System of Rice Intensification (SRI) in Deorali Geog

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The new method of rice cultivation which is popularly known as System of Rice Intensification was introduced in Deorali geog for the first time in 2009. Although it is not an entirely different method, it was new to the farmers of the geog. In collaboration with the interested farmers, SRI trial was set up at Balabas, a 30-minute journey by vehicle from the Dungkhag Administration. The site lies at an altitude about 450m above the sea level, and moreover it receives heavy rainfall during summer seasons. The trial plot had an area of 15 decimals, which consisted of three terraces. The treatments used for the trial are discussed below:

1) Solarized nursery-raising techniques:

At present, most of the farmers sow their seed using the wet-bed method. Solarization technique is not practiced elsewhere in Bhutan. Solarization is a technique for treating the nursery bed with the sun's heat to eliminate harmful organisms such as nematodes and also weed seeds which may cause diseases or competition for the young seedlings. Well-tilled soil is mixed with FYM and covered with plastic and leaves for a month to capture sun heat. During this period, the bed is heated by the sun. The temperature of the soil may rise even to 80 degree Celsius to kill undesirable organisms and weed seeds.

After a month, pre-germinated seeds were sown in the solarized seedbed. The well-prepared bed was irrigated without flooding just before sowing to give the soil adequate moisture for germinating the seeds. Then the nursery bed was monitored for about a week to avoid domestic pest attack.

2) Planting of younger seedlings (at 8 days, 2-leaves stage):

Young seedlings eight days old (2-leaves stage) were planted singly per hill in a well-prepared field. The field was prepared 48 hours ahead of transplanting. This was done mainly to prepare the mud for plantation of delicate young seedlings. During transplanting, the field was kept just wet, not flooded as in conventional practice. More care is given while transplanting so as to avoid feeder root trauma and damage to the young plant. The seedlings were removed from the nursery with a shovel along with the soil still attached to the roots, unlike the farmers' practice of uprooting the seedlings and washing away the soil attached to their roots.

Fig.1.Removing young seedlings from nursery.

Fig.2.Planting of young seedling (2-leaf stage)

Under farmers' conditions, seedlings are transplanted deeper with much downward force, which will cause injuries to the plant and root system, thereby leading the plant to form roots from the nodes which are in contact with the soil surface. This practice reduces the tillering potential of the rice plant. With SRI practice, seedlings are transplanted right after removing them from the nursery along with their seed sacs still attached. This seed sac contain nutrients which supply the growing plant.

As an SRI plant has capacity to produce more tillers, it is necessary for the plant to have more spacing (Shao-hua *et al*., 2002). Therefore, spacing of four distances was evaluated in the trial: *25cmx25cm, 30cmx30cm, random, and conventional practice (more closely spaced).* The capacity for producing tillers in the four different spacings was recorded and compared as reported in the table below. Differences in color of the culm (base of plant) were noted; the SRI plant is brighter green (Fig. 1); the non-SRI plant is more brownish (Fig. 2). The darker color indicates necrosis, the premature dying back of plant cells and tissues due to hypoxia.

Fig 3. SRI plant under controlled irrigation.

Fig.4.Non-SRI plant under regular irrigation.

Table 1. Tillers recorded for SRI plants

Sl#	Spacing	Average tillers (3 samples)	Date of recording	Average tiller
1	25x25m	17	27/07/09	22
		23	11/08/09	
		27	23/10/09	
2	30x30m	21	27/07/09	23
		25	11/08/09	
		24	23/10/09	
3	Random planting	14	27/07/09	18
		18	11/08/09	
		21	23/10/09	
4	30-day- old seedlings with conventional practice	7	27/07/09	10
		12	11/08/09	
		10	23/10/09	

3) Irrigation:

Unlike with conventional methods, SRI plants are watered with a somewhat different method of irrigation. In conventional method, the field is kept flooded (inundated) for as long as water is available for irrigation. However under SRI practices, the transplanted field is kept without irrigation for six days after transplanting to let the young plants set their root system and acclimatize to the new growing environment. Then, the field is managed with alternate drying and wetting until the plants have reached the ripening stage.

Fig.5. SRI Plant five days after plantation

Fig.6. SRI field with controlled irrigation

In our trials, the SRI field was not flooded with continuous irrigation but instead just kept moist, not letting the field surface to crack. With this method, however, it is experienced that weed pressure increased, and weeding should be done two to three times. Although rice plants can survive when their roots are continuously submerged under water, they do not thrive in this situation, due to lack of oxygen. Hence, the root growth of the plants is hampered

4) FYM application:

After two weeks of transplanting, 100 kg FYM was applied. Before application, it was stirred in water and supplied through running water. The application is done uniformly on all the plots.

5) Weeding:

Weed pressure was increased due to the wider spacing and the alternate wetting and drying irrigation system. Three to four times weeding is adequate to obtain the satisfactory yield (Shao-hua *et al.,* 2002). However, as it is labor-intensive under farmers' conditions, weeding was done only two times of weeding was done, even though it is known that additional weedings, by aerating the soil, can contribute to even higher yields under SRI management.

RESULTS

During the crop cutting, three samples from each spacing (25cmx25cm, 30cmx30cm, random, and conventional practice) were recorded. This is done to observe any yield differences that could be attributed to each spacing under the same type of treatments and monitoring. The details on yield associated with each spacing are recorded below (Table 2).

Table 2. Yield differences for different spacing (each crop cut area 6 sq. m)

Sl*	Spacing	Crop cut yield (kg/6 sq.m)	Yield/area (tons/Ac)	Yield/area (tons/Ha)
1	25cmx25cm	5.7	3.8	9.5
2	30cmx30cm	6.0	4	10.0
3	Random	3.5	2.4	6.0
4	Conventional	1.9	1.4	3.5

Fig.7.Farmer with SRI and non-SRI plant.

Fig.8. Comparison of SRI and non-SRI plant.

Farmers of Deorali geog have received first-time training on the new method of rice cultivation which is popularly known as System of Rice Intensification (SRI). Thirty-two farmers participated in the training in 2008. With the success of SRI in this season, more farmers of the geog are interested to adopt SRI techniques in the next planting season. Farmers have pointed out that besides increasing their yield, this technique was found to be useful in saving resources like labor, water and seed.