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

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Abstract. Agriculture in developing countries is complex and vulnerable, especially for resource-poor farmers. They require location-specific technologies and solutions developed with their active involvement. In Nepal, several top-down approaches have been tried but there appeared to be challenges in addressing the needs of poor farmers. Participatory approaches emphasise involvement of local farmers and interaction between farmers, extension workers and researchers in order to understand local needs, challenges and opportunities, and to adjust or design technology for the specific situation. This paper focuses on the joint learning process applied to the introduction of System of Rice Intensification (SRI) in Nepal. The program was conducted during 2003-2006 in the Morang district of eastern Nepal.

Keywords: Appropriate technology, SRI, participation, poor farmers, local resource, local knowledge.

Introduction

The System of Rice Intensification (SRI) is a new method of rice cultivation developed in Madagascar. It has been introduced to other parts of the world since 1999, first in China followed by Indonesia and India (Prasad 2006; Uphoff 2007), with the support of the Cornell International Institute for Agriculture Development (CIIFAD). Later it was introduced in many countries in Africa, Asia and the Americas (Prasad 2006). All countries have reported high yields of rice and profitability due to SRI (Barison 2002; Koma 2002; Anthofer 2004; Satyanarayana 2004; Kabir 2006; Sato 2006; Uprety 2006). Rice yields were increased using this method when compared to the conventional method, without increasing inputs and investment. This is the most important aspect of SRI for resource-poor farmers and less developed countries.

Following an initiative of Professor John Duxbury of Cornell University, SRI was tried rather unsuccessfully at research stations of the National Agricultural Research Council in Nepal during 1998 and 1999. In 2001, there was another trial at the Bhairahawa research station under the National Wheat Research Program. These did not show 'the SRI effect' either, as conventional practices gave a greater yield (by 5.6%). This seemed to establish the belief that SRI practices 'do not work' in Nepal (Uphoff 2007). The first time I heard about this method was in the Low External Input and Sustainable Agriculture (LEISA) magazine, which lead to correspondence with Professor Norman Uphoff about trialling it in the Morang district of eastern Nepal. At that time I did not know about the past failures of SRI in Nepal. In 2003 the first trial was conducted by the district agriculture development office (DADO) in Morang on a small plot (about 100 square meters) and the results were very encouraging. The yield was more than seven tonnes per hectare, whereas the conventional method yielded less than four tonnes per hectare at the trial area. These results were very encouraging to the DADO staff. In the following year, the number of SRI farmers and the area under SRI was increased, but problems and challenges also appeared.

SRI is a combination of principles and practices used to fully exploit the potential of the rice plant. The main technological components of SRI (Stoop et al. 2002; Uphoff 2007) include:

- Rapid, careful and shallow transplanting of very young seedlings (10–15 days old).
- Single seedling transplanting rather than clumps of 4
- Wide spacing between the plants in a square pattern (25x25 cm or wider)
- No continuous flooding (but alternate wetting and drying) during the vegetative stage and a thin layer of water (moisten soil) kept on the field during reproductive stage
- Controlling weeds by weeding with a rotating hoe and applying compost in preference to chemical fertilizers.

The main recommendations of SRI mentioned above did not work equally in every plot or were weaker than rice grown using the conventional method. This was a challenging situation for the DADO staff. The disappointing trials demonstrated the risks of SRI adoption, especially for those farmers who want to increase their rice production but are resource poor (due to unreliable water supplies, less fertile land, less investment). This paper presents the problems we found and the outcomes of working with the farmers during the SRI dissemination program.

Field activities, problems and outcomes of joint learning

I was leading the SRI movement (introduction and dissemination) in the Morang district of Nepal. I received the 'Nepal Development Marketplace Award 2005' (NDM 2005), organized by the World Bank, Nepal, to disseminate SRI in the Morang and Panchthar districts of eastern Nepal. It was a big challenge to achieve the objectives of the SRI dissemination project. There was a lot of diversity in land type, fertility status, water availability for irrigation, varieties of rice, socio-economic status of farmers, labour availability and many other aspects. In such diversified situations, we needed to speed up the SRI movement to achieve our target specified for the NDM project. To do this, it was necessary to explore the main bottlenecks and the possible solutions for the SRI farmers. DADO staff discussed the problems and it was decided to conduct an in-depth study of SRI reality in the field. During the field study farmers reported their farm condition, the SRI practices they followed and the results. The study showed that SRI performance was influenced by the farm conditions. That is, similar recommendations did not work equally everywhere and, therefore, practices had to be adjusted/reshaped according to the farming situation. It was found that following modified recommendations gave better results.

1. Water management

SRI needs less water than the conventional method but there must be an assured irrigation facility. Alternate wetting and drying (AWD) irrigation is one of the main recommendations of SRI. In the early stage of rice growth, it was recommended that the soil should be kept moist without stagnation of water on the field, and drying soil 3-4 times (up to the cracking stage) during the growing stage. This recommendation worked well on loose soils with high organic matter content. On heavy clay soils, the drying effect was found to have negative impacts. Heavy clay soils became very hard after drying, which is problematic for root growth. These results showed how the recommendations for water management of rice fields needed to be adjusted according to soil type—loose soils with rich organic matter can be dried up to the cracking stage but heavy clay soil should be kept moist for the better growth (root and shoot) of rice. Based on that reality and the farmer's reactions, we changed our SRI recommendation of water management according to soil types after the third season.

2. Variety and spacing

Initially we recommended 25x25 cm or 30x30 cm spacing for all rice varieties in all soil types. Rice varieties used by SRI farmers in the early days had a long duration and high tillering capacity. The growth and development of currently used rice varieties were very good but expected output has not been achieved by other short duration and low tillering modern varieties. We observed that fertile tiller, panicle size and number of grains per panicle increased with wider spacing, but the total number of panicles per unit area was less in some varieties. That is, the expected production was decreased. The next season we conducted trials on different varieties and spacing on the farmers' fields. The trial results demonstrated the appropriate adjustments required. Short duration varieties and some newly released varieties had reduced tillering habits and needed to be transplanted closer (20x20 cm) than previously recommended. The best results according to variety are given in Table 1. By this joint learning, we recommended three spacings 20x20, 25x25 and 30x30 cm according to rice variety and soil fertility status. This worked well, and farmers and extension workers became experts on adjusting spacings according to variety and soil.

Table 1. Best spacing for greatest yield of different rice varieties in Morang, Nepal (2005)

Site No.	Rice variety	Crop duration (days)	Highest yield (t/ha)	Best spacing for greatest 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

3. Weed management

Young seedlings, wider spacings and AWD irrigation create a favourable environment for weeds. Weed management is the one of the crucial tasks for the SRI method. Initially DADO recommended 3-4 manual weedings for SRI, but the labour requirements for this were more than doubled when compared to the conventional method. Farmers reported that it was difficult to manage the increased labour for the larger SRI fields. To solve this problem, DADO introduced mechanical weeders (cono weeder—a two-wheeled rotary weeder) in 2005. Farmers tried it in different types of soil and situations. One important issue for mechanical weeding was the availability of water on the field to roll the weeder. Furthermore, most of the female labour force felt it was very difficult to roll the weeder on the field, and only male labourers used it in their fields. The rotary weeder cut down the labour requirement of SRI by three-quarters but its use was problematic, particularly because rice weeding is conventionally done by female labourers. Some farmers made their own weeders that were lightweight and easy to operate, (see Plates 1-4) and some maintained closer spacings (20x20 cm) to reduce weed growth. Other farmers used a combination of chemicals (herbicides) and manual weeding for better weed management. These adjustments were done in partnership with the farmers. Strategies were different on different farms and were influenced by water availability, soil type, labour type and labour availability. Based on our joint learning we suggested different weed management strategies for the SRI farmers according to their situations.

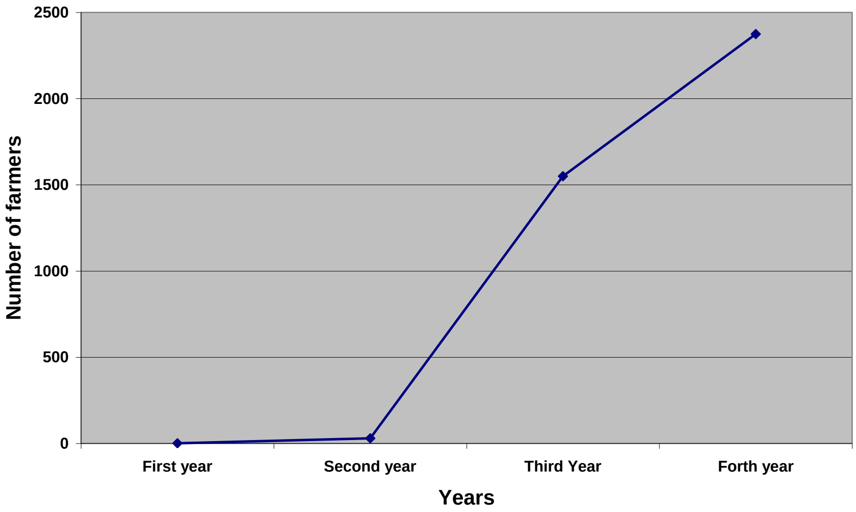
Plate 1 and 2. Farmer-made weeders

Plate 3 and 4. Farmer-made markers

Trends of SRI dissemination in Morang

In the beginning it was very difficult to convince farmers to change their conventional rice farming practices. Farmers did not believe in the survival of younger, delicate seedlings, and wider-spaced plantings scared them about not covering the total field with rice plants. Water management was another difficulty because traditionally they always held or flooded water on their fields. They were sceptical about the alternate wetting and drying system. Even after seeing the reality on the fields, it was very difficult for the farmers to believe. Slowly farmers and extension workers gained confidence in the SRI practices. After joint trials and learning, they felt more comfortable to communicate and interact with each other. Such interaction helped to modify and re-shape the general recommendations according to local situations. Such modifications to the technology have speed-up SRI dissemination in the later stages of the project. Figure 1 shows the growth of SRI in Morang. In addition to Morang, SRI was introduced to more than 30 districts of Nepal. To disseminate SRI in the other districts, newspapers and television played a very important role. Most of the leading media, including the BBC World Service, reported on our SRI activities and performances (Haviland 2005; Dixit 2005).

Fig 1. SRI dissemination trend in Morang district



Change in the attitude of extension workers and farmers

Initially most of the extension workers thought they were a source of information and the farmers were passive recipients of technical information. They always tried to influence and dictate to the farmers about new technologies for change. When they started to work with farmers and saw first-hand some failures based on their own recommendations, they slowly started to re-think their information. Initially, they discussed the issues with other extension workers and subject matter specialists (SMS). They then went to the fields to begin a review with the farmers as farmers are always in the field and observe all the changes with their plants. This closeness gives the farmers greater knowledge about the plant and its development. Having the extension workers working together with the farmers was an important opportunity for joint learning. Through this joint effort they found out several new facts and learnt from each other. The farmers initially worked as passive recipients, but they slowly started to open up and present their experiences and thinking. When DADO started to incorporate their findings and suggestions, the farmers became pro-active to test and disseminate the new information and tools (Plate 1-4) and techniques. Both the extension workers and farmers considered each other as their partners to re-shape technology or invent new knowledge and to disseminate new technology like SRI. This is the main learning by the SRI dissemination project.

Conclusion

Participation of farmers in all steps of the SRI trials and demonstrations helped to reshape the technology. Joint work of extension workers and farmers in diversified farming and agro-ecological conditions encouraged modification of some of the SRI recommendations and practices. This lead to the repackaging of SRI according to soil type and other conditions, in particular rice varieties and farmer socio-economic situations. These modifications proved to have good results and SRI has been disseminated to several districts of the country. SRI appeared to catch-on in areas where the DADO had not been active in the past. These outcomes brought a change in the thinking of extension workers. They realised that joint learning benefited farmers, extension workers and researchers. These results emphasised that such partnerships and modifications can be helpful to increase technology acceptance, especially for those resource-poor farmers living far from modern agriculture development.

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