

World Neighbors experience with SRI in Kavre, Nepal 2016- 2017

World Neighbors (WN), an international NGO with national affiliates, works in Mahadevsthan village in Kavre district with small landholding farmers there, mostly women. To enhance the livelihoods as well as food security, WN gave orientation on SRI techniques to members from all of the savings and credit groups in Kavre district. Seven women farmers came forward to do experimentation with SRI, and WN trained them on SRI principles and practices, then providing them with regular technical support throughout the entire cycle of rice cropping, from seed to harvest. The farmers used a local variety of rice seed and also employed organic fertilizer to give their seedlings a good start.

Experience Sharing

After the harvest, WN organized an experience-sharing meeting with these 7 farmers and other group members. Farmers compared the SRI method with their conventional methods of rice transplantation. People were very excited with the yield results, which were 30-50 % higher than obtained with general practice. During the sharing process, farmers (all women) also talked about criticisms from their own family members and neighbors who were doubtful about the new methods. They also shared how they dealt with drought stress, weed management, and low self-confidence during the cropping period. (One of the farmers had to harvest her rice crop early due to family pressure even though she knew from having been trained in SRI that the harvest time is not right.) Various family problems were mentioned, such as a mother-in-law disagreeing with her daughter-in-law's new-found skill in rice plantation.

Farmers also shared about the stress they went through during the first one month until they saw how many tiller could come out from one seedling. (It was quite unusual for farmers to see a rice field with seedlings sown in rows maintaining a regular and wide distance). Then, they shared also how they were worried about the eventual yield and time to maturity. They were worried that if the maturity of rice would be late, then the crop for the next season would be adversely affected. However, as the season went on, they realized that their worries over the timing of maturity were unnecessary as the rice grains matured more quickly than expected, as reported below. Except for the one farmer who had to harvest before-time, the other six SRI farmers' crops matured about 20 days sooner than with usual practice, so their next season crop was not affected. Since their yield was also better, the farmers were quite satisfied.

Cultivation practices

- **Seed bed preparation and solarization**

A raised dry (unflooded) seedbed was prepared, mixing the soil with organic matter, and then the bed was solarized to minimize pathogens in the soil. This reduced the damping-off of seedlings, soil-borne diseases, weeds, and insect infestation. The seedbeds were solarised with a 120-gauge plastic sheet.

- **Variety and seed selection**

Rice varieties commonly used in the Madhavsthan area (locally called as Japanese, i.e., Japonica) were selected for the experimentation. The selected seeds were screened for their density by pouring them in a salt-water solution (1 kg of salt in 5 liters of water). Those grains which settled at the bottom of the container were selected as healthy seeds, and those that floated on top of the water were discarded. The bold and dense seeds were then rinsed with clean, unsalted water and kept submerged in water for 2 days. The water-soaked seeds were air-dried for 6 hours and then sown on the nursery bed.

- **Raising of seedlings**

The SRI field was ploughed with addition of farmyard manure (FYM) and some fertilizer. The nursery beds prepared for raising seedlings were 1 m wide, 15 cm high, and of the length required to have enough seedlings for their field. The prepared raised bed was solarized for at least 21 days before sowing. The seeds when sown in this solarized seedbed were covered with a thin layer of soil and lightly watered daily (not flooded).

- **Land preparation**

Land was prepared for transplanting after incorporation of FYM and fertilizer by puddling the soil and leveling it. The plots were puddled for two days before transplanting so that the weed population would be reduced. Plots were leveled so that uniform wetting of the soil could be achieved with less water.

- **Transplanting and gap filling**

In SRI plots, seedlings 11-15 days old were transplanted in the leveled muddy field within 30 min after removal of the seedlings from the nursery on 8th – 12th March 2016. Seedlings were transplanted with just one per hill, maintaining a row-to-row and plant-to-plant distance of 25 cm×25 cm (16 plants per m²). Seedlings were taken out of the nursery very carefully, lifted with a trowel so that the seed sac remained attached to the root, and the roots were less disturbed. Seedlings were transplanted in the soil very shallow, just 1-2 cm deep, without knocking off any attached soil. Spacing was maintained by crossing the field with ropes tied to sticks keeping a specified distance. Gap-filling to replace seedlings that did not survive the transplanting vigorously was done two days after transplanting to maintain the plant population.

- **Fertilizer management**

Well-decomposed FYM was used in seedbed. Farmers had been using DAP and urea as fertilizer, hence in absence of a replacement, even during the experimentation they continued to use the same fertilizer. WN strives to educate farmers about the harmful impacts of chemicals on soil and human health. Its aim is to gradually replace chemical fertilizer with organic manure.

- **Weed management**

The SRI plots were hand-weeded at 7-10 days after transplantation (DAT) and at 26 -30 DAT. The plots were irrigated on the 7th day, and water level was maintained at 3-4 cm to make the soil loose and easier for weeding. Water was drained out after weeding. Water was given also before the second weeding. A third weeding was done by some farmers as needed.

- **Irrigation management**

General practice among farmers has been to keep the plots of transplanted rice (TPR) continuously flooded, maintaining 5-8 cm depth of water on them during the entire growth period. In SRI plots, the first irrigation done 5-7 days after transplanting to moisten the field without ponding. A second irrigation was given to the SRI plots on the evening of the 12th day after transplanting at a ponding depth of 4-5 cm, and the next morning weeding was performed by a rotary weeder. Thereafter, the alternate wetting and drying method of irrigation was followed, with the plots being irrigated when cracks appeared in the field. After panicle initiation, all plots were kept flooded with a thin layer of water 1–2 cm on the paddies, and all were drained 15 days before harvest.

- **Insect-pest management**

Rice earhead bug and rice hispa were observed in the field. The infestation was below the damage threshold, however, and management actions were not needed. Rice plants were generally free from disease.

- **Harvesting and threshing**

The crop from the net plot area was harvested manually with the help of sickle. Threshing was done manually, and grains separated out by winnowing and were weighed.

Observations recorded in rice

Phenological observations

The rice crop's phenological development was observed by farmers. They noted the times of observed maximum tillering, booting, heading, milking, soft and hard dough, and physiological maturity. Approximately 75% development of each of the stage was treated as signifying completion of that particular stage, and the data were expressed as days after sowing (DAS). Farmers were worried whether late maturity of the SRI plots would affect the succeeding crop. Farmers were oriented to attend to the different phenological stages of rice growth. Earlier maturing of rice under SRI was also discussed. The nursery bed preparation date, transplantation date, and physiological maturity date of SRI plots and general farmers practice plots were all recorded.

Biometrical observations

Number of tillers per hill

Number of tillers per hill from ten hills from the SRI plots and from the farmers-practice plots were counted, and the average number of tillers per hill was computed. These data were collected at booting stage.

Yield-contributing characteristics of rice

Number of effective tillers per square meter

The number of effective tillers per square meter was recorded within each plot from randomly selected areas with the help of a quadrat (1 m × 1m) frame just before harvesting the crop, and the average value was used to obtain effective panicles per square meter.

- **Grain yield**

Grain yields were taken at harvest from randomly-selected areas with the help of a quadrat frame (1m × 1m). The crop was dried, threshed, sun-dried, cleaned, and again dried to maintain 12% moisture before a final weight was taken. The grain yield per hectare was computed from the quadrat plot yields.

- **Results and Discussion**

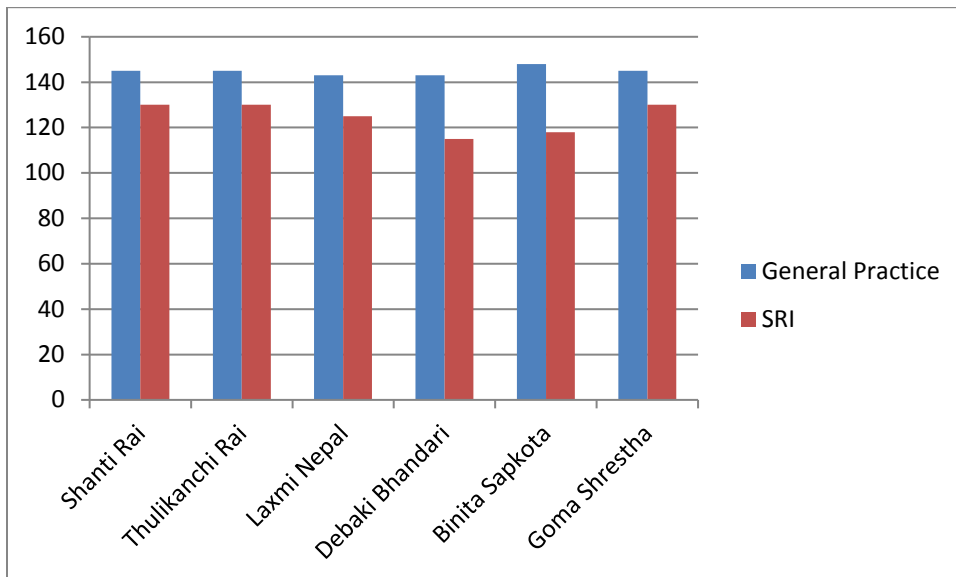


Figure 1: Days to physiological maturity of rice, reported from the date of nursery establishment under System of Rice Intensification and general farmer-practice methods (for the six farmers who harvested according to their crop's observed maturity)

The rice variety under cultivation was Chaite 4. Its maturity days under general farmer-practice was 145 days from the nursery establishment day. The SRI plots matured at about 125 days from nursery establishment day. It thus matured about 20 days earlier. The result showed that we could reduce the crop cycle by 20 days. The reduced number of days were mainly due to the younger-aged seedling transplantation. We could not collect the data on the difference in maturity days from the transplantation. The earliest maturity was at 115 days, and the latest was at 131 days. The number of days to maturity can be reduced by using younger-aged seedlings and alternate wetting and drying irrigation.

Number of effective tillers per square meter

The number of effective tillers per m² were counted at the time of harvesting. The data showed the average number of tillers under farmer-practice was 300, and under SRI method it was 317. While the number of effective tillers per m² was not much different (even though there were more hills per m² and more plants per hill with farmer practice), the number of tillers per hill was different. The average number of tillers per hill under SRI was 19.8, and under farmers' practice it was 12. Maximum effective tillers per m² was observed in Debaki Bhandari's field (416). The lowest number under SRI was observed in Laxmi Nepal's field (just 96). The effective tillers per square meter is one of the most important yields-contributing characteristics, but it is not only factor to influence yield. The number of filled grains per panicle and test weight of these grains are also major yield-contributing characteristics. The effective tillers per square meter under SRI and farmer-practice is presented in Figure 2. The tillers per hill under SRI method and farmer methods is presented in Table 1.

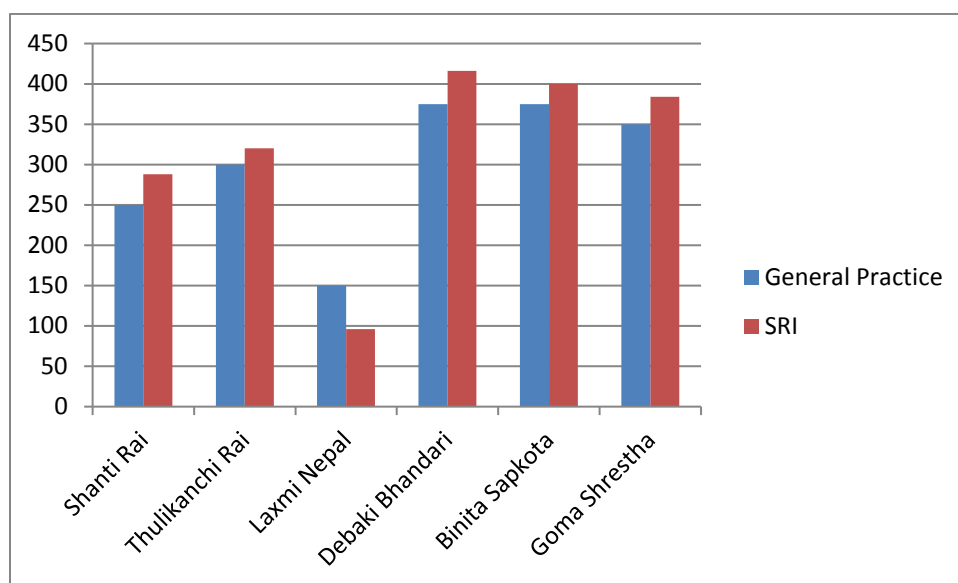


Figure 2: Number of effective tillers per square meter under farmer-practice and System of Rice Intensification at Madhavsthan. (Note that the number of plants per m² was quite different between the two methods.)

Grain Yield

The comparative data in the grain yield was recorded. The grain harvested from the 1-m² quadrat on SRI plots and the farmer-practice plots of each farmer was threshed and weighed separately. These data showed an average grain yield about 30 percent higher from SRI methods compared with farmer-practice. The maximum yield among SRI plots was obtained in Goma Shrestha's field, reaching 7.3 mt /ha. The minimum yield was obtained in Laxmi Nepal's field, amounting to 2.8 mt/ha. The highest difference in yield of rice was found by Thulikanchi Rai. The lowest grain yield, observed in Laxmi Nepal's field under SRI method, was due to severe drought.

The yields under SRI method were about 30% higher than general farmer-practice methods. The higher grain yield was obtained with the synergistic effect of younger-aged seedling, single seedlings, wider spacing, alternate wetting and drying irrigation, and early, soil-aerating weeding. Following the principles more precisely as recommended leads to higher yield.

Table 1: Yield of rice under System of rice intensification (SRI) and general farmers practice method (conventional method)

Farmer's Name	Farmer-practice grain yield (mt/ha)	SRI grain yield (mt/ha)	% difference in yield
Shanti Rai	4.0	6.0	50.0
Thulikanchi Rai	4.2	6.8	61.9
Laxmi Nepal	3.2	2.8	-12.5
Debaki Bhandari	5.5	7.2	30.9
Binita Sapkota	4.14	4.75	14.7
Goma Shrestha	5.5	7.3	32.7
Average	4.42	5.81	31.4

Data Source: Technical Report submitted by SRI expert

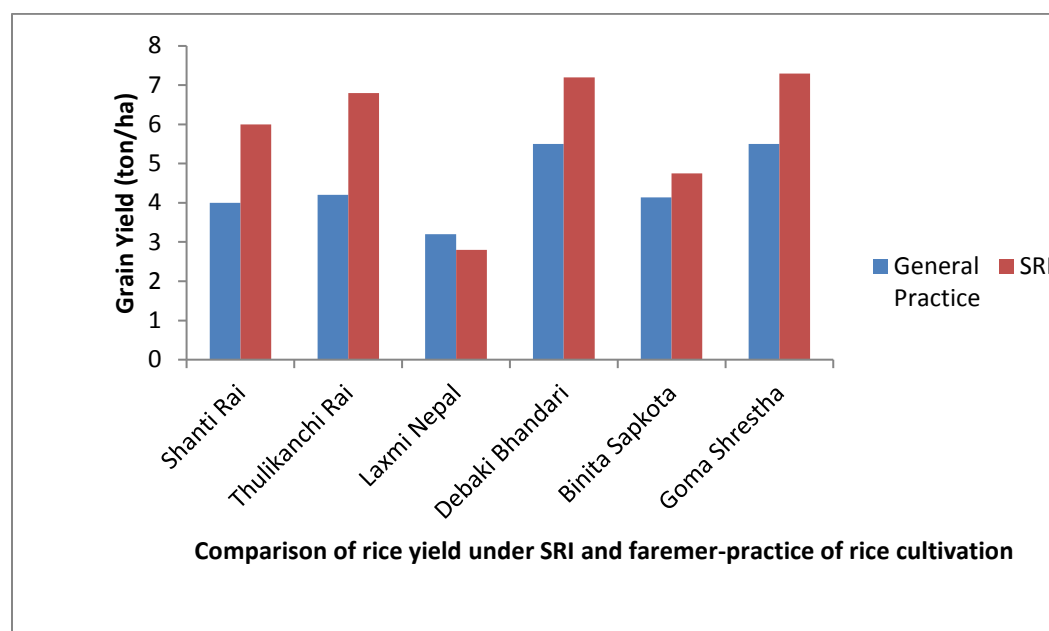


Figure 3: Grain yield under System of Rice Intensification and general farmer-practice of rice cultivation at Madhavsthan.

SRI in WN working areas at present



WN invested in the training and supervision of just 7 farmers from Mahadevsthan, Kavre. Map of Nepal on left shows Kavrepalanchowk district, and below it the SRI site of Mahadevsthan VDC in Kavrepalanchok district. The site is located at 27° 71' North latitude and 85° 61' East longitudes, 670 meters above sea level.



The piloting period (January-July 2016) to introduce SRI to small landholders included consultation with groups, orientation, training, monitoring visits, harvesting, and experience sharing). At present, the number of farmers practicing SRI in the community has reached 18. All the new entrants of SRI were trained by those 7 influencer farmers (including the one who failed initially).

The experienced farmers as they grew confident about SRI technique have increased their SRI plots from 300 m² to 600 m², and new ones are gradually following in the same footsteps. Initially, farmers would

test SRI rice planting on a very small plot to avoid losses if the methods failed. But with time and proven results of SRI, we have found that the number of SRI practitioners is growing along with an increased areas of land with each rice planting season. We have also started SRI in Udaypur, a new working district for WN.

This the typical way of WN's approach to introducing new technology – starting small and staying practical – investing in a smaller number of people and letting the people lead the further expansion process.

Location of SRI Fields

Mahadevsthan of Kavre District



SRI starting in Khabu, Udaypur





Robust tillers from one seedling – specialty of SRI



Happy community member in her SRI field seeing the positive results, Kavre