REPORT ON SYSTEM OF RICE INTENSIFICATION (SRI) TRIALS AT LOBESA, BHUTAN -- 2007 SEASON

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Introduction

The results of the first SRI trials, both on-farm and on-station at elevations between 1600 and 2000 masl in 2006 were quite successful, showing better crop performance in terms of yield and various yield parameters than on comparable plots grown with standard methods. In 2007, a follow-up study was carried out at somewhat lower elevations (1443 masl) to assess the performance of SRI and scaling up of its activities in other parts of the country.

Trials were conducted in two sites at Lobesa in Western Bhutan, using an improved rice variety (IR64) and an aromatic variety introduced from Sri Lanka (NRTI1), using both SRI and conventional methods of rice cultivation. A batch of 23 agriculture trainees of the College of Natural Resources were trained on SRI methods of rice cultivation and were involved in this entire process. The field used for the trials was leased out by farmers to the College of Natural Resources.

The practices used on the SRI plots were transplanting one young seedling per hill, wide spacing in a square pattern, intermittent irrigation, application of organic matter, and timely weeding. Soil solarization technique was used in the nursery to ensure healthy seedlings. Also, seeds were pre-soaked in water for 24 hours before sowing in the solarized bed.

Seedlings were transplanted at the 3-leaf stage, attainable at about 14 – 16 days at the given altitude. Transplanting time was from 27 to 29th June, and harvesting time was from 28th to 29th October. SRI plots indicated good results in comparison with conventional practice as seen below. This report presents the results of these trials in the rice-growing season of year 2007 (Table 1).

Methodology

1. **Design**

The experimental design was a simple randomized complete block design (RCBD) with 4 replications at site 1 and with 3 replications at site 2, with a total of four treatments at each site. Plot size was 5 x 4 m^2, and there were a total of 15 plots in each site. The treatments were:

1. 20 x 20 cm spacing, with 3-leaf stage seedling age
2. 30 x 30 cm spacing, with 3-leaf stage seedling age
3. Random spacing, with 3-leaf stage seedling age
4. Control (farmers' normal practice, > 7 leaf stage)

For the control plots, farmers' normal practices of rice cultivation were followed, with transplanting of older seedlings at close spacing (less than 15 cm) in a bunch; maintaining about 7 cm water level from transplantation up to 2 weeks before harvest; and weeding 2 to 3 times.

2. **Management Practices**

Water management in the SRI plots was done by keeping the soil moist and never flooded during the plants' vegetative growth phase; rather a cycle of alternate wetting (up to 2 cm water level) and drying (about to crack) was executed. Then during panicle initiation and the plants' reproductive phase, a thin layer of water (2 - 3 cm) was maintained. In contrast, the control plots were kept flooded with about 7 cm water level for the entire crop cycle.

Timely weeding was done as desired in SRI plots using a rotary weeder and some crude tools were used for the SRI plots randomly-spaced to aid the manual weeding. The first weeding was carried out at about 2 weeks after transplanting, and subsequent weedings at an interval of 2-3 weeks in between.

A mixture of compost (leaf mould) and cow dung was applied in all the plots before transplanting the seedlings. Chemical vs. organic fertilization was not evaluated in these trials. Additional cattle manures were applied at the vegetative growth phase in all the plots.

Agronomic findings

Table 1 provides the results for yield-contributing parameters and for yield in all the trials. The average number of fertile (effective) tillers per hill was higher in SRI plots than in conventional/control plots. The highest number of productive tillers, 31 and 32, was found in plots with wider spacing (30x30 cm) in both the sites as compared to 18 and 20 on control plots. This is an increase of 42% and 38% as compared to conventional methods. Also the number of tillers with immature grains was slightly higher in SRI plots than the conventional plots. Average number of grains per panicle was also more in the SRI plots in both sites as compared to conventional plots (Table 1). The average number of unfilled grains in SRI plots at site 2 was less than on the conventional plots while site 1 had slightly higher number of unfilled grains in SRI plots.

Similarly, the average yield performance was better on SRI plots than conventional plots in both sites (Table 1). Among these sites, better yield performance was observed at Site 2 as compared to Site I for both SRI as well as control plots, which may be attributed to the variety planted. As observed, the SRI plot with 20x20 cm spacing yielded about 15% more than the wider spacing plot, 30 x 30 cm, and 28% more compared to the conventional plots at site 1. The SRI plot with wider spacing was expected to yield more than the narrower spacing, but the difference in yield was very much less. Considering the high yield obtained from a smaller number of seedlings used with 30x30 cm spacing (66) compared with 20x20cm spacing (149), the advantage of the latter was not clear-cut. The average yield from the randomly-spaced plots using 3-leaf stage seedlings planted singly was higher than in the more widely-spaced plots as well as the farmer-practice control plots. However, the yield difference was not so much as compared to other plots.

Table 1. Yield and yield-contributing parameters of trials at two sites.			
Sl. No	Parameters	Site I (Lobesa)	Site II (Lobesa)
1	Rice variety	NRTI 1	IR 64
2	Average fertile tillers/hill		
	20 x 20 3-leaf stage	22	24
	30 x 30 3-leaf stage	31	32
	Random 3-leaf stage	19	22
	Control (> 7-leaf stage)	18	20
3	Plant height (cm)		
	20 x 20 3-leaf stage	128	100
	30 x 30 3-leaf stage	124	116
	Random 3-leaf stage	128	97
	Control (> 7-leaf stage)	126	134
4	Average filled grains/panicle		
	20 x 20 3-leaf stage	411	254
	30 x 30 3-leaf stage	378	219
	Random 3-leaf stage	345	223
	Control (> 7-leaf stage)	311	191
5	Average unfilled grains/panicle		
	20 x 20 3-leaf stage	26	13
	30 x 30 3-leaf stage	23	6
	Random 3-leaf stage	18	12
	Control (> 7-leaf stage)	17	13
6	Stover yield (kg/plot)		
	20 x 20 3-leaf stage	22.4	15.1
	30 x 30 3-leaf stage	21.4	14.8
	Random 3-leaf stage	20.8	14.2
	Control (> 7-leaf stage)	21.5	14.0
7	Yield (kg/plot) MT/hac		
	20 x 20 3-leaf stage	(3.08) 4.89	(3.67) 5.97
	30 x 30 3-leaf stage	(2.63) 4.14	(3.68) 6.05
	Random 3-leaf stage	(2.55) 4.09	(3.75) 6.15
	Control (> 7-leaf stage)	(2.19) 3.51	(3.50) 5.83
Yield calculated at 14% moisture content			

Further, the stover yield result was better from SRI plots than from the conventional plots at both the sites (Table 1). However, the difference in straw yield between the SRI plots and control plots are not much.

Pest Problem

Many of the plots at site 2 were infested with sheath blight. The infected plots were uprooted and thrown away but no pesticide was applied. This resulted in lowering the paddy yield per plot. Further, the presence of rodents and grasshoppers also affected the yield. Grasshoppers were seen mostly in the control plots as compared to SRI plots.

Conclusion

The second year of SRI yield results and the yield-contributing parameters also showed a positive effect from the SRI methods evaluated as was observed in my first set of SRI trials, conducted in eastern Bhutan in 2006, as well as in many other countries. Further trials and demonstrations at various locations involving farmers and agricultural trainees are planned for the coming season to verify and demonstrate the benefits of SRI under more varied circumstances comparing SRI results to conventional practices, thereby helping to build the trust and confidence among farmers to adopt these techniques**.** This will also provide a good platform to carry out training of more agricultural trainees in our College for a multiplier effect as they will be working with farmers all over the country once they graduate in a year from now.

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Trainees transplanting paddy using SRI methodology

37-day-old plants after transplanting

Tillers being counted at 40 days

Batch of agricultural trainees getting familiar with SRI methods of rice cultivation.

Another batch of agricultural trainees being familiarized on SRI methods of rice cultivation.

NRTI 1 variety (SRI plots)

Demonstration at College of Natural Resources comparing SRI and non-SRI rice hills at exhibition

Trainees being trained on crop cutting and yield measurement with NRTI 1 variety at site 1

Comparison measurement of IR 64 at site 2: plants from control plot and from SRI plot

Single hill with over 50 tillers, highest number of tillers attained with SRI methods was 82

Drs. Norman and Marguerite Uphoff at Lobesa trial site in October 2007