# Participatory learning for technology shaping and its dissemination: a case of Nepal

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## Introduction

System of Rice Intensification (SRI) is a new method of rice cultivation developed in Madagascar. It was first introduced outside Madagascar after 1999 in China and followed by Indonesia and India (Uphoff 2007; Prasad 2006) with the support of Cornel International Institute for Agriculture Development (CIIFAD). Rice yields by this method were found more than those by conventional method using locally available varieties, without increasing inputs (water, seed, and chemicals) and investment. This is the most important aspect of SRI for farmers who have poor resource in less developed countries.

Prof. John Duxbury of Cornell University in 1998 and 1999 tried SRI unsuccessfully at research stations of the National Agricultural Research Council. In 2001, there was another trial at the Bhairahawa research station under the National Wheat Research Program, which did not show 'the SRI effect' either, as conventional practices gave a higher yield (by 5.6%). This seemed that SRI practices 'do not work' in Nepal (Uphoff 2007). In 2003 first trial was conducted by district agriculture development office (DADO) Morang on a small plot (about 100 square meters) and the result was very encouraging. Yield of that SRI plot was more than 7 tons/ha while it was less than 4 tons/ha under the conventional plot. That result encouraged the DADO staffs very much. In the following year numbers of SRI farmers and the areas under SRI increased but in the mean time problems and challenge also appeared.

SRI is a combination of some practices used to fully exploit the potential of the rice plant. But main recommendations of SRI method (Stoop et al. 2002; Uphoff 2007) didn't work equally in every plot/place. In some plots the performance of SRI was unpleasant compared to conventional method. That was challenging situation to the DADO staffs. This paper presents those problems and the outcome we found out during the SRI dissemination program during 2003-2006 in Morang district of Nepal.

## Field activities, problems and outcome of joint learning

There was a lot of diversity in land type, fertility status, water availability for the irrigation, varieties of rice, socio-economic status of farmers, and labor availability etc. In such diversified situations we need to explore main bottlenecks and its possible solutions for the SRI farmers. First of all, DADO staffs discussed problems and then decided to conduct an in-depth study of SRI in the field. During the field study farmers reported about their farm conditions, SRI practices and results. The study showed that SRI performance was influenced by the diversified farm conditions. Similar recommendation didn't work equally everywhere, therefore practices must be adjusted/reshaped to farming situations.

*Water management*
SRI needs less water than conventional method but there must be assured irrigation facility. Alternate wetting and drying (AWD) irrigation is one of the main recommendations of SRI.

In the early stage of rice it was recommended that soil should keep moist (no stagnation of water on the field) and 3-4 times for soil drying up to cracking stage. This recommendation worked well on the loose soil with high organic matter content. But on heavy clay soil drying effect has found negative. Heavy clay soil became very hard and problematic for root growth after drying. This indicated that recommendation on water management of rice field should be based on soil type. In the loose soil with rich organic matter it could be dried up to cracking stage but heavy clay soil should keep moist for the better growth (root and shoot) of rice. Based on that reality and farmers reaction we changed our SRI recommendation of water management according to soil types after 3rd season.

*Variety and spacing*

Initially we recommended 25x25cm or 30x30cm spacing for all rice varieties in all type soils. Rice varieties used by SRI farmers in early days were long duration and high tillering capacity. The growth and development of those rice varieties went very well but some short duration and low tillering modern varieties did not achieve expect outputs. We observed that fertile tiller, panicle size and number of grains/panicle were better with wider spacing but total number of panicles per unit areas was less for some varieties. As a result, the rice production decreased. Next season we conducted trials on varieties and spacing on the farmers' field. The trials results indicated that short duration varieties and some newly released varieties were less tillering and needed closer spacing (20x20cm) than that previously recommended. The best result according to varieties is given on Table 1. Through the two previous trials we recommended three spacing 20x20, 25x25 and 30x30 cm according to rice varieties, soil fertility status and they worked well.

**Table 1.** Best yield of different rice varieties with best spacing in Morang, Nepal. 2005

| SN | Rice variety | Crop duration (days) | Highest yield (t/ha) | Best spacing for highest yield |
|---|---|---|---|---|
| 1 | Basdhan/Kanchi | 145 | 11 | 25x25 cm |
| 2 | Mansuli | 155 | 9.9 | 30x30 cm |
| 3 | Swarna | 155 | 9 | 25x25 cm |
| 4 | Sugandha | 120 | 7 | 20x20 cm |
| 5 | Radha 12 | 155 | 9.6 | 25x25 cm |
| 6 | Hardinath 1 | 120 | 8.4 | 20x20 cm |

*Weed management*

Young seedling, wider spacing, and AWD irrigation create favorable environment for weed growth. Weed management is one of the crucial tasks for SRI method. Initially DADO recommended manual weeding for SRI. It required 3-4 times of weeding for better weed management and labor requirements for such weeding were more than double compared to conventional method. Farmers reported that it was difficult to manage more labor for larger SRI field. To solve that problem in 2005 DADO introduced a two-wheelers rotary mechanical weeder (cono weeder), and farmers tried it in different type of soil and situations. One important thing for mechanical weeding was the availability of water in the field to roll the weeder. Another thing was that most of the female labor felt it was very difficult to roll it in the field. As a result, only male labor used it in their field. Although rotary weeder cut down the labor requirement by 3/4th, there was a problem, as conventionally rice weeding is done by female labor. Thus, some farmers made their own weeder (light weight and easy to operate), some maintained closer spacing (20x20cm) to reduce weed growth and some others combined chemical (use weedicide) and manual weeding for better weed management. Based on our experience, we suggested different weed management strategies for the SRI farmers.

## Trends of SRI dissemination in Morang

In the beginning it was very difficult to convince farmers to change their conventional rice farming practices. Farmers didn't believe that younger delicate seedlings could survive; they were scared of wider spacing of planting; water management was different from their conventional method because they always hold/flooded water into their field conventionally; and they didn't believe the alternate waiting and drying system. Slowly farmers and extension workers gained confidence on SRI practices after joint trials and learning experience, and they felt more comfortable to communicate and interact with each other. Such interaction helped them to modify/re-shape the general recommendations according to local situations and such modification in technology transfer has accelerated SRI dissemination in later stage. Figure 1 shows the SRI dissemination trends in Morang. The SRI has spread more than 30 districts in Nepal.

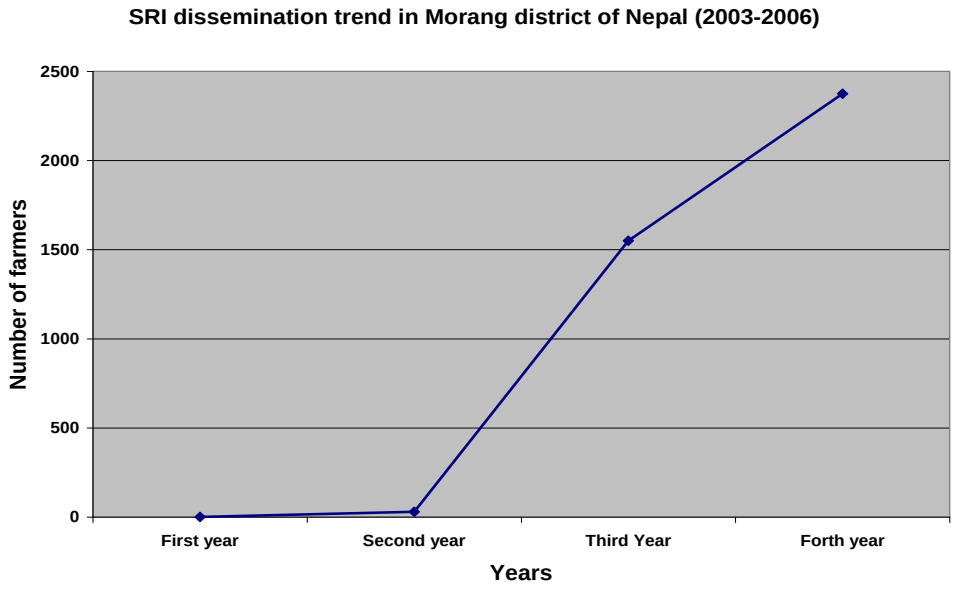


**Figure 1**: SRI dissemination trend in Morang district

## Change in the attitude of extension worker and farmers

Initially most of the extension workers thought that they were the source of information and farmers were passive recipients of technical information, therefore they always tried to influence and dictate farmers to adopt new technology. However, when they started to work with farmers, they found some failure cases of their own recommendations. As a result, they started to discuss this with other extension workers and subject matter specialist (SMS), and they went to the fields to learn with farmers. Because farmers are always in the field and they observed and noticed all changes of their plants, this provided opportunities for the extension workers to learn more knowledge about plant and to develop a partnership with farmers. By doing this, farmers slowly started to open up and share their experiences and thinking. When DADO started to incorporate their findings/suggestions into new technology, farmers also became proactive to test and disseminate new information. Both extension workers and farmers learned from each other to disseminate new technology like SRI.

## Conclusion

Participation of farmers in all steps of SRI trials and demonstrations help to re-shape the technology. Extension workers working together with farmers in diversified farming and agro-ecological conditions enhanced some of the SRI recommendations/practices according to soil type and other conditions, in particular varieties and farmers' socio-economic situation. These modifications proved to have good results and SRI has been disseminated to several districts of the country. These results emphasized that such partnership and modification can be helpful to increase technology acceptance, especially for those farmers who have poor resource and living far from modern agriculture development.

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