More rice for less water – An Introduction to SRI Document

Cultivating a single kilo of rice requires 5,000 litres of water. India has over 24 million hectares under irrigated paddy, so imagine all the water required. If the system of rice intensification (SRI) were to be applied on all this land we would be able to cut water requirement for paddy by 50% and simultaneously boost rice production by 50%. So why is the government not pushing SRI?

- By Himanshu Thakkar

Suppose you were told that a new system of rice cultivation had been `discovered`that requires half the water needed for conventional rice cultivation, would increase per acre grain yields by at least 50%, would substantially reduce or eliminate the need for chemical fertilisers, would cut seed requirements by up to 95% and yet make rice cultivation more sustainable and profitable for farmers.

Most people would reject these claims as a figment of the imagination. Indeed, scepticism was the natural reaction of many participants at the fourth IWMI-Tata Annual Partners Meet held on February 24-26, 2005 , in Anand (Gujarat) where nine papers on the system of rice intensification (SRI) were presented.

Let us look at the solid facts before we reject one of the most remarkable developments in agriculture in recent times. If found workable, and it seems there is a rapidly building body of evidence in its favour, the system could have huge implications also for water resource development in India and other countries as it entails considerable water saving for water-intensive crops like rice.

What is SRI?

The system of rice intensification (SRI) is a new and evolving alternative to conventional methods of rice cultivation. In this method, rice seedlings are transplanted early (eight to 12 days old compared to 21 days in the conventional method). They are transplanted in un-puddled condition; the seedlings are widely spaced (up to 20, 25, 30 or even 50 cm apart). The fields are alternately kept wet and dry; they are not flooded until the panicle initiation stage (1-3 cm of water in the field during the reproductive phase). The field is drained 25 days before harvest and organic manure is used as much as possible. Mechanical weeding should start around 10 days after transplantation; at least two weedings are necessary, more are recommended. It is supposed to provide better growing conditions in the root zone, save inputs, improve soil health and optimise water use efficiency.

History

SRI was developed in Madagascar in the early-1980s by Father Henri de Laulanie, a French priest. As Shambu Prasad, Prajit K Basu and Andrew Hall note: "SRI has evolved over two decades, involving 15 years of observation, experimentation and mastery in Madagascar . It rapidly spread to 21 countries in the next six years." Uphoff and CIIFAD started popularising SRI to other parts of the world in 1997, calling it the answer to the needs of farmers in the 21st century.

Experiments in India

Formal experimentation in India started in 2002-2003. So far the method has been taken up in Tamil Nadu, Andhra Pradesh, West Bengal , Jharkhand, Chhattisgarh and Gujarat .

- **Tamil Nadu**

During experiments in 2003-2004 at the Agricultural College and Research Institute and Tamil Nadu Agricultural University (TNAU), Killkulam, Tamil Nadu, it was found that, on average, 53% less irrigation water was used in SRI farms. In these experiments, 21-day-old seedlings were transplanted 15 x 10 cm apart on the conventional farm. The SRI farm had 14-day-old seedlings transplanted 20 x 20 cm apart. Water depth on the SRI farm was maintained at 2.5 cm, with alternate wetting and drying cycles up to the panicle initiation stage. The farm was flooded to the same depth thereafter until harvest. On the conventional farm, the depth of the water was maintained at 5 cm throughout the standing crop. The experiments showed that SRI recorded higher water productivity of 0.699 kg/m3 compared to conventional farm water productivity of 0.253 kg/m3. The partial factor productivity of nitrogen was 28.3% more under SRI. The SRI farm recorded a grain yield of 3,892.7 kg/ha, 28% higher than from the conventional farm.

The results from two on-farm, state government-funded evaluations by TNAU -- one of which was in the Tamirparani basin in south Tamil Nadu -- showed that mean grain yields under SRI and conventional cultivation were 7,227 and 5,637 kg/ha respectively, showing an overall yield advantage of 1,570 kg/ha (maximum yield advantage: 4,036 kg/ha) for SRI. Around 31 farmers recorded grain yields of over 8 t/ha under SRI.

- **Andhra Pradesh**

On-farm SRI demonstrations were organised in 22 rural districts during the 2003 kharif season. A study carried out by the Acharya N G Ranga Agricultural University, Hyderabad, using 291 respondents including 67 SRI farmers, 71 neighbouring farmers, 77 researchers and 76 extension workers, found that 95% of seeds on SRI farms were saved, as a seed rate of 5 kg/ha was sufficient; about 50% of water was saved and an average yield advantage of 2 t/ha was reported. SRI farmers did have problems using the rotary weeder, transplanting the young seeds and managing the water. However, all of them reported that the plants look healthier on SRI farms.

Through the civil society organisation Timbaktu Collective, farmers in drought-prone Anantapur district in Andhra Pradesh have turned crisis into opportunity by employing SRI principles.

- **West Bengal**

PRADAN has done a study on the experiences of 110 farmers in Jhalda and Balrampur blocks in West Bengal 's Purulia district during the 2004 kharif season.

The study found that SRI plots produced an average of 32% higher paddy yields even with the partial adoption of SRI practices. In the 59 plots in Balrampur, the average paddy output from SRI farms was 6,282.65 kg/ha (49.8% higher) compared to 4,194.13 kg/ha in conventional fields. Average straw output was 5,150.1 kg/ha in SRI fields compared to 3,456.87 kg/ha in conventional fields.

In Jhalda block the increase was only 11.9% for a number of reasons including drought, only one weeding and transplantation of older seedlings. Straw output was 49.13% and 54.34% higher respectively in Balrampur and Jhalda blocks. Seed requirements for SRI farms were only 2.87 kg/acre compared to 27.17 kg/acre in the case of conventional farms -- a saving of Rs 292 per acre. SRI farms also required less labour compared to conventional farms, resulting in savings of Rs 184 per acre. The gross return per acre was Rs 3,341 in Balrampur block. The net return from an SRI farm was 67% higher than a conventional farm. The results show substantial savings in applied water on SRI farms, partly due to less percolation and partly due to a reduction in evaporation from the field.

- **Gujarat**

During experiments at Anand Agricultural University , Gujarat , it was found that while the conventional practice yielded 5,840 kg/ha of grain, the SRI method yielded 5,813 kg/ha, with 46% less water usage.

- **Others**

In Pondicherry , SRI trials were done at the Annapurna farm in Auroville, and later the M S Swaminathan Research Foundation tried SRI on small plots in the bio-village. PRADAN also took up SRI work in Jharkhand. Farmers like Kouligi from Melkote in Karnataka have produced booklets in Kannada on SRI.
Tamil Nadu Agricultural University has recommended SRI as a technology in Tamil Nadu to increase rice productivity and save irrigation water. The state department of agriculture held demonstration trials in all rice-growing areas of the state during the 2004 season.
In Punjab , as reported by Dr Sudhirendar Sharma, the JDM Foundation in Ladhowal, Ludhiana , is pushing a different version of low-water-use rice cultivation. According to Dr Sharma, this practice is the answer to Punjab 's water problems as it can lead to water savings of up to 60-70% during the paddy-growing season.

Experiments in other countries

SRI has been tested in 22 countries around the world including predominantly rice-growing countries like China , Sri Lanka , Cambodia and Indonesia and it is supposed to have come up with outstanding results.

- **Sri Lanka**
  According to a study by the International Water Management Institute, SRI farmers reported yield increases of 44%. Returns on crop budgets were higher, cost of production per unit of paddy output considerably lower, and average profits almost double those from conventional farms. It was found that both rich and poor farmers were equally likely to adopt SRI; once they adopted the method, however, poor farmers were more likely to continue with it. Rain-fed farmers saw SRI as an opportunity to minimise losses associated with weather uncertainties.

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Reduction in the use of chemical fertiliser is an obvious environmental benefit of SRI. The need for a considerable labour force and the tedious nature of the job (transplanting, manual weeding) are also seen as problems associated with conventional rice-growing.

- **Nepal**
  Experiments by 14 village development committees, in 2004, have shown yields from SRI farms to be more than double yields from conventional farms.

- **Laos**
  Rice cultivation through SRI has led to increases in yields from 3.27 t/ha to 5.05 t/ha.

- **China**
  Experiments since 2000 have shown that rice yields under SRI have risen by 35.6% compared to yields from conventional rice-growing.

- **Philippines**
  SRI farms achieved rice yields of 7.33 t/ha compared to the most advanced system of conventional rice-growing where yields were restricted to 3.66 t/ha.

- **Cambodia**
  According to a GTZ-supported study in 2004, over 400 SRI farmers displayed 41% higher grain yields from SRI farms.

Implications of SRI for India

Around 5,000 litres of water are required to produce one kilo of rice. Tamil Nadu has roughly 2 million hectares under rice cultivation; 70% of the area being irrigated. Rice consumes around 70% of the water available for agriculture in Tamil Nadu. Over the last four decades, the area under rice in Tamil Nadu has declined at the rate of 22,900 hectares per year.

Today, India has over 24 million hectares under irrigated paddy. If SRI were to be applied on all this land we would be able to increase our irrigated area by at least 50%, using the water now being used for paddy irrigation. It would also lead to a 50% increase in rice production. Both these factors would have huge implications for water resource management in India in the years to come. The question that immediately springs to mind is: With such far-reaching implications why is the government not actively pushing the adoption of SRI?

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