Towards Food & Livelihood Security

From SRI to SCI in Uttarakhand and Himachal Pradesh

The mission of People's Science Institute (PSI) commits it to enabling rural communities to achieve food and livelihood security. In 2006 it identified the System of Rice Intensification (SRI) as a potential method of achieving food and livelihood security in the mountain states of Uttarakhand and Himachal Pradesh. Since then it has trained more than 25,000 farmers in both the states to achieve astonishing gains in productivity.

Background

The scope for intensive resource-based development in Uttarakhand (UKD) and Himachal Pradesh (HP) is limited. In the mountain villages, farm holdings are usually small, about 0.4 ha (1 acre) per family and rice productivity varies from about 1 T/ha on unirrigated fields to 2 T/ha on irrigated ones. Thus a typical family can only meet a part of its annual food grain needs. As rice is the staple food in the mountains, enhancing its productivity through the SRI method can lead to greater food security for farming families. The stalk volume in the SRI method is also much higher, providing more fodder for cattle, more farmyard manure for fertilizing fields and also increasing milk yields. Hence PSI has chosen to promote the widespread use of the SRI technique and extend its concept to other food grains also. Promotion of SRI, or its expanded version SCI - System of Crop Intensification - also helps meet livelihood needs in UKD and HP.

SRI is a new way of cultivating paddy. It focuses on the root rather than the plant. Ensuring healthy roots ensures healthy and more productive plants. Fewer saplings/seedlings are planted per unit area reducing competition for nutrients and instead of keeping the fields flooded, the practice in SRI is to drain the water out after 3-4 days. This increases the supply of air, i.e., nitrogen, to the roots. SRI also recommends use of organic fertilizers. Thus farmers raise rice production substantially by changing the way they manage their plants, soil, water and nutrients, rather than by increasing inputs such as fertilizer, water and agrochemicals. Getting more output with less cost enhances profitability. PSI has also successfully applied the SRI principles to other grains like wheat, maize, *mandwa* (finger millet) and *rajma* (kidney bean).

PSI began an experimental programme in 2006 with 40 farmers to promote SRI in HP and UKD. In 2009 it helped about 13,225 farmers to adopt the SRI method in an area of about 545 ha in the two states. While non-SRI yields stood close to 2.5 T/ha, the SRI yields were around 4.8 T/ha in these states, an average increase of 92 per cent. But 2009 was a drought year when UKD and HP had a shortfall of 47 per cent and 41 per cent rain respectively, till August end. Hence it can be concluded that SRI performance is superior even in a drought year.

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Outreach during kharif 2009

The scaling up operation of SCI in UKD and HP has been quite successful. PSI and its partner organisations (POs) mobilized more than 14,000 farmers during the current drought to cultivate paddy and other crops using the SCI method. Linkages have been established with local VOs, agriculture departments, KVKs, agriculture universities and research institutions in these states.The following steps were taken during 2009:

- Reached out to more than 14,000 farmers in UKD with the financial assistance of Sir Dorabji Tata Trust and in HP with financial assistance from WWF-ICRISAT, Hyderabad.
- Selected 29 POs in UKD and 10 in HP to cover 523 villages in all the 13 districts of UKD and five districts of HP (Bilaspur, Chamba, Kangra, Mandi and Sirmour).
- Created a talent pool of 47 master trainers and 190 village level resource persons (i.e., experienced SRI farmers) through 12 three days training programme.
- The master trainers conducted 317 two-day orientation workshops with 14,605 farmers of which 59 % were women and 29% SC/ST during March - May 2009.
- A user-friendly manual on SRI and a set of 5 posters on SRI (both in Hindi) were distributed amongst farmers, master trainers and village level resource persons.
- A film *SRI Vidhi: Kisano Ke Liye Vardan* produced by PSI was screened for the benefit of farmers.
- One weeder was provided to groups of 10 farmers in each of the selected villages.
- SRI was promoted through the print and electronic media. Advertisement spots on SRI were introduced on Doordarshan channel.
- Field support was extended through the master trainers on a monthly basis throughout the cropping period. Agricultural extension officers and trainers from local KVKs were invited to visit the SRI fields during the cropping season.
- Just before harvesting, exposure visits of farmers from adjoining villages were organized.
- A Programme Advisory Committee (PAC) was constituted in both the states consisting of a panel of experienced scientists and government officials to regularly appraise the programme.
- Eighteen one-day district-level experience-sharing workshops were organized in October – November 2009 when the paddy crop was being harvested.

Performance Assessment

Paddy: A comparison of SCI paddy over the conventional paddy is shown in Table 1. The SCI paddy produced more effective tillers per plant, each plant had longer ears with more and heavier grains yielding 4.8 T/ha whereas conventional paddy produced only 2.5 T/ha showing an **average increase of about 92 % in grain yield of SCI paddy over the conventional paddy crop.** Table 1 also shows that there was about 67 % increase in straw yield from SCI paddy over the conventional paddy.

Table-1: Comparative results of SRI & conventional paddy during normal and drought year

S. No.	Particulars	Normal Year (2006-2008)		Drought Year (2009)	
		Conventional	SRI	Conventional	SRI
1.	Average no. of effective tillers/ Plant	7	21	5	18
2.	Average Plant Height (cm)	99	122	88	102
3.	Average Panicle Length (cm)	18	24	19	25
4.	Average No. of Grains/Panicle	93	177	90	174
5.	Grain Yield (T/ha)	3.6	5.5	2.5	4.8
	% Increase in Grain Yield	-	**53**	-	**92**
6.	Straw Yield (T/ha)	11.1	14.5	5.1	8.5
	% Increase in Straw Yield	-	**31**	-	**67**

On comparing, the crop yields with the previous three years' data, one finds that **during the present drought the grain yields of the conventional crop decreased by 31% as compared to reduction of only 13% in the SRI crop. Similarly, straw yields decreased by 54% and 41% for conventional crop and SRI crop, respectively.**

Other crops: SCI performances with kidney beans, soyabean, finger millet and maize have (see Table 2) **increased grain yields upto 69 %, 29 % 50% and 34 % in kidney bean, soyabean, finger millet and maize, respectively**.

Table-2: Comparison of SCI crops during drought (2009)

S. No.	Particulars	Kidney bean		Soyabean		Finger millet		Maize	
		Conv.	SCI	Conv.	SCI	Conv.	SCI	Conv.	SCI
1.	Average no. of ears / Plant (in pulses: pod/plant, in maize: cob/plant)	34	56	35	56	3	5	2	3
2.	Average Plant Height (cm)	163	205	50	66	70	89	149	174
3.	Average No.of Grains/ear (in pulses: seeds/pod, maize: corn/cob)	4	6	3	4	290	428	225	248
4.	Grain Yield (T/ha)	1.3	2.2	2.8	3.6	1.2	1.8	1.7	2.3
5.	% Increase in Grain Yield	-	**69**	-	**29**	-	**50**	-	**34**

Innovative practices adopted to cope with drought

PSI's previous experience with the SCI, especially in rainfed areas, was immensely helpful during the 2009 drought. The Institute's and POs' staff worked with the Master Trainers and Village Level Resource Persons to motivate farmers to practice SCI even in a drought situation. As a result of the drought farmers were not able to transplant young saplings due to lack of timely rainfall. It led to seed mortality and a drop in the number of participating farmers and area covered. It restricted the use of weeders and increased labour cost and time.It also led to a lot of variability in adoption of the recommended SCI practices.

Despite the above problems, the crop cutting results undertaken in the farmers' fields across the two mountain states demonstrate the versatility of the SCI technique in improving the food security situation of the rural communities even during times of water scarcity.

Paddy: Staggered nurseries (repeated establishment of nurseries with a gap of 7 days) were encouraged instead of relying on a one-time nursery. The drought forced some farmers to plant saplings older than 10-12 days, sometimes upto 25 days. To further ensure crop survival in irrigated fields one seedling per hill was transplanted whereas in the rainfed fields transplantation of two to three seedlings per hill was done at 15-25 cms and 15-20 cms plant to plant and row to row spacing respectively. The farmers could not practice alternate wetting and drying of fields due to unavailability of irrigation water which also resulted in restricted use of weeders and therefore in many cases only one mechanical weeding was practiced. However, farmers were encouraged to use *panchgavya*, *amritghol* and *matkakhad* to get higher crop yields.

Table-3: Alterations in SRI practice during the 2009 drought

Recommended Practices	Normal Year	Drought Year(2009)
Young Seedling	8-12 days	10-25 days
Wider Spacing	25 x 25 cm	P to P : 15-25cmR to R : 15-20cm
Seedling / hill	1 / hill	1-3/ hill
Alternative Wetting & Drying	✓	Not under control
Inter Cultivation	2+ (mechanical weeding)	1+ (mechanical/manual weeding)
Organic Matter	Panchgavya, Amritghol, Matkakhad	Panchgavya, Amritghol, Matkakhad

Other crops: In the case of *mandwa*, farmers were recommended (a) to transplant one to three 15-25 days old seedling per hill keeping the plant-to-plant and row-to-row spacing of 15-25 cm and 15-20 cm respectively, in the case of irrigated fields, and (b) to undertake direct seed sowing, placing 1-2 seeds about 30 cms in a line under rainfed conditions. Direct seed sowing was also adopted for kidney beans and maize. Healthy seeds were selected and treated with organic formulations and one to two seeds per hill were sown maintaining a spacing of about 25 cm to 30 cm. In all the crops weeding was done once or twice using a hand rake. Application of cowdung, *matka khad, panchgavya* and *amritghol* was done as desired by the farmers.

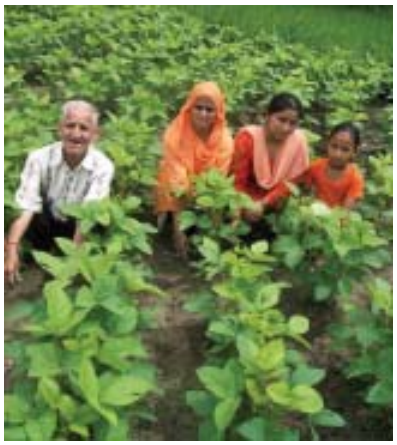

Table 4: Adaptations for SCI in other crops during drought

Practice	Conv.	Kidney bean	Soya bean	Finger millet	Maize
Young seedling	Seed sowing	Seed sowing in line	Seed sowing in line	Seed sowing in line/ Transplanting of 15-20 days saplings	Seed sowing in line
Wide spacing	Broad-casting	P to P : 25 cm R to R : 30 cm	P to P : 30 cm R to R : 30 cm	P to P :15-25 cm R to R : 30 cm	P to P : 30 cm R to R : 30 cm
Single seedling/hill	-	1-2 seed/hill	1-2 seed/hill	Line sowing or 1-3 seedlings/hill	1-2 seed/hill
Inter-culture	1 + (manual weeding)	2 + (manual weeding)	2 + (manual weeding)	2 + (manual weeding)	2 + (manual weeding)
Organic manure	Compost	Compost, PAM	Compost, PAM	Compost, PAM	Compost, PAM

PAM: Panchgavya, Amritghol, Matkakhad

Way Forward

In a normal year we can expect a minimum annual SCI-based grain production of 100 kg/nali (5 T/ha) under irrigated conditions and 60 kg /nali (3 T/ha) under rainfed conditions. A typical mountain family of 5 to 6 persons requires about 1.2 tons per year. With an average landholding of about 5 nalis irrigated land and 15 nalis rainfed lands, a family can expect to generate a small surplus using SCI techniques. In the coming year PSI proposes to saturate villages where SCI has been successfully demonstrated by increasing the number of households and the area covered per household. It will also expand the coverage of crops other than paddy while experimenting with new crops.

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