and FAO-managed demonstration plots.

To discuss and share activities, results and experiences on SRI, and to clarify misconceptions about SRI and to solve technical problems, village-level Focus Group Discussion (FGD) was also found to be a very useful method.

To understand what farmers felt and to have a common understanding about SRI after the vegetative period of rice growth, farmer-led evaluation was very useful. From this exercise, it can be concluded that farmers are willing to continue SRI practices covering larger areas in the coming years as they face few difficulties.

To promote wider understanding of PR&D and to encourage farmers to continue developing and adapting SRI, systematic dissemination of knowledge through information, education and communication (IEC) materials like simple posters in local language was undertaken. These IEC materials will be targeted for community-level use. Multi-media packages of IEC materials like reports: posters, a powerpoint presentation were packaged together in a CD ROM for a global audience and for Nepal policy-makers and administrators.

A one-day exchange workshop on SRI organised at ICIMOD pointed out certain research needs regarding weed management, water requirements and quantity of water savings, best varieties for Nepalese conditions, age of seedlings, spacing in different agroecological zones, and soil fertility management in maintaining long-term soil nutrient status.

The workshop also emphasized the integration of SRI into the national agriculture extension policy. Programmes such as awareness-building through campaigns, radio and television use, training through Farmer Field Schools, and farmer interaction, study tours and workshops were identified as a promising outreach strategy.

SRI in the Jhikhu Khola Watershed has proved to be a good potential agronomic option for growing rice in the middle mountains. Yield increases with SRI method were recorded up to 90% more than traditional method. This is seen to be an appropriate technological option especially under controlled irrigation management

1. Background and Justification

PARDYP is a regional project that carries out applied research in the field of natural resources and watershed management. The project's objective is: Sustainable options – applicable at household, community and policy level with proven impact potential for improving food and water security and income of rural households. These are to be developed through applied interdisciplinary research.

The project activities include agronomic and horticultural initiatives, socioeconomic and market studies, rehabilitation of degraded lands and forestry, soil fertility studies, participatory conservation activities, and water and erosion studies. PARDYP's 21 sub-projects are categorised into the following major areas for Expected Results (ERs):

1. Options for improved farming systems productivity to be developed and tested;
2. Options for increased productivity of agricultural land to be tested and disseminated;
3. Water management options for equitable access to be identified, tested and disseminated; and
4. Options and approaches for achieving sustainable and equitable access to water, land and forests to be identified and disseminated

PARDYP is being implemented in five middle-mountain watersheds in the Hindu Kush-Himalayas (HKH) and in four countries: China, India, Nepal, and Pakistan. Selected national focal research institutions implement, manage, and supervise the activities with the assistance of national and international partners and collaborators. Although SRI is being tested in PARDYP India, Nepal and Pakistan, it was only in the Jhikhu Khola, Nepal that SRI was selected for review and analysis in this PR&D project.

JKW is located 45 km east of Kathmandu, the capital of Nepal. The famous Araniko highway links JKW with Kathmandu and passes through the watershed. The total area covered by the watershed is 111.4 sq. km, with elevation ranging from 800 to 2200 masl. About

25% of the watershed area has slopes greater than 50%; agricultural land covers 55% of the total area, followed by forest 29% (Shrestha, 2005a).
The findings of a recent livelihood survey conducted in the JKW (N=169) are given in Box 1 (from Shrestha, 2005c).

Box 1: Jhikhu Khola Watershed: A fact file

Cast composition: Brahmin (37%), Tamang (21%), Chhetri (15%), disadvantaged groups, e.g. Danuwar, Sharki, Bishwokarma and Damai (17%), and others, e.g., Newar, Magar, Sanyasi (10%).
Family size: Average family size 6.5; 7 or more members (41%), 5-6 members (39%), 4 members or less (20%).
Religion: Hindu (80%), Buddhist (17%), Christian (2%), and mixture of Hindu and Buddhist (1%).
Literacy rate: Literacy 65% among persons 6 years and above, with male literacy rate higher than female literacy rate.
Occupation: Agricultural work (77%); domestic work, done mostly by females and older males (7%); shopkeepers (2 %); and others (service holders, businessmen, drivers, etc.) (14%).
House: 98% had their own houses, of which tin roof (55%), tile roof (32%), thatch and *jhingati* roof (9%), and concrete roof (4%).
Electricity: Households with electricity facility (76 %) including solar electricity.
Access to cultivated land: 96% households had access to cultivated land.
Land holding: Average landholdings 0.77 hectare; less than 0.25 hectare (16%), between 0.25-0.51 hectare (20%), between 0.51-1.27 hectare (45%), and more than 1.27 hectare (15%)
Source of fuel energy: Households had multiple sources, e.g., firewood (93%), biogas (14%), kerosene (6 %), LPG (4%), and crop residues (1%).
Major income source: Majority of households had multiple sources, e.g., livestock (47%), vegetables/fruit (59%), crops (43%), agricultural labor (5%), non-agricultural labor (9%), petty business (14%), private service (9%), government service (9%), international remittances (2%), and other skilled labor (8%).

The total population of JKW in 2001 was about 59,242, and the average population growth rate from 1947 to 2001 was about 3.54 per annum (after Shrestha, 2005b). Food production kept pace with the increasing population as average annual number of crops grown on fields has increased from 1.3 to 2.5 between 1980 and 1994 (Schreier and Shah, 2000) and further up to 2.8 by 2001. This indicates a very high cropping intensity.

In recent years, farmers in the watershed have started growing up to four crops annually on irrigated prime land in the valley bottom (Westarp, 2002). As a consequence, there has been a depletion of agricultural land productivity, increase in agrochemical application, and a growing demand for irrigation water in the watershed. To address these problems, improved farming systems have to be explored within and outside the watershed, as targeted under PARDYP ER1. Field research on SRI was part of this broader effort.

2. Objectives

The general objectives of the research were to test, refine and demonstrate improved and sustainable rice-based farming options for farmers living in the middle mountains of the Hindu Kush-Himalayas. The specific objectives of this particular field research focused on System of Rice Intensification (SRI) were:

- to evaluate end-of-project results from 2004 and 2005 (after harvest) with farmers serving as evaluators to assess outputs and outcomes of the project;
- to further test, refine and demonstrate with smallholder farmers, including women, and with the field-based research station in the JKW, the potential of SRI in the middle mountains of Nepal; and
- to disseminate the knowledge gained in the field of SRI through IEC materials.

3. Conceptual Framework

3.1 System of Rice Intensification (SRI)

SRI is a methodology for increasing the productivity of rice by changing the management of plants, soil, water and nutrients. SRI increases rice production and raises the productivity of land, labour, water and capital through different practices for management (http://ciifad.cornell.edu/sri/).

Dr. Norman Uphoff, one of the leading SRI scientists based at Cornell University, USA, has reported rice yield increases of 50-100% with SRI methods in most of the countries where they have been tried, along with increased productivity of limited water and greater saving of seed requirements because paddies are not kept continuously flooded and plant population is greatly reduced when adopting the system.

In SRI management practices

Rice seedlings are transplanted:

- *very young* -- usually just 8-12 days old, with just two small leaves
- *carefully and quickly* to have minimum trauma to the roots
- *singly*, only one per hill instead of 3-4 together to avoid root competition
- *widely spaced* to encourage greater root and canopy growth
- *in a square grid pattern*, 25x25 cm or wider -- 30x30 cm or 40x40 cm, even up to 50x50 cm with the best quality soil

Soil**:**

- Is kept moist but well drained and aerated to support increased biological activity.

Water:

- Is applied in minimum quantity during the vegetative growth period, and then only a thin layer of water is maintained on the field during the flowering and grain filling stage; note: some farmers are finding that they can get good results continuing alternate wetting and drying throughout the whole crop cycle; also, in some areas, a rainfed version of SRI is being used with good results

Nutrients:

- Better quality compost such as with manure can give additional yield advantages.

Weeds:

- Since weeds become a problem in fields that are not kept flooded, weeding is necessary at least once or twice, starting 10-12 days after transplanting, and preferably 3 or 4 times before the canopy closes.

(Source: http://ciifad.cornell.edu/sri/methods.html)

In general, SRI crops have yielded at least twice as much grain as traditionally-grown rice. The average SRI yield was about 130 percent higher than that with traditional methods. SRI yield in Morang District of Nepal was up to 9.25 t/ha compared with 4 t/ha with improved practices (IPM method) and 2.5 t/ha with farmer practices in previous FFS trials there (Uprety 2005).

3.2 PR&D on the System of Rice Intensification

In 2005, SRI research was conducted following PR&D approach. The objectives, activities and methods are presented in the following log frame.

Objective 1: Further test, refine and demonstrate with smallholder farmers, including women, and with the field-based research station in the JKW, the potential of SRI in the middle mountains of Nepal

Activities	**Methods**	**Outputs**
Village–level interaction workshop	Village-specific group discussions	Identification of interested lead farmers for ToT

Training of Trainers/Farmer field school	Agro-ecosystem analysis, presentation and group discussions	Information sharing and technical backstopping (report)
Establishing TOT plots, FFS plots and on-station plots	On-farm trials	Scientific data
Exchange visits	Focus group discussions	Farmers assessment of trial (report)
Village –level discussions	Focus group discussions	Farmers assessment of trial (report)
Farmers' field day	Presentations	Farmers assessment of trial and approach (report)
Objective 2: Evaluate end-of-project results with farmers serving as evaluators to assess outputs and outcomes of the project		
Village–level interaction workshop	Focus group discussions	Document previous adapters' experience (report)
End-of-project (2005) evaluation	Questionnaire survey	Document lead farmers experience (survey report)
ToT participants meeting (Information sharing and feed back collection)	Focus group discussions	Assessment of 2005 results and share common understanding (report)
Objective 3: Dissemination of knowledge gained in the field of SRI		
Local/district level dissemination (farmers' day)	Presentations by FFSs participants	IEC materials (e.g. poster)
National workshops	Presentations (scientists	Reports and IEC materials

and farmers)

4. Methodology
The following PR&D methods were used to collect information for the specific objectives

4.1 Farmers' workshop
Village-level interaction workshops were organized in two different locations of the JKW to evaluate 2004 SRI results; collect qualitative information from previous adopters; share the information collected by PARDYP in 2004 with farmers; introduce SRI to all interested farmers; and select new lead farmers to facilitate SRI research in their respective villages in 2005.

The workshop had three sessions. At the beginning, SRI concepts and practices were discussed. Scientific data, including SRI yield data, collected from different farmers' fields in 2004, were presented and discussed with participants. The dataset was provided to all participants.

In the second session, Focus Group Discussion (FGD), a semi-structured method of collecting qualitative data, was used to share experiences from previous adopters. Previous adopters explained the processes (what they did, and how). Cost, benefits, and advantages and disadvantages were discussed in detail. Previous adopters responded to questions raised by the new farmers.

In the third session, participants were divided into 13 groups for the nomination of lead farmers for the 2005 SRI research. Each group nominated a lead farmer for participation in the Training of Trainers (ToT) program.

4.2 Participatory on-farm trials
In 2005, research started with participatory on-farm trials. The following approaches were adopted to conduct on-farm trials and share information.

4.2.1 Training of Trainers (ToT)

The concept of ToT was explained in detail, and the following criteria used for the selection of participants.

1. One participant from at least one village or possibly two villages should be nominated for ToT.
2. Each participant must in turn select at least 3 farmers (more would be better) from their villages to participate in village-level Farmers Field School (FFS) and should establish at least one observation plot in their villages.
3. Immediately after attending the training (the same day or the next day), trainers should share experiences with participants in village-level FFS with demonstration.
4. Each trainer must present a weekly report of his/her FFS in the ToT school.
5. Trainers must participate in the training and FFS for at least 16 weeks out of the total of 18 weeks.
6. ToT and FFS will focus on the comparative study on SRI and traditional method (TM) and also cover concepts and practices of integrated crop management (ICM) on rice.

SRI-ToT School was organized weekly (mostly on Saturdays) at the centre of the watershed. This started from the third week of June and continued until rice harvest (the full cropping season). Observation plots to compare SRI and traditional practices in terms of inputs and output have been established near the training site.

In the ToT school, a set of activities based on the Integrated Pest Management (IPM) Farmer Field School (FFS) approach was conducted. FFS consisted of three activities: agroecosystem observations, analysis and presentation of results; a special topic; and group dynamics (http://www.communityipm.org).

4.2.2 Farmers Field Schools in different villages

Trainees of the ToT school facilitated FFS in their respective villages. They established at least one demonstration SRI plot near the FFS. Together with other participants they observed and analysed SRI and traditional methods. Reports from village-level observation plots were presented in the village-level FFS and in the ToT school.

4.2.3 Observation plots in the research station (Spice Crop Development Centre)

To test and demonstrate SRI practices with a wider range of variables, e.g., different planting matrix, different doses of fertiliser inputs, and cultivation in both irrigated and rainfed conditions, etc., a demonstration plot was established at the Spice Crop Development Centre (SCDC)/ HMG Nepal.

4.2.4 Farmer-to-farmer site visits

Farmer-to-farmer site visits were organized for FFS participants from the mid-season (starting the last week of August until harvest). The main aim of these visits was to provide exposure to other SRI fields, so that farmers could observe and compare SRI in different locations.

4.2.5 Mid-season focus group discussion

A group of PARDYP facilitators and the respective facilitators of particular villages jointly organized village-level FGD in different villages. The main aim of these village-level focus group discussions was to jointly monitor and evaluate the technology and to share knowledge and experiences.

4.2.6 Farmers' day

At the end of the season, a farmers' field day was organized in the watershed to share experiences with a wider audience. Participants presented their learning experiences via posters, photographs, result sheets, folk songs, speeches, and poems.

4.3 Farmer-led evaluation

An end-of-project (2005) evaluation was organized with different panels of farmers as evaluators to assess the outputs and outcomes of the field research. The methods for evaluation were a questionnaire survey and group discussions with leading questions.

4.4 Dissemination of knowledge

Dissemination of knowledge through IEC materials, e.g., poster, was prepared for local-level dissemination. Similarly, a SRI report, posters and powerpoint presentation were packaged together in a multimedia CD-ROM for a global audience, Nepal's policymakers and administrators.

PARDYP organized a one-day exchange workshop on SRI in December 2005. The workshop was organized to share the experience on SRI from different districts of the Nepal and to work out outreach strategies and an agenda of future research needs for SRI.

Limitations faced during the PR&D:

Due to the current political situation, implementation of field activities was difficult in Nepal. There were certain limitations while implementing the fieldwork.

- Due to the limited time, not all previous adapters' opinions and experiences could be covered in interaction workshops.
- Due to technical constraints, only 13 villages could participate in the ToT program.
- Women's participation in the village level workshop was poor (2% in one location and 5% in another).
- **A**go-**e**co**s**ystem **A**nalysis (AESA) became a time-consuming process, as participants had to spend more time in preparing presentations.
- Due to the long dry spell, SRI observation plot could not be established near the discussion site. It took about 4 hours to observe the field and record analysis. Another 4 hours were spent on presentation, discussion and special topics. Each week, participants had to spend a whole day.
- About 15 % of participants didn't participate regularly in the ToT program due to various reasons, the major constraint being location. Only 17 participants participated in the ToT until the end.
- Due to the long dry spells, rice seedlings became old, and most of the participants could not transplant their rice on time. They had to prepare their seedbeds 2 to 3 times in order to prepare young seedlings. This also happened for previous adapters' farms.
- Only fifteen facilitators could establish observation plots in their villages.
- About 40% of facilitators could organise FFS regularly (weekly), while others only once in 15 days or 2 times in a week (irregularly).
- Participants in village FFS were from diverse backgrounds, i.e., farmers, school teachers and students, so finding an appropriate time and day for all of them was not an easy job. However, they participated either in the morning or in the evening. Facilitators had to attend ToT on Saturdays so they got limited time to share what they learned in ToT.
- ToT participants tried to estimate costs but could not figure out labour requirements accurately. The area was very small (107 sq m x 4 for two rice varieties planted with both methods), and the vegetative period was not the same for both varieties. About 19 participants carried out all of the activities quickly. The cost of applied fertilisers and pesticides were almost the same for both methods.
- Due to limited time, the scattering of FFSs (distance-wise), and the difficult political situation, exchange visits could not be organised to all FFSs.
- Harvest results from three villages could not be collected. In two cases, the rice did not produce grains, and in one case, the participant did not take a harvest record.

5. Results and Discussions

SRI research can be divided into two different phases, i.e., the first phase (2004 and before), and a second (2005). Farmers' workshop was conducted to evaluate the results from first phase (especially 2004) and to select participants for the second-phase research.

5.1 Farmers' workshops

5.1.1 One-day farmers' interaction workshops were organized in two different locations, one at Patlekhet VDC and another at Ampgahri in the middle part of Panchakhal valley, where rice is grown intensively. All together, 90 participants were present in the review and exchange program. Farmers from the different villages of Patlekhet, Phulbari, Kavre, Baluwa, Khanalthok and Daraune Pokhari Village Development Committees participated at Patalekhet. Likewise, farmers from the different villages of Panchakhal, Baluwa, Sathighar-Bhagawati, Hokse, Patlekhet and Kharelthok Village Development Committees participated at Ampghari.

5.1.2 At the beginning, PARDYP staff presented SRI yield data collected in 2004 from different farmer's field. Increased yield was found in all the 11 farmers' plots. Maximum yield increase in 2004 was 67% (with rice grains at 12%-14% moisture) compared to farmers' traditional practice (Table 1 in Appendix 1). Previous SRI adapter's experiences were very encouraging and informative. PARDYP staff learned many new things from the farmers. Yield increase was reported to be high compared to traditionally cultivated rice. Reduced frequency of irrigation, decreased rates of riser collapse, reduced conflict over water during irrigation times, and improved soil environment were very interesting learning to the scientific communities. Farmer's experiences provided new topics for further research.

5.1.3 Farmers responses to feedback from 2004 data were noted. Some agreed on the PARDYP's research results, and some didn't. Interestingly, most of the farmers estimated higher yield than the scientifically-measured yield. Some of the other important observations mentioned by the farmers were:

- All of them said that first weeding in SRI was labour-intensive; but from the second weeding, it was the same. The cost of first weeding was compensated by other activities.
- Most of them explained that the expenditure during the vegetative period was same for both systems; therefore, whatever yield increased was achieved was a net benefit.
- In low-lying wet (swampy) land, managing excess water was difficult because of the time and effort required to drain.
- Conflict among the villagers during irrigation was reduced / minimized because the frequency of irrigation for SRI was reduced as compared to the traditional system.

All the feedback and information collected from the interaction meeting is presented in the Table 2 in Appendix 1. This information was valuable to validate the scientific data collected by the PARDYP.

5.1.4 Participants for the Training of Trainers (ToT) program were selected for the second phase research. For this, all the participants were asked to nominate lead farmer(s) from their villages. After long discussions, each group nominated a lead candidate for the training. Thirteen participants, including one female, were nominated from the groups.

5.1.5 There was a healthy competition among participants while selecting candidates for ToT in Patalekhet, but in Anpghari the process went smoothly. Farmers of Patalekhet area were much more aware of FFS because the District Agricultural Office (DAO) had been conducting a series of Integrated Pest Management (IPM) FFS on rice and vegetables for a couple of years. Farmers' participation in the workshop was more than expected. School teachers, students, farmers, NGO representatives, and health workers participated in the meeting, which showed that there is an increasing interest on this new system of rice cultivation. Meeting venues were selected on the basis of suggestions made by the farmers. Interestingly, participants from a NGO related to food security were present in the workshop because they had heard about SRI and wanted to know more and expand in their working area, *Koshi Pari,* a remote village of Kabhre district.

5.1.6 PARDYP's role was mainly to facilitate the discussions. New and old SRI farmers discussed with each other, and previous adapters jointly answered the questions raised.

5.2. Participatory on-farm trials

The second phase started with participatory on-farm trials. The key elements of the action research approach in this phase were:

- Action research was conducted with farmers in a group, whereas in the first phase, work was conducted with individual households.
- Action research was conducted in the FFS mode.
- Lead farmers were trained through a Training of Trainers (ToT) program.

- Lead farmers served as key resource persons in their village-level FFSs.
- Data were analysed by farmers starting from the project initiation to the end on a weekly basis.
- Participatory methods and tools were employed repeatedly, whereas in the first phase, tools were practiced just once before the rice-planting season.

5.2.1 Training of Trainers (ToT)/ Farmer Field Schools

Nineteen participants participated in the ToT. Among them, 13 were selected by the villagers through intensive discussion. Another four farmers, who were involved in PARDYP's on-farm activities since the beginning (since 2003) and who expressed great interest in SRI, were also included in the training. Two junior female staff members from PARDYP who had conducted trials on SRI in the previous year(s) also joined the school. Among the participants, 13 were male and 6 female (including PARDYP staff). Only 17 participants were able to continue until the end of the program.

Orientation on concepts of participatory research on SRI, the learning approach of FFS, and participants' role as facilitator, etc. was given to them on the first day of the ToT school. Seventeen participants organized FFS in 15 different villages, each with one observation plot. (Two FFS were jointly facilitated by two trainers.) They facilitated weekly field school in their respective villages immediately after the ToT. A total of 35 SRI fields, managed by FFS participants and previous adapters, were established in 2005.

More than 100 farmers actively participated in the SRI research process (Table 3 in Appendix 1) and also a large number of their neighbours closely observed the SRI research. With this approach, ToT trainees had good opportunities to practice SRI under their local conditions, at many different altitudes.

Presentation of progress reports from the ToT-field and respective villages was followed by discussing special topics of immediate interest. Weekly summaries of the key results from observation fields are presented in Figure 2a and 2b in Appendix 1. Each week, participants decided the special topic for the following week, and appropriate subject-related specialists were invited to facilitate the special session.

Special topics covered were:

- Concepts and practices of SRI, its origin and importance, national production of different rice varieties, and seed treatment methods.
- Soil sampling methods; N, P, K, pH and OM testing using portable soil testing kits; type and texture identification; information on previous inputs and cultivated crops; soil treatment; lime recommendation; and planting area estimation
- Demonstration of improved composting options; information on national recommended doses of fertilizer for different crops.
- Techniques for identifying pests and diseases; life cycles of pests; methods for pest disease control (without applying pesticides and fungicides); proper treatment using pesticides; and fungicides for rice, vegetables and fruit trees.

The participants ran the FFS in a participatory way. Training management main and sub- committees were formed in the first day of the ToT. Each week, participants nominated a program reporter, monitor and evaluator. Sessions were conducted and evaluated by them.

PARDYP supported/facilitated the ToT program, and scientists from the District Agricultural Office (DAO) Kabhre, the Spice Crop Development Centre (SCDC) Kabhre, and the Vegetable Development Directorate (VDD) Lalitpur evaluated the approaches and facilitated special sessions on 'special topics.'

Village-level participants also learned and practiced other activities, such as improved composting options, in-situ soil testing methods, pests and pesticides and their effects, etc. Two- way learning opportunities enhanced the confidence of TOT trainees regarding village-level problem-sharing and -solving in the TOT Centre and giving feedback to the village-level FFS.

Activities of the FFSs were found to be very effective tools for participatory research on SRI. Participants realised that discovering the problems and solutions jointly within a community or in a group can improve many difficult aspects of the farming system.

5.2.2 On-farm trials

Each week's activity started from field observation. For the comparative study of SRI and traditional practice, four equal-sized observation plots (for two different rice varieties) were established near the ToT Centre. Regular activities of ToT/FFS included recording phenological characteristics: tillers, height, weeds, flowering, fruiting and production; observing and recording pest and diseases; observing weather; and keeping cost-benefit records. The same activities were conducted in 15 village-level FFSs, comparing inputs and output compared for two plots (SRI and conventional) with two varieties.

5.2.3 Agroecosystem analysis (AESA)

Reports of agroecosystem analysis were prepared and presented after field observations giving conclusions and recommendations. After the presentations, discussion followed, and action plans were made for the next week. Materials like brown paper, marker pen, etc. were used for the analysis of field observation.

5.2.4 Observation plots in the research station

SRI plots in the SCDC were jointly monitored and evaluated by PARDYP and SCDC. The Centre is located in the centre of the JKW region near the main highway; therefore, many visitors from local, district and national levels visit the Centre, and they observed SRI and acquired information on it. Most of the participating farmers (ToT & FFS) visited the Centre and observed its SRI plots with different treatments. Then they discussed about advantages and disadvantages of different practices.

Performance of SRI in 2005 was poor in the SCDC due to irrigation water scarcity and improper management. But 2004 results were encouraging (see Tables 4a and 4b in Appendix 1). In 2004, in the SRI plots with different treatments, yield was increased by 6-23 %, with the maximum grains recorded in the plot that was irrigated during dry spells and applied with the full dose of chemical fertilizers (compared to TM). However, in rainfed plots, the yield increase was only 10%. Combining irrigation in dry spells with half dose of chemical fertilizer resulted in a yield increase of 11%. In the case of 50cmx50 cm spacing, the rice yield was 20 to 33 % less compared to the TM.

5.2.5 Farmer-to-farmer site visits

Series of farmer-to-farmers site visits, involving farmers who had participated in FFSs in their different villages, were organized during the vegetative growth period of rice. Visits to ToT observation plots, village-level FFS plots, and on-station trial plots at the Spice Crop Development Centre were organised. All the village-level participants had a chance to observe ToT activities and ToT observation plots.

ToT participants visited the IPM–Training of Facilitators (ToF) field school at Banepa, near to JKW, which was jointly organized by Department of Agriculture/HMG Nepal and FAO. There they observed varietal trials on rice, and presentations were made by IPM participants. SRI was one component of the IPM training. This was the important opportunity for the JKW lead farmers to share experiences with IPM participants who came from different districts of Nepal. They also visited 3 other Farmer Field Schools in Kabhre district that were conducted on rice, cauliflower and tomato.

Through this process, participants had an opportunity to observe others' fields, ToT field, ToF field, and on-station trials. Village-level participants observed what their facilitators and other farmers were doing and also the performance of SRI in different locations/conditions.

5.2.6 Mid-season focus group discussion

This was jointly organized by PARDYP and respective village-facilitators. During the FGDs, village-level FFSs with observation plots of the respective villages were also observed. PARDYP facilitators had an opportunity to interact directly with village-level FFS participants and their facilitators. Group discussion was useful to share local, national and international activities, results and experiences on SRI. Performance of SRI and non-participating farmers' opinion could also be observed. Group discussions were useful to solve some misunderstandings (e.g., a few non-adopters interestingly but incorrectly explained last year's high production as being due to SRI seed!) and to solve technical problems.

5.2.7 Farmers' day

Farmer's Day was celebrated on 3rd December, 2005, at Salpani in Jhikhu Khola. Participation was very enthusiastic. About 150 participants were present, more than half women. There was representation from different government organizations (National Agriculture Research Centre, Department of Soil Conservation and Watershed Management, SCWM), NGOs and ICIMOD as well. The head of the District Agriculture Development Office-Kabhrepalanchowk was the chief guest of this farmers' day.

On the farmers' day, all groups from the Farmer Field Schools presented their implementation procedures and results using flip charts and photograph displays, songs, reports and poems. Results were very encouraging. This was an important event to share information on SRI with national and district-level organizations, NGOs CBOs, local farmers, district-level managers, and policy-makers.

5.3 Farmer-led evaluation

5.3.1 Evaluation

PARDYP conducted a survey to assess farmers' perceptions. Fifteeen lead farmers were surveyed using a structured questionnaire. The same questionnaire was used for focus group discussion in three groups, consisting each of 5 lead farmers, after the 2005 harvest.

Survey details are given in Appendix 2. Following were some of the main findings:

- Compared to traditional methods, SRI required only 25% of seeds normally used; 50% less labor for transplanting; 50-60% less labor for irrigation; and less use of pesticides. This was considered advantageous for smallholder farmers. But the first weeding was difficult, and the cost for weeding was more by 50-60%. The cost of fertilizer and harvesting remained same.
- There was about 40-50% increase in grain yield and 20-25% increase in biomass production with SRI. Generally, overall expenditure was either the same or slightly less with SRI compared to traditional, but SRI gave more yield. Therefore, increase in yield (both biomass and grain) was a net benefit.
- Farmers perceived that SRI consumed 50 to 75% less water compared to TM. Therefore, SRI reduced the frequency of irrigation, conflict among irrigation water users, and riser failure caused by stagnant water.
- Generally, 15 day-old seedlings are better, and best spacing depends on location and soil conditions. In general, 30 cm spacing is better in lower altitudes (*besi*) and 20 cm spacing at higher altitudes (*lekh*).

5.3.2 On-Farm SRI Results 2005

In 2005, the yield increase in SRI plots varied from 8 to 93%. The highest yield was recorded with Markwanpur-1, followed by the Japanese Mansuli variety. In case of Parwanipur variety, yield with SRI varied from 14 to 38%. Details of 2005 results are given in Table 5, Appendix 1.

5.4 Dissemination of knowledge

Dissemination of knowledge through IEC materials like posters was prepared for local-level dissemination. Three key messages were put on a poster: first, key concepts and instructions on methods of SRI; second, results from selected farmers field; and third, farmer experiences. This was distributed to all the participants of the farmers' day and exchange workshop.

Reports, posters and a powerpoint presentation on SRI were packaged together in a multimedia CD ROM for a global audience, Nepal's policymakers and administrators.

PARDYP organized a one-day exchange workshop on SRI, 19th December 2005, in Kathmandu. Eight papers from different districts were presented. Thirty-six scientists and farmers were participated in the workshop.

The workshop pointed out research needs on weed management, how weeds could be efficiently removed as the first SRI weeding demands more labor than the conventional method. Research on the optimal water requirement for better growth was indicated as a second important research need. Research on varieties, age of seedlings, spacing in different agroecological zones, and soil fertility management in maintaining long-term nutrient balance were some other research concerns reflected during the workshop.

The workshop emphasized integration of SRI in the national agriculture extension policy. Programmes such as awareness-building through campaigns, radio and television programs, training through Farmer Field Schools, and farmer interactions, study tours and workshops were identified as effective methods for extension. Exchange workshops and networking were also identified to strengthen the coordination among the different line agencies. Participants also emphasized strengthening of local institutions to implement the programme at grassroots level.

The Integrated Programme Manager of the Natural Resource Management Programme of ICIMOD highlighted the importance of SRI technology in growing more rice for sustainable food security. Citing the example of low-cost technology by increasing the yield (2-3 times) in maize by inoculating seeds using rhizosphere bacteria in Sikkim-India, he emphasized the importance of low-cost technology such as SRI, which is affordable and acceptable to local farmers in the Hindu Kush-Himalayan Region.

The Chief Scientist in the Communication, Publication and Documentation Directorate of the Nepal Agriculture Research Center (NARC) who chaired the presentation session indicated that good seed is crucial for producing healthy seedlings. He also pointed out that solarization helps in producing healthy seedlings, and SRI can multiply the production. He highlighted the importance of the integrated approach of combining different techniques for optimizing the production.

The Executive Director of NARC who chaired the concluding session pointed out that any technology must contribute to sustainable yield for its wide adaptation. Research will play a greater role in polishing the technology, where the Nepal Agriculture Research Center can play an important role. He assured that NARC would be carrying out the necessary research to support developing such important innovations.

The workshop attended by national-level scientists, managers, policy makers, farmers and journalist was a very effective event to share the experience on SRI and its dissemination throughout the country.

6. Conclusions and Recommendations

6.1 Conclusions

Evaluation of results of the previous season (2004) and this season (2005) with farmers as evaluators was very encouraging. In summary PARDYP's research findings on SRI have found that:

- SRI has almost all the features required for attracting farmers in the middle mountains of the HKH. The technology has been found to increase yields without external inputs, save time required for irrigation, control disease and pest attacks, and reduce lodging problem.
- The Himalayas are diverse in terms of bio-physical, socio-economic and cultural settings. Even though this research showed that the prospects for adopting SRI in the HKH are bright, more PR&D work is required so that the technology can be improved for wider adoption.
- The success of a technology depends on facilitators. A SRI facilitator should lay emphasis on understanding the process of SRI adoption and not just obtain information about the net benefits. The present research showed that SRI farmers in the JKW were very cautious while testing and adopting the technology. They first tried in small plots and decided to increase the area under SRI only after they made an in-depth analysis of the technology using their own indicators.
- Adoption of SRI by farmers in the HKH on a large-scale will depend on how enabling the policy environment is. Any research initiative on SRI will have to bear in mind the importance of those institutions and individuals who are involved in formulation of agriculture policies. Therefore, involvement of national departments and local institutions in R&D programmes will be vital.
- Knowledge sharing is one of the best ways of empowering local institutions and farmers. Information on SRI concepts, methods and practices, along with other aspects of crop (rice) management such as seed selection and treatment, pest disease management, soil fertility management, possible uncertainties caused by any disaster must be included in the outreach package. Continuous feedback through regular meetings/ interactions, FFSs and farm visits would encourage them for

discovering problems and finding solutions jointly within communities, villages, and the region. Research focus must also direct towards farmers' concerns and knowledge gained must be shared with them through easily understandable dissemination materials.

6.2 Recommendations

- To spread SRI within or outside the watershed, FFS approach would be a very effective PR&D method. For this, local/regional or national lead farmers should be trained and used as facilitators.
- Regular visits to villages and discussion with individual adopters and non-adopters, farmer-to-farmer exchange visits at different stages of vegetative growth, and interaction among adopters and non-adopters would help to build confidence in this new rice cultivation system.
- On-station research conducted in easily accessible locations would be effective to convince the new farmers who don't know about SRI.
- Sharing of knowledge through local/regional/international-level meetings and workshops would help to understand more on SRI and to fill the research gaps.
- IEC materials like simple posters in local language could be very effective for disseminating materials to primary stakeholders, which in long run could be helpful for the sustainability of SRI.
- IEC materials like reports, posters, video clips, and powerpoint presentations packaged together on a multi-media CD-ROM would be very useful to convince global audience, Nepalese policy-makers and administrators for further SRI expansion.
- However, research on water requirements, fertilizer management, long-term soil nutrient status, weed management, best varieties, and optimal spacing for different altitudes and soil conditions are yet to be conducted to understand more about SRI.

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8. Appendices

Appendix 1

Table 1: On-Farm SRI Results, 2004

Year	Description			Average Tiller / Panicle			Production (dry weight, 12-14% moisture in grain)		SRI grain yield increase compared to traditional method (in %)
	Method	Altitude (masl)	Variety	Total No.	Fertile No.	Panicle length (cm)	Biomass (t/ha)	Grain (t/ha)	
Lamdihi	SRI			20	19	19	12.5	7.12	
	TM	850	Makawanpur1	8	7		11.5	6.7	6
Kubinde	SRI						8.5	8.0	
	TM	860	Parwanipur				5.5	5.5	45
Patlekhet 1	SRI			11	9	19	4.7	5.0	
	TM	1200	Parwanipur				4.7	4.9	2
Dhotra 1	SRI						6.5	5.9	
	TM	850	Parwanipur				3.5	5.3	11
Dhotra 2	SRI		Japanese				7.0	6.6	
	TM	840	mansuli				8.5	5.3	25
Kalchhe 1	SRI		Japanese	33	23	21	9.4	7.0	
	TM	875	mansuli				9.4	6.4	9
Kalchhe 2	SRI		Japanese	35	23	20	4.48	7.13	
	TM	875	mansuli				6.95	5.8	23
Patlekhet 2	SRI		Japanese	13	12	20	7.0	5.0	
	TM	990	mansuli				7.5	3.0	67
Kalchhe 3	SRI		Japanese	20	16	19	7.5	7.8	
	TM	875	mansuli				7.0	5.8	34
Kalchhe 4	SRI		Japanese	12	11	20	4.7	7.4	
	TM	865	mansuli				4.6	5.2	42
Patlekhet 3	SRI	1150	Japanese mansuli	14	13	18	4.4	2.8	12

Table 2: Results and experiences shared by the previous adopters

		F1	F2	F3	F4	F5	F6	F7	F8	F9
Expenditure on Seed	SRI	Less	Less	90 % less seed	Very less seed	250 gram seed /ropani	Less	Less	---	75 % less seed
	TM		--	---	-	3.5 kg seed /ropani	--	--	---	
Labour requirement	SRI	Same as TM (less during planting; double during first weeding, and less during harvest)	Same as TM, more labor for the first weeding	Same as TM, more labor for the first weeding	Same as TM	First time weeding: 2x more labor/ ropani Finally, same as TM	Same for both methods	More labor in weeding and less in harvesting	More labor in weeding; finally same as TM	10 person / ropani
	TM	---	---	--		More during plantation	---		More labor for irrigation	7 person/ropani
Fertilizer input	SRI	Requires 50% less chemical fertilizer	Requires 25% less chemical fertilizer	Requires less chemical fertilizer	Requires less chemical fertilizer	Requires 40% less chemical fertilizer	Requires 50% less chemical fertilizer	Requires equal amount of compost, but less chemical fertilizer	Requires less chemical fertilizer	Requires less chemical fertilizer
	TM	--	--				---			---
Pesticide input		Not applied in both cases								

Yield	SRI	Double (23% more)*	20% more yield and better quality (2% more)*	50% more yield (34% more)*	40% more yield	40% more yield (9% more)*	More than TM (45% more)*	Equal yield, but SRI good quality	75% yield increased (67% more)*	10 % more yield
	TM	-	Lower quality grain (more husk)	Poor quality	----	Low quality grain	---	Low quality grain (more husk)		---
Straw	SRI	More and good quality (Negative)*	Equal, long and good quality (Same)*	Equal and good quality (7% more)*	Same as TM	Same and good quality (Same)*	80% yield increase, with good quality (55% more)*	Less production	Increased 50% yield (Negative)*	30% increase
	TM				--	--	---	More than SRI	---	---
Advantages	SRI	Easy to transplant; less irrigation water required; can be grown on rainfed land	----	Can be grown with less irrigation water	---	Easy to irrigate; improvement of soil environment; easy to harvest	Easy to plant; less disturbance by rats	--	Need less irrigation water	---
	TM	---	---	---	---	--	---	Easy to weed	Easy to weed;	

Disadvantages	SRI	More labor during first weeding	Difficult to weed, difficult to grow in wetland	---	---	---	---	Difficult to plant; more time and labor during weeding	---	More time in weeding
	TM	Needs more irrigation water; cannot be transplanted in rainfed land	---	Needs more irrigation water, conflict during irrigation	---	---	---	Needs more irrigation water; problem of small slides on terraces	Needs more irrigation water; problem of small slides and terrace collapse	More time for irrigation
Future plans		Wants to cultivate on larger area than last year	Wants to grow in larger area than last year	Wants to cultivate on dry land and wants to increase area	Wants to cultivate on 3 ropanis of land (~ 1500 sq m)	Wants to cultivate on one ropani land	Wants to extend to all of his land	Wants to expand in bigger area	---	Wants to expand in a larger area than last year.
Suggestions		---	---	--	---	Suggests others to start with small area	Suggests others to adopt	Suggests others to adopt after a trial	Suggests others to try once.	---

* According to the scientifically-measured data

1 ropani: ~ 508 sq. m. SRI: System of Rice Intensification TM: Traditional Method

Names of the farmers		**Villages**	**Names of the farmers**		**Villages**
F1:	Ambika Humagain	Patlekhet-Kalchhe	F6:	Indra Tamang	Hokse - Kubhinde
F2:	Muktinath Ghimire	Patlekhet - 4	F7:	Laxmi Sharma	Patlekhet - 4, Hanumankharka
F3:	Ram Prasad Humagain	Patlekhet – Kalchhe	F8:	Dornath Gotame	Patlekhet - 8, Madhayapur
F4:	Dharma Bahadur Magar	Baluwa – Anpghari	F9:	Uttam Adhikari	Patlekhet - 8, Kalchhe
F5:	Laxman Adhikari	Patlekhet - Kalchhe			

Table 3: Facilitators and number of village FFS participants

S.N.	Facilitator	Location	Participants	Participants plot	Remarks
1	Ambika Humagain	Kalchhe	9	7	
2	Muktinath Ghimire	Patalekhet-4	5	4	
3	Rajendra Phuyal and Nava Raj Pyakurel	Kabre	14	2	Jointly conducted
4	Dornath Gautam	Patalekhet-8	9	2	
5	Harisaran Pathak and Krishna Prasad Sapkota	Patalekhet-8	7	1	Jointly conducted
6	Man B. Danuwar	Baluwa	11	1	
7	Sagar Danuwar	Dhotra	5	2	
8	Mina Kayastha	Panchkhal-9, Dhunganabesi	4	1	
9	Deepak Acharya	Chiuribot	7	2	
10	Shyam B. Danuwar	Pipaltar	3	3	
11	Chandika Pathak	Bela	3	1	
12	Hirakaji Shrestha	Anpghari	5	1	
13	Nava Raj Pyakurel	Phulbari		1	only observation field
14	Rekha Kafle	Hokse	3	1	
15	Narayen Prasad Sedain	Kharekthok	5	1	
16	Bhawani Sanjel	PARDYP Staff			left PARDYP
17	Kamal Humagain	PARDYP Staff			

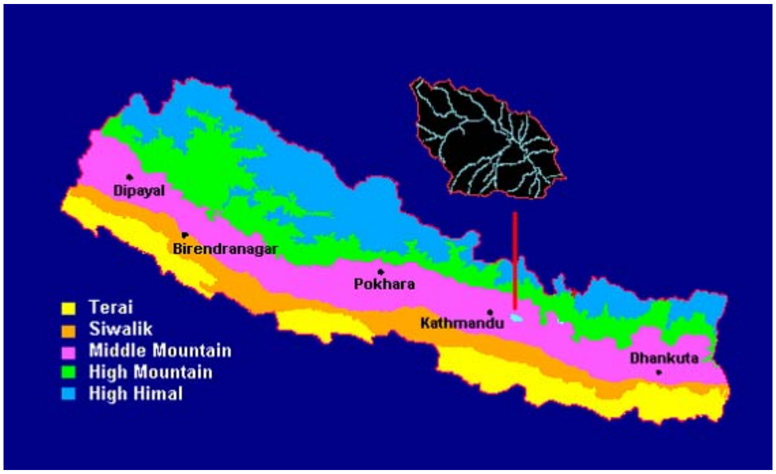

Figure 1: **Physiographic regions of Nepal and the JKW**

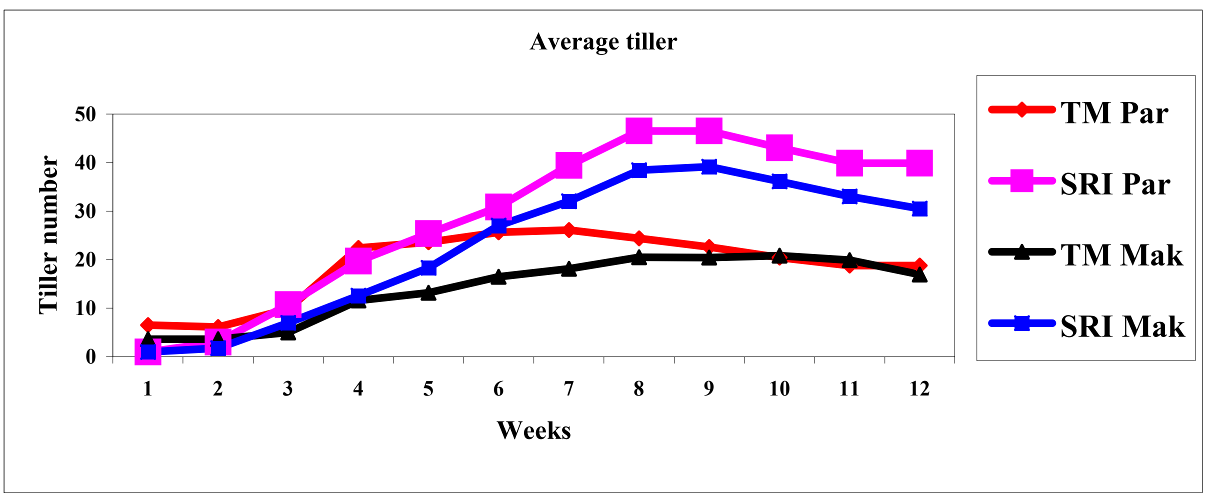

Figure 2a: **Weekly tillers recorded at the ToT plots**

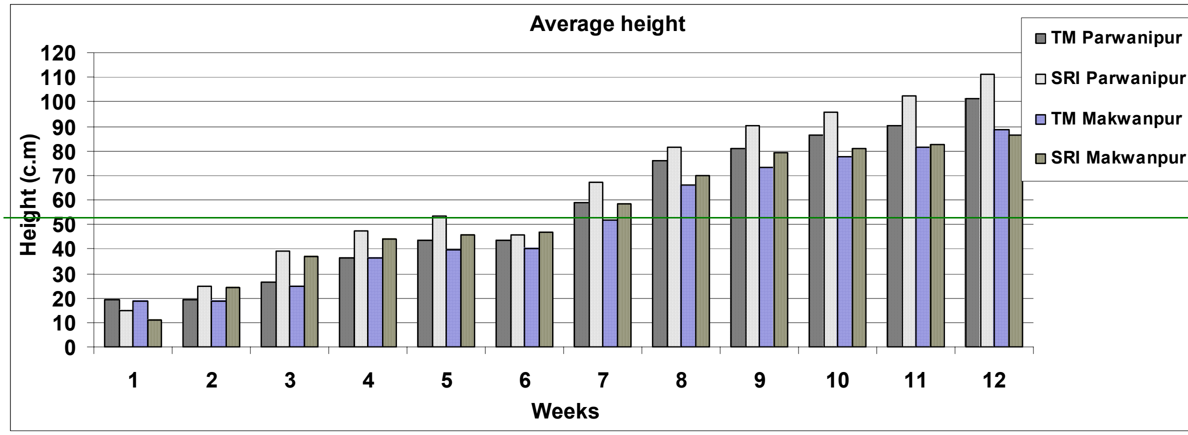

Figure 2b: **Weekly height recorded at the ToT plots**

Table 4a: On-station SRI treatments, 2004

General descriptions	Spices Crop Development Center (SCDC), Tamaghat, 880 m asl Rice variety: Makanwpur-1 Age of seedlings: 12 days (SRI), 25 days (TM) Weeding: manual	
Treatments	SRI-1	Planting distance: 25*25 cm Irrigation: Rain fed Fertilizer input: National recommended dose
	SRI-2	Planting distance: 25*25 cm Irrigation: Rain fed Fertilizer input: Half of National recommended dose + half dose of compost
	SRI-3	Planting distance: 25*25 cm Irrigation: Rain fed Fertilizer input: National recommended dose Soybean intercropped in between rice plants
	SRI-4	Planting distance: 50*50 cm Irrigation: Rain fed Fertilizer input: National recommended dose
	SRI-5	Planting distance: 25*25 cm Irrigation: Weekly (in case of dry spells) Fertilizer input: Half of National recommended dose + half dose of compost
	SRI-6	Planting distance: 25*25 cm Irrigation: Weekly (in case of dry spells) Fertilizer input: National recommended dose
	SRI-7	Planting distance: 50*50 cm Irrigation: Weekly (in case of dry spells) Fertilizer input: National recommended dose

Table 4b: On-station SRI results, 2004

Year: 2004	Method	Production (dry weight 12-14% moisture in grain)		Remarks (Grain yield compare to traditional method in %)
		Biomass (t/ha)	Grain (t/ha)	
	Traditional Method	9.0	7.0	
	SRI-1	6.9	7.7	10
	SRI-2	7.4	7.4	6
	SRI-3	6.8	8.1	16 % yield increase + 200 kg dry soyabean/ha
	SRI-4	6.9	5.6	-20
	SRI-5	7.5	7.8	11
	SRI-6	11.8	8.6	23
	SRI-7	7.4	4.7	-33

Table 5: On-farm SRI results, 2005

Year	Description			Average Tillers			Production (dry weight 14% moisture in grain)		Grain yield increase compared to traditional method (in %)
	Method	Altitude (masl)	Variety Planted	Total No.	Fertile No.	Panicle length (cm)	Biomass (t/ha)	Grain (t/ha)	
ToT plot	SRI		Mankawanpur 1	26	25	18	13.5	8.3	
	TM	820		14	13	16	5.3	4.3	93
ToT plot	SRI			28	27	27	14.7	6.8	
	TM	820	Parwanipur	16	15	16	10.7	5.3	28
	SRI			16	15	19	11.7	4.0	
Dhotra group	TM	840	Parwanipur				8.5	3.5	14
	SRI			20	19	18	5.6	4.3	
Baluwa group	TM	800	Parwanipur				4.1	3.7	16
	SRI			30	28	17	9.9	4.6	
Pipaltar group	TM	820	Parwanipur				5.2	3.4	35
	SRI						10.2	5.5	
Hokse group	TM	850	Parwanipur				8.2	4.5	22
Patalekhet –8a group	SRI		Parwanipur	11	10	16	3.6	2.2	
	TM	1100					3.4	1.6	38
Ampghari group	SRI	860	Parwanipur				7.4	6.3	
	TM						7.3	5.4	17
Madyapur group	SRI	950							
	TM		Parwanipur						*
	SRI	1185							Yield not recorded.
Bela group	TM		Parwanipur						
	SRI		Japanese Mansuli.	14	12	18	5.5	6.6	
Kalchhe group	TM	880		11	10	16	4.3	3.8	74
	SRI			15	14	20	9.5	6.0	
Chiuribot group	TM	1100	Khumal 4				5.1	4.4	36
Patlekhet-8b group	SRI	1250		14	13	19	3.3	3	
	TM		Khumal 4						
	SRI		Jharuwa Mansuli	16	15	22	5.5	3.8	
Patalekhet –4 group	TM	1200						3.1	23
Dhungana besi group	SRI	830		9	8	18	1.95	0.54	
	TM		Chaite 4						
Kharelthok group	SRI	860		18	15		10.1	10.0	8
	TM		Chaite 4				9.0	9.3	
	SRI	910							
Kabhre group	TM		Anadhi						*

Appendix 2

Farmers' perception on SRI:

PARDYP conducted a survey to assess farmers' perception. A structured questionnaire survey was conducted with 15 lead farmers, and using the same questionnaire, focus group discussion was conducted in three groups each consisting of 5 lead farmers after the 2005 harvest. The overall perceptions of the farmers are presented as follows:

How do you feel about the SRI technique?
SRI is a scientific technique of growing rice without any additional material, labor and cost. SRI gives more production (biomass and grain), saves seeds, and produces bold grains.

Comparative analysis of cost between TM and SRI methods?
Compared to traditional method, SRI requires only 25 % of seeds, requires 50% less labor for transplanting, 50-60% less labor for irrigation, and cost of pesticides is less. However, cost for weeding is more by 50-60%, and cost of fertilizer and harvest remain same.

What are the major differences between TM and SRI methods?
Compared to traditional method, weeding and water control is more difficult in SRI. Number of tillers, diameter and depth of roots are two times more, and there is less insect and diseases attack in case of SRI.

What are the major reasons for the difference in production?
More production in the SRI due to vigorous root growth and more nutrient uptake because of planting young seedlings at wide spacing and good air circulation in the field because of cracking caused by drying.

How much more is the average increase in grain production?
Farmers feel 40-50 % increase in grain production in SRI compared to traditional method.

How much more is the average increase in biomass production?
Farmers feel 20-25 % increase in biomass production in SRI compared to traditional method.

What are the difficult aspects of SRI?
The first weeding and water management (timely irrigation and drying of the land) are difficult aspects of SRI. While transplanting young seedlings for the first time, maintaining the spacing and handling the young seedling are difficult.

Do you have any alternative method of weeding?
No except manual weeding. Herbicide doesn't work in the dry and moist field conditions.

What and when are the risks if field cannot be moistened due to shortage of irrigation?
Production risk is significant when land cannot be irrigated after the first weeding, flowering and fruiting stages.

How difficult is to control water during the monsoon, esp. in waterlogging areas, to dry the land?
Draining the water to dry the field is difficult, and it is more severe in the flat lands and during monsoon period.

What age of seedling did you find better?
Generally 15 day-old seedling is better.

In the future, which do you prefer: traditional method with hybrid variety, or SRI with local variety, and why?
Farmers prefer to use local variety with SRI method, because standard method with hybrid variety requires more seeds, hybrid seed is more expensive, and second-generation hybrid seeds cannot be used.

Do you think production will be more in SRI with hybrid seed?
No experience with this, but they think production must be more.

Use of chemical fertilizer or compost: In which you think production will be more?
Farmers think that more production will be reached with chemical fertilizer, but if improved compost is used, production must be more than in the chemical fertilizer because compost improves the soil environment *(mato Khukulo hunchha*), easing ploughing.

What are the advantages of getting more tillers?
More tillers produce more grains and more straw. Therefore, more forage will be available for the livestock.

What are the difference in the productive tillers between the traditional method and SRI?
Out of total tillers, 90 % of the tillers are fertile in case of SRI, and only 77% in case of TM.

How do you perceive water saving in SRI compare to TM?
Farmers perceived that SRI consumed 50 to75 % less water compared to TM.
Conflict among irrigation water users and riser failure caused by the stagnant water was reduced with SRI.

Disease and pest resistance capability of SRI?
SRI is found to be more resistant to disease and pest, because of vigorous growth as a result of less competition for nutrients and sunlight because of the wider spacing.

What would be the appropriate spacing for SRI?

It depends on location and soil conditions. 30 cm spacing seems appropriate in low altitudes (*besi*) and 20 cm in high altitudes (*lekh*).

What you have observed on the lodging of the rice plants?
Lodging is observed less with SRI, due to longer roots in SRI.

In the long run, what would you think about the soil nutrient status?
Must be same as in traditionally planted rice because rice plants get residual fertilizer from other crops; fertilizer is also added to rice plants during its vegetative period.

Can you convince others easily about SRI?
It will be easy to convince neighbours who have seen the results, but not others who have not seen. Convincing through on-farm demonstration would be easier.