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***BRIEF COMMUNICATION***

## **Yield Performance of IR 64 variety Using System of Rice Intensification (SRI) Methods at Three Locations in Wandgüe and Punakha**

Karma Lhendup<sup>1</sup>, Mahesh Ghimiray<sup>2</sup>, Sangay Tshewang<sup>3</sup>

### **INTRODUCTION**

There is a growing recognition and popularity of the System of Rice Intensification (SRI) methods of rice cultivation around the world since its first trials outside of Madagascar in 1999-2000. As of 4<sup>th</sup> March 2009, 36 countries have documented the beneficial effects of SRI method in terms of saving seed, water, cost, increased soil health, and grain yields compared with traditional methods of rice cultivation [<http://ciifad.cornell.edu/sri/countries/costarica/index.html>]. Other benefits of SRI experienced by farmers include earlier crop maturity, higher straw yields and higher rate of milling outturn (Uphoff, 2005). It is now considered as an innovative and cost-effective method of rice cultivation particularly in terms of seed and irrigation water saving, and chemical input reduction.

SRI method of rice cultivation does not involve an entire change in the existing cultivation practices of rice. It involves modification of some agronomic practices on existing methods in rice cultivation providing better growing conditions for plants, particularly in their root zones. Six principles and practices of SRI include: transplanting of young seedlings (at 2-3 leaf stage), transplanting of single seedling per hill, wider spacing, moist but unflooded soil conditions during the vegetative growth phase, early and timely weeding, and organic manuring. Researchers claim that these practices achieve synergistic effects, resulting in higher yield than the conventional rice production methods (Uphoff, 2001).

Success of SRI in many countries has stimulated researchers in Bhutan to conduct trials on SRI methods (initial trials were in Khangma,

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College of Natural Resources, Lobesa, Royal University of Bhutan  
Renewable Natural Resource Research Centre, Bajo, CoRRB, Ministry of Agriculture  
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Kanglung and Lobesa - Lhendup, et al. 2008, <http://ciifad.cornell.edu/sri/countries/bhutan/bhLobesaRpt07.pdf>) to observe their performance under Bhutanese field conditions and examine their associated benefits.

### **Past Research on SRI methods in Bhutan**

Lhendup et al. (2008) found that initial trials at RC Khangma and Kanglung using some of the SRI method such as young seedlings (3-leaf stage), single seedlings, wide spacing (30x30 cm gave better performance than 20x20 cm), and reduced water application (non-flooding) showed better crop performance in terms of yield and various yield parameters than did comparable plots grown with standard methods. For this study, there was no introduction and evaluation of organic soil fertilization (standard chemical fertilizer applications were made), and there was no active soil aeration (only hand weeding, not using a rotary hoe). The average yield increase comparing replicated plot results was 0.65 t/ha, significant at the .05 level of confidence. Profuse tillering was observed, and farmers were impressed with both the plant growth and the cost-saving opportunities. In addition, the first trial using SRI methods at Khasadrapchu by researchers of Yusipang also showed positive results as compared to those with conventional methods (<http://ciifad.cornell.edu/sri/countries/bhutan/bhKhachadrapchuRpt07.pdf>).

Further, the results of the follow-up study at the College of Natural Resources (CNR) farm, Lobesa in 2007 showed a positive effect from the SRI method evaluated (<http://ciifad.cornell.edu/sri/countries/bhutan/bhLobesaRpt07.pdf>).

The results of the first and second years' trial conducted in 2006 and 2007 by RNR RC Bajo at its station were not very convincing. Thus, a study was undertaken jointly in 2008 by RC Bajo and CNR researchers at three locations: RC, Bajo (1200 masl); CNR, Lobesa (1440 masl); and Sopsokha, Punakha (farmer's field, 1480 masl) to verify the performance of SRI methods. The variety tested was an introduced rice variety (IR64), which is quite popular among the farmers in Wangdue-Punakha valley.

At RC Bajo, the trial was laid out in a large observation plot of 645 squared meters. The trial was not randomized given that our previous

experience showed that it was difficult to follow SRI principles in small contiguous plots especially water management because of lateral spread. Prof. Norman Uphoff, a SRI specialist agreed on single-plot observation rather than randomization during his visit to the station (Personal communication, 2007). A large adjacent plot subjected to normal conventional practices was used as a control.

At CNR farm, a modified simple randomized design was used with three replications. The replicated plots were separated by 50 cm wide line spacing. At Sopsokha, a portion of the farmer's field was cultivated with SRI methods while traditional methods were employed on the rest. A bund was constructed within the field to separate the two areas to avoid spill-over of fertilizers and weedicides.

At Bajo, the SRI plots were raised organically without any inorganic fertilization. Farm yard manure of 2 tonnes per 645 squared meters was applied and incorporated during the last puddling. However, there could have been some residual effects from the previous season's fertilization.

At Sopsokha, a total of 7 bags of farmyard manure (FYM), each weighing 30-35 kilograms, were applied on each of the half terraces, 18 m long and 4 m wide, while the FYM application at the CNR farm was slightly more. This is because the animal waste upstream was let into the field until the vegetative phase.

In all the sites, the nursery was established using pre-soaked incubated seeds. At CNR farm and Sopsokha, transplanting of 3-leaf seedlings was done in the first to second week of June at 25 cm spacing. At Bajo, the spacing used was 30 cm. Three weedings were carried out at all the sites.

## **RESULTS**

Table 1 presents the results for a main yield-contributing parameter (number of fertile tillers) and for yield at the three locations: RC Bajo, CNR farm, and Sopsokha. In all three sites, the average number of fertile (effective) tillers per hill was higher in SRI plots than in conventional/control plots. Among the three sites, the highest number of productive tillers was found at RC Bajo (47) followed by Sopsokha (32) and CNR farm (30 tillers). This was an increase of 64%, 66% and 33% compared to conventional methods, respectively.

Similarly, average yield performance was better on the SRI plots compared with conventional plots in all three sites (Table 1). Among the three sites, the 10.1 t/ha yield performance at CNR farm was the highest, followed closely by Sopsokha and RC Bajo, with 9.3 and 8.6 t/ha. The increase in yield compared to conventional methods in all three locations was 14%, 29% and 19%, respectively. Further, the yield obtained for IR 64 variety with SRI methods was more than that obtained from the normal practice in RC station at Bajo, which is usually averaging about 6-8 t/ha. The increased in yield with SRI methods is mainly contributed from the increased number of productive tillers.

Apart from the increase in yield, it was observed that there was a reduction in the prevalence of *shochum* (*Potamogeton distinctus* A. Bennett) at RC Bajo and Sopsokha. *Shochum* is a dominant and perennial fresh-water weed found abundantly in almost all the rice-growing districts at mid-altitude. It is reported to reduce paddy yields by about 40% in the country. Among the many districts, Wangdue and Punakha are the most severely affected by the prevalence of this weed. Thus, the possibility that SRI methods will enable farmers to reduce the prevalence of *shochum* simply through changes in crop management is an area where further investigation of the effects of SRI methods is warranted.

Table 1. Yield and yield-contributing parameter of trials at RC Bajo, CNR farm and Sopsokha, farmer's field using IR64 variety.

Sl. No.	Parameters	Study Site		
		RC Bajo	CNR farm	Sopsokha
1	<b>Fertile tillers/hill</b>			
	SRI method	47	30	32
	Conventional method	17	20	11
2	<b>Plant height (cm)</b>			
	SRI method	88	91	92
	Conventional method	90	90	89

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3	<b>Number of hills/6m<sup>2</sup></b> SRI method Conventional method	66 NA	96 110	96 211
4	<b>Yield (kg/6m<sup>2</sup>) &amp; t/ha</b> SRI method Conventional method	(5.4) 8.6 (4.3) 7.0	(6.1) 10.1 (5.2) 8.7	(5.6) 9.3 (4.0) 6.6
Yield calculated at 14% moisture content				

## CONCLUSION

The results of evaluations in the 2008 season at three sites showed a positive effect from SRI methods, greater than observed in previous SRI trials. The researchers at RC Bajo as well as farmers were convinced about the potentiality of SRI techniques of rice production in enhancing the yield. Thus, the adoption of these techniques by farmers will not only enhance food security, but will also ensure a sustainable environment and improve the livelihoods of farmers.

Further trials and demonstrations involving farmers 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.

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