Photo: Author

SRI seedlings are planted at the recommended spacing with the help of a string.

SRI takes root in Nepal

Rajendra Uprety

The System of Rice Intensification (SRI) is now spreading widely around the world, being further developed and modified as more experience is gained and new conditions are encountered. It is proving to be a very dynamic approach to rice cultivation, and should not be regarded as a finished or fixed technology. SRI was introduced into Nepal around 1999 by some researchers in the Nepal Agricultural Research Council (NARC), but they did not get very encouraging results when they first tried it out at the Khumaltar research station.

In 2001, various development workers started testing SRI in their own areas. The National Wheat Research Programme and the NGO Appropriate Technology Asia began working with SRI methods in Bhairahawa and the Kathmandu valley. In 2002, different technical advisors tried out SRI methods in the Sunsari-Morang irrigation system in the districts of Morang and Sunsari via Farmer Field Schools operating there under a DFID-funded project. Farmers were encouraged enough by the results from the trials to continue with their SRI activities.

From 2003 onwards, the District Agriculture Development Office for Morang began evaluating SRI and disseminating it among farmers. Very impressive results rapidly spurred the growth of the SRI movement in Nepal. Contributory factors included the active participation of farmers and high levels of awareness of SRI among farmers, the media and policy makers. Every opportunity was used to publicise the successes achieved. This illustrates how effective communication and use of the media can be in disseminating an innovation such as SRI over a larger area.

There was some initial resistance and criticism from senior scientists, agriculturists and policymakers who had heard about the disappointing results from the Khumaltar trials and who had little other information about SRI. However, with a favourable and growing response from farmers to this new opportunity, the innovation has "taken root". Whenever possible, we have brought senior officials, journalists and media personnel to see our SRI fields in person. Together with publications, the positive impressions formed during these visits have created curiosity among agriculturists and development workers about SRI. As more concrete results emerged, earlier opposition was overcome and was followed by encouragement and support from the Department of Agriculture and other organisations. Even the BBC World Service has run a short feature on SRI results from Morang in its "Asia Today" programme (September 2005).

From a small start on a plot of 100 m^2, which first showed the effect of SRI practices, we were able to disseminate SRI in first three and then 15 Village Development Committee areas within Morang district in 2004. This expansion of activities meant that

we had insufficient financial resources for sustaining our support activities, but additional funding enabled us to expand our work within Morang and Panchthar districts (see issue 21.2 of the *LEISA Magazine*). This money was used to prepare and publish new SRI information materials (booklets, posters and a video) to reach a much wider audience. We also started broadcasting agricultural programmes about SRI through the local FM radio. This strategy created more demand for training among farmers, resulting in more SRI experiences in the districts.

Difficulties in scaling up

Other District Agriculture Development Offices and NGOs have started promoting SRI activities in their own areas. Further trials and demonstrations are giving more people confidence in SRI methods and encouraging them to disseminate them. But with increased expansion of SRI farming, some difficulties also arose. Among the problems affecting the scaling up of SRI, weeding is the most prominent.

Manual weeding is expensive and if farmers use hired labour, it is not very effective, as hired-in labourers are careless when removing weeds. They often leave the roots of the weeds in the soil, so the weeds emerge again within a few days. This creates problems and makes weed management expensive. Small farmers cultivating their own land themselves do not face such problems as they do the work with more care. Another difficulty arises when weeding is done late. This allows weeds to become established and makes removing them more difficult. To counter these difficulties, we supplied some rotary hoe weeders for mechanical hand weeding and provided training in timely weed management. This helped resolve the weeding problems and reduced production costs.

With SRI, the amount of labour required makes manual weeding twice as expensive as in conventional rice production. However, by using a mechanical hand weeder (rotary hoe), the cost of weeding can be reduced to less than under conventional methods, even when doing three weedings instead of one. Additional weedings add as much as 2 t/ha to the yield, which substantially increases the profitability of SRI (see Table 1). A field kept free of weeds during the first month gives early tillering, leading to more (and bigger) panicles. We also think that the yield enhancement results from the effects of soil aeration on soil biological activity.

Other problems encountered relate to water management. Our farmers found that the standard SRI water management recommendation was not appropriate for all types of soil. The practice of alternatively wetting and drying the soil up to the cracking stage was very effective together with the other SRI practices, provided that their soil was loose and friable or that had high organic matter content.

However, with heavy clay soil, this alternative system of wetting and drying was seen to be harmful during the vegetative growth stage because when such a soil dries to the cracking stage, it becomes very hard, inhibiting the plants' root development and nutrient absorption. This has led us to change our recommendation for SRI water management and to adapt the recommendations to different soil types. This has brought positive results regarding water management.

Varietal differences have also been found to be important with SRI methods. Generally, most local or indigenous varieties have

Photo: Author

Preparation of a nursery bed.

Table 1. Yield increment with additional weeding by SRI and conventional methods

Number of weedings with SRI	Average productivity with SRI (t/ha)	Cost of manual weeding (Rs./ha)	Cost of mechanical weeding (Rs./ha)	Calculated differences in net income (Rs./ha)	
				MW	RW
One	5.2	2250	450	30 786	32 586
Two	5.8	3750	900	36 296	39 146
Three	7.8	4500	1350	55 184	58 334
Conventional	3.1	2250	-	8288	

MW: Manual weeding; RW: Use of rotary weeder

performed well with SRI techniques. But the results of a few recently released improved varieties (like Hardinath 1) were not as good. Such varieties perform well with close spacing and high input application, but not as well with SRI practices due to their low tillering growth habits. So we need to assess the responses of different varieties and to make specific varietal recommendations for use with SRI practices.

There are several learning experiences that we have gained about SRI through our fieldwork, both from farmers' reactions and from experience-sharing workshops with other people and organisations working within the SRI movement in Nepal. In 2005, we shared experiences in a workshop organised by ICIMOD (the International Centre for Integrated Mountain Development) in Kathmandu, with representatives of many different organisations.

SRI is becoming popular

After 3 to 4 years of effort by different organisations and individuals, SRI is becoming popular and establishing a position within the mainstream of agriculture development in Nepal. For individual farmers, SRI is becoming attractive due to its greater profitability compared to conventional methods. Conventional rice production, with its high reliance on purchased inputs, is less attractive because of low productivity relative to the high production costs. The prices of inputs (improved seed, fuel, fertilizers and pesticides) have increased two to three fold over the last 10-15 years, and these increased production costs have cut into the profit margins of rice cultivation.

Through SRI methods, farmers are able to get 3 to 4 times as much profit than from conventional methods and this gives farmers an incentive to take up the new practices. These are initially more labour-intensive while farmers are learning the new methods. But once the skills and experience are acquired, and taking advantage of mechanical hand weeders to reduce labour input, farmers can turn SRI into a labour-saving methodology that is good for them, for consumers and for the environment.

A farmer's comparison

Shree Narayan Dhami is a member of the Motipur Village Development Committee Ward No.4, in Morang district. As a farmer, he has been growing rice for many years. Having heard about SRI, he decided to try it out in the 2006 early season (between March and July). He planted 6.5 kathas (approximately 2160 m²) with seedlings of the Chaite-2 variety and followed all the SRI principles. He sowed a similar field in the conventional way. His SRI crop was sowed in lines so that he could use a rotary hoe weeder, which he could not use in the conventional field. He produced 260 kg rice grains per katha in the SRI field, and only 100 kg/katha in the conventional field. He sold half of his SRI product for seed, for a high price (because the grain size and quality was very good). He found that the rotary weeder was very easy to use and very effective, needing no more help than that of his young son. Having seen and analysed the results, he plans to grow SRI rice on all of his 1.5 hectares of land in the 2007 season, saying that many of his neighbours in Motipur plan to so as well.

Practice/purchase	Costs, SRI rice (Rs./ha)	Costs, conventional rice (Rs./ha)	Difference (Rs./ha)
Seed	125	1250	1125
Nursery preparation	50	500	450
Land preparation	7500	7500	0
Compost	4800	2400	-2400
Fertilizers	1500	3000	1500
Transplanting	1250	1500	250
Irrigation	200	400	200
Weeding	750	1350	600
Pesticide	0	500	500
Harvesting	1750	1500	-250
Total cost	17 925	19 900	1975
Revenue, grain	60 450	23 250	37 200
Revenue, by-product	3000	3000	0
Total revenue	63 450	26 250	37 200
Net profit	45 525	6350	39 175

Conclusions

Rice is the most important crop in Nepal, in terms of sales volume and as the main staple food for Nepalese people. Despite much investment and efforts, the productivity of rice production in Nepal has remained the lowest within the region. Production has failed to keep pace with population growth, and the country has now become a net food importer with an annual deficit of more that 150 000 tons. Increasing rice production can solve this food-deficit problem and save millions of rupees now spent by the government every year in bringing grains to food-deficit areas. The performance of SRI raises the hope among policy makers, development workers and farmers of solving this national problem.

SRI is a very dynamic method which is being developed further on the basis of local experiences and findings. Within a very short time span it is starting to spread rapidly within Nepal and other parts of the world. As a new method, its promoters have faced several difficulties, because it differs markedly from conventional rice farming methods. But with continued effort, further experience and adjustment of practices to suit local situations, SRI is becoming popular and spreading across the country.

Initially, just a few people took an interest in SRI. But today, there are a growing number of District Development Offices, NGOs and private sector actors coming forward to promote SRI methods within Nepal. Farmer initiatives in spreading SRI are also expanding. The main attraction behind SRI is its suitability for a resource-poor country like Nepal. Farmers find the approach advantageous because of SRI's greater productivity and higher profits due to lower requirements for seed, fertilizers, pesticides, and irrigation water. In addition to saving water, SRI helps reduce soil and water pollution and conserve rice biodiversity for sustainable development. In Nepal, SRI is becoming seen as the best solution for its food-deficit problems and for enhancing food security in remote areas where modern inputs are costly and difficult to obtain. ■

Rajendra Uprety. Agriculture Extension Officer, District Agriculture Development Office, Morang, Nepal. E-mail: dadomorang@wlink.com.np

References
- ICIMOD, 2005. **Proceedings of the SRI workshop organised by the International Centre for Integrated Mountain Development (ICIMOD)**, Kathmandu, December 2005.
- IRRI, 2006. **Bringing hope, improving lives: Strategic Plan 2007-2015.** Los Baños, Philippines.
- Uprety, R., 2006. **Economic analysis of System of Rice Intensification (SRI) methods in Morang district of Nepal, main season 2005.** Agricultural Development Journal, Vol.3, No.3, Directorate of Agriculture Training, Department of Agriculture, Nepal.
- Uprety, R., 2005. **Performance of SRI in Nepal**. *LEISA Magazine,* Volume 21, No.2, June 2005.