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System of Rice Intensification

RAHUL KUMAR

Combining several innovative practices, SRI is a different way of cultivating rice, including changes in nursery management, in the time of transplantation, and in water and weed management, which could well easily counter the side-effects of the Green Revolution

The System of Rice Intensification (SRI) emerged in the 1980s as a synthesis of locally advantageous rice production practices in Madagascar. Fr Henri de Laulanie, a Jesuit priest who had been working in Madagascar since 1969, integrated the techniques that he saw being used and helped create awareness about the new technique all over the world. Today, SRI has been adopted in many states in India and the response from the farmers has been overwhelming because they have reaped the benefits of the method.

SRI is a combination of several innovative practices, which includes changes in nursery management, the time of transplantation, and water and weed management. It is a different way of cultivating rice though fundamentally the practices remain more or less the same as in the conventional method. There is, in this practice, an emphasis on altering certain agronomic practices of the conventional method of rice cultivation. It is not a fixed package of technical specifications but a system of production with four main components, that is, soil fertility management, planting method, weed control and water (irrigation) management. Several field practices have been developed around these components.

The key elements of SRI practices are as follows.

I. Transplanting young seedlings, before the start of the fourth phyllochron of growth
II. Reducing plant population by as much as 80–90 per cent per square metre
III. Converting paddy soils from the anaerobic, flooded status to mostly aerobic conditions, by alternate wetting and drying
IV. Improving active soil aerations with mechanical weeders
V. Increasing soil organic composition

Whereas some of the practices appear counter-intuitive, getting more production from fewer plants, with less water application and with reduced reliance on chemical fertilizers, the effects of each can be explained and justified scientifically. The overall effect is a higher grain yield (food) and dry matter (feed).

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There are numerous benefits of this technique that have an impact on households (HH), countries and the planet at large. These benefits are enumerated here.

NEED FOR SRI

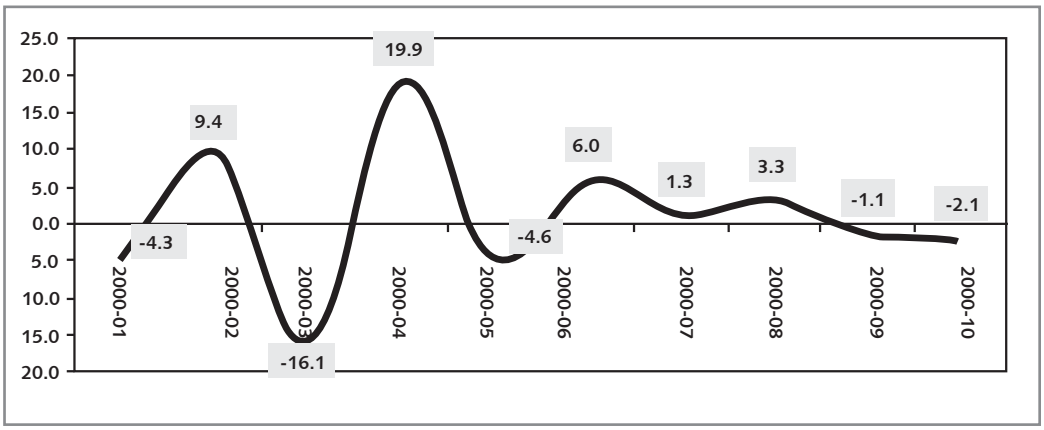
There has been stagnation in the productivity of grain especially in the Green Revolution areas that have been contributing disproportionally to the national food supply and the food security of the country. Among the factors that have led to a decline in productivity are inappropriate plant, soil, water and nutrient management practices. The management and efficiency of the surface irrigation systems is in serious disarray, and the costs of irrigation continue to mount because of the continued neglect of

Fig. 1: Benefits of SRI

Benefits for Rural HH	Benefits for Countries	Benefits for the Planet
More rice grown to eat and sell from the same amount of land, in a cost-effective manner (HH food security)	Improved food security	Less pressure to convert remaining forests and natural landscapes to agriculture
Higher incomes/Lower costs including less water (income security)	Water freed up from the rice sector for other crops, people, natural systems	Enhanced ecosystem services involved in regulating water, soil, climate
Reduced dependency on purchased inputs (seeds, fertilizers, pesticides)	Budget savings on new water projects, food imports, energy and fertilizer subsidies	Reductions in Green House gases, especially methane
Enhanced natural resource base	Improved soil and water quality from reduced loads of nitrogen fertilizer and pesticides	Less loss of plant and animal biodiversity from soil and water pollution
Reduced risk and vulnerability	More resilient, productive rural communities	Reduced flashpoints for conflict over food, water, land
Improved farm/ family health	Improved public health	Improved planetary health

(Source: http://www.sri-india.net/documents/More_Water_For_The_Planet.pdf)

Fig. 2: Trends in Growth Rate(%) of Rice Yield (GOI, 2010)



maintenance and the ineffective operation of irrigation systems.

Groundwater resources are being over-exploited, partly encouraged by policies that provide farmers with an unlimited amount of free water. The quality of the soil is declining in many areas due to inappropriate tillage practices, the overuse of agro-chemicals, the lack of ground cover and other poor management techniques that have contributed to erosion, loss of soil structure and function, salinization, nutrient depletion, loss of soil biodiversity and, ultimately, desertification. Nearly 90 million tonnes of soil are lost annually.

The policies for subsidizing chemical fertilizers are proving to be very expensive fiscally, without demonstrable/commensurate contribution to agricultural productivity, leading to negative impact on soil systems. The excessive focus on varietal changes for productivity enhancement while ignoring the new synergetic possibilities of interactions that are emerging globally is contributing to the developmental dilemma. Existing extension systems are overstretched and have not delivered adequately to small and marginal farmers in rain-fed areas. Scarcity of labour is threatening the continuance of rice farming as well.

EMERGENCE AND IMPACT OF THE GREEN REVOLUTION

The Green Revolution led to sizeable increases in returns from the land and, hence, to the raised income of farmers. Moreover, greater disposable incomes led to the introduction of new farm inputs, and milling and marketing services. Farming families led a general increase in demands for goods and services, thus stimulating the rural non-farm economy, which in turn grew and generated significant new income and employment of its own. In India, the percentage of the rural population living below the poverty line fluctuated between 50 and 65 per cent before the mid-1960s but then declined steadily to about one-third of the rural population by 2003. Research shows that much of this steady decline in poverty is attributable to agricultural growth and associated declines in food prices. The Green Revolution also contributed to better nutrition by raising incomes and reducing prices, which permitted people to consume more calories and a more diversified diet.

The Green Revolution in India, as well as in Asia, stimulated a debate about how agricultural and technological changes have affected the poorer farmers. It has been argued that the owners of the large farms were the main adopters of the new technologies because of their better access to irrigation, fertilizers, seeds and credit. Small farmers were either unaffected and sometimes even harmed because the Green Revolution resulted in lower product prices, higher input prices, and efforts by landlords to increase rents or force tenants off the land. It is also argued that the Green Revolution encouraged unnecessary mechanization, thereby pushing down rural wages and employment. The Green Revolution also led to large-scale environmental damage. Excessive and inappropriate use of fertilizers and pesticides has polluted waterways, poisoned agricultural workers, and killed beneficial insects and other wildlife. Irrigation practices have led to a salt build-up and have eventually led to the abandonment of some of the best farming lands. Groundwater levels are retreating in areas where more water is being pumped for irrigation than can be replenished by the rains; and the heavy dependence on a few major cereal varieties has led to a loss of biodiversity on the farms. Some of these outcomes were inevitable as millions of largely illiterate farmers began to use modern inputs for the first time. In addition, inadequate extension and training, an absence of effective regulation of water quality and input pricing, and subsidy policies that made modern inputs too cheap and encouraged their excessive use, also created a negative environmental impact.

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It has often been argued that the Green Revolution provided the only way in which India could have increased food availability within the country. Until the 1960s, India was successfully pursuing an agricultural development policy, based on strengthening the ecological base of agriculture and the self-reliance of peasants. Land reform was viewed as a policy necessity and most states initiated measures to secure tenure for tenant cultivators, to fix reasonable rents and to abolish the *zamindari* system. Ceilings on land holdings were also introduced.

LOSS OF DIVERSITY

Diversity is a central principle of traditional agriculture in the regions of Punjab, as in the rest of India. Such diversity contributes to ecological stability, and hence to ecosystem productivity. The lower the diversity in an ecosystem, the higher is its vulnerability to pests and disease. The Green Revolution package reduced genetic diversity at two levels. First, it replaced mixtures and rotations of crops such as wheat, maize, millets, pulses and oil seeds with monocultures of wheat and rice. Second, the introduced wheat and rice varieties came from a very narrow genetic base.

INCREASE IN USE OF PESTICIDES

Because of their narrow genetic base, High Yielding Varieties (HYVs) are inherently vulnerable to major pests and diseases. In Punjab, the rice variety PR 106, which currently accounts for 80 per cent of the area

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under rice cultivation, was considered resistant to white-backed plant hopper and stem rot when it was introduced in 1976. It has since become susceptible to both diseases, in addition to succumbing to rice leaf-folder, hispa, stemborer and several other insect pests. The natural vulnerability of HYVs to pests has been exacerbated by other aspects of the Green Revolution package. Large-scale monoculture provides a large and often permanent niche for pests, turning minor diseases into epidemics. In addition, fertilizers have been found to lower the resistance of plants to pests. The result has been a massive increase in the use of pesticides, in itself creating still further pest problems due to the emergence of pesticide-resistant pests and a reduction in the natural checks on pest populations.

The 'miracle' seeds of the Green Revolution have thus become mechanisms for breeding new pests and creating new diseases. Yet, the cost of pesticides or of breeding new 'resistant' varieties was never counted as part of the 'miracle' of the new seeds.

SOIL EROSION

Over the centuries, the fertility of the Indo-Gangetic plains was preserved by treating the soil as a living system, with soil-depleting crops being rotated with soil-building legumes. However, during the Green Revolution, marginal land or forests have been cleared to make way for the expansion of agriculture; rotations have been abandoned; and the cropland is now being used to grow soil-depleting crops year after year. Since the start of the Green Revolution, the area under wheat, for example, has nearly doubled and the area under rice has increased five-fold. During the same period, the area under legumes has been reduced by half. Today, 84 per cent of Punjab is under cultivation, as against 42 per cent of India as a whole. Only four per cent of Punjab is now forested and most of these have plantations of Eucalyptus.

WATER SHORTAGES

Traditionally, irrigation was used in the state of Punjab only as an insurance against crop failure in times of severe drought. The new seeds, however, needed intensive irrigation as an essential input for crop yields. Although HYVs of wheat may yield over 40 per cent more than traditional varieties, they need about three times as much water. In terms of water use, therefore, they are less than half as productive. One result of the Green Revolution has, therefore, been to create conflicts over diminishing water resources. Wherever crops are dependent on ground water for irrigation, the water table is declining at an estimated rate of one-third to half a metre per year.

Increased use of fertilizers, however, has not compensated for the over-use of the soil. HYVs rapidly deplete micronutrients from soils and chemical fertilizers (unlike organic manure, which contains a wide range of trace elements) cannot compensate for the loss. Micronutrient deficiencies of zinc, iron, copper, manganese, magnesium, molybdenum and boron are thus common. Because of soil

deficiencies, the productivity of wheat and rice has declined in many districts of Punjab, in spite of increasing levels of fertilizer application.

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The Green Revolution depended upon an input-based extension system, in which imported techniques were taken to large farmers, who had assured irrigation facilities. These farmers were provided inputs such as seeds, fertilizers and agricultural equipment through the government machinery. But the same model may not be applicable to small and marginal farmers, who are dependent upon rainfall to meet their irrigation requirements. Small and marginal farmers do not even have the capital to meet the risk of the vagaries in rainfall and, thus, are more prone to risks of erratic rainfall. Such farmers require a process-oriented extension system, in which they are provided with low-cost, subsidized technical support along with long-term, hand-holding support. This extension system needs to have built-in, hand-holding support and facilitation to bring about an institutional change in the behavioural pattern of the farmers. Given the fact that these farmers would have a strong cross-learning approach with their peers, it is imperative to develop a strong cadre of community resource persons (CRPs) with sound technical knowledge and a willingness to support the farmers in the field. There is also a need to create a pool of extension workers to provide on-farm support to the farmers, and train and motivate these farmers to take up low-cost technological inputs, which will help them fight against the vagaries of nature.

OUTREACH OF SRI IN THE WORLD

The SRI methodology was synthesized in the early 1980s by Fr Henri in Madagascar. He devoted 34 years of his life, working with Malagasy farmers, to improve their agricultural systems and, particularly, their rice production because rice is the staple food in Madagascar. SRI gained momentum in 1999, and since then has spread all across the globe. Today, this practice is being followed in more than 40 countries across the globe, including major rice producing countries such as China, India, Indonesia and, Brazil. The area under SRI in some of the countries has been listed in the figure 3.

Fig. 3: Area under SRI

No.	Name of the country	Year of Data	Area in Hectares
1	China	2009	2,51,000
2	Korea	2009	250
3	Cambodia	2011	24,293
4	Indonesia	2011	1,00,000
5	Laos	2010	2,625
6	Myanmar	2007	4,000
7	Timor Leste	2010	3,400
8	Vietnam	2009	2,32,365

(Source: http://sri.ciifad.cornell.edu/index.html dated 31/10/11)

This demonstrates the fact that, in the last two decades, most of the rice producing countries of the world have adopted SRI as a method of rice cultivation.

OUTREACH OF SRI IN INDIA

Within a span of 10 years, SRI has reached over 2,50,000 farmers in over 250 districts across India. SRI has become a part of the state policy in Bihar (which declared 2011 as the year of SRI), Tripura, etc. This has been possible largely due to civil society innovations. Financial Institutions such as the National Bank for Agriculture and Rural Development (NABARD) and funding agencies such as the Sir Dorabji Tata Trust (SDTT) have played a very important role in spreading SRI across the country.

STATE GOVERNMENTS

States such as Tamil Nadu, Tripura, Andhra Pradesh, Bihar, Chhattisgarh, Uttar Pradesh, Odisha and Jharkhand are actively engaged in the promotion of SRI. Agencies such as the Bihar Rural Livelihood Promotion Society (BRLPS) and the Society for Elimination of Rural Poverty (SERP) have been instrumental in spreading SRI within Bihar and Andhra Pradesh.

NABARD

NABARD is also extensively engaged country-wide in spreading SRI through its NGO partners. These are working primarily in Andhra Pradesh, Assam, Bihar, Chhattisgarh, Jharkhand, Maharashtra and Karnataka. In Jharkhand, NABARD's target was to cover 30,000 farmers, covering 7,500 acres in 22 districts in 2010.

SRI in Berhampur, Orisha

The method of rice cultivation under SRI is proving to be the means to deal with the problem of erratic monsoon in Berhampur. Whereas paddy farmers in the state face extreme crop loss due to low rainfall and pest menace, the small and marginal farmers in Ganjam district, who experimented with the SRI method, are confident of a good harvest. D. Anuradha, a woman farmer of Panibandha village, said she was expecting a better harvest using SRI than with the conventional method of paddy cultivation although no chemical fertilizer or pesticide was used.

Showing the standing crop in her field, Pranhasini Mohrana said she had not expected to get a good yield despite the low rainfall. "A great myth in our minds that paddy cultivation needs standing water was broken through the SRI method of cultivation," she said. T. Bhagirathi was confident that he would harvest more than 40 quintals of paddy from one acre of land, on which he used the SRI method. According to him, the progress of the plants shows that there would be a higher yield of grain as well as straw. These farmers know that success in their fields will surely change the mindset of other farmers and the latter will also come to believe in the magic of the SRI method. The method uses one-tenth of the seeds used in the conventional cultivation because it has fewer plants per unit area. It requires less expenditure on fertilizers and pesticides and shatters the myth that paddy needs deep standing water. Under the SRI method, paddy fields are never flooded.

The Hindu, 21 November 2009

DTT AND OTHER DONORS

SDTT has initiated the promotion of SRI and livelihoods in the low Human Development Index (HDI) states, particularly in eastern India. Within a short period of less than three years, SDTT reached out to 81,138 SRI farmers in 2010–11. Over 8,000 ha of land was covered in Assam, Bihar, Chhattisgarh, Jharkhand, Madhya Pradesh, Maharashtra, Manipur, Odisha, Uttar Pradesh and Uttarakhand. Other donors and promoters (including WASSAN, PRADAN, AME foundation, AKRSP, CWS and other state NGOs) are also being supportive in Karnataka, Andhra Pradesh, Tamil Nadu, Himachal and Uttar Pradesh.

Scaling up SRI is a process-oriented system, in which the major focus is on building the capacity of farmers, to adopt the SRI method of paddy cultivation. The strategy is to primarily target small and marginal farmers, who are at the highest risk of facing food insecurity.

VARIOUS ACTORS ENGAGED IN THE PROMOTION OF SRI ACROSS INDIA

The promotion of SRI in India is not limited to government departments only. Many are engaged in the promotion of SRI across India, ranging from civil societies to various organizations. The Tamil Nadu Agriculture University is working extensively in Tamil Nadu; SERP and Acharya NG Ranga Agriculture University are promoting SRI in Andhra Pradesh; SDTT and its partners are engaged in the promotion of SRI in Assam, Bihar, Chhattisgarh, Jharkhand, Madhya Pradesh, Maharashtra, Manipur, Odisha, Uttar Pradesh, Uttarakhand and West Bengal; the Department of Rural Development is working in Tripura; BRLPS is working in Bihar; WASSAN and PSI are promoting SRI in Tamil Nadu and Himachal Pradesh, respectively.

STEPS FOR SCALING UP SRI

Scaling up SRI is a process-oriented system, in which the major focus is on building the capacity of farmers, to adopt the SRI method of paddy cultivation. The strategy is to primarily target small and marginal farmers, who are at the highest risk of facing food insecurity. The major focus of the intervention is to change the mindset of the people rather than to provide them with inputs in the form of cash or kind.

In order to address the needs of the small and marginal farmers in the rain-fed areas, there is strong need to create a pool of resource persons, who will work directly with farmers and provide them hand-holding support for a period of at least three to five years so that the farmers are able to adapt to SRI as a method of rice cultivation. Given this situation, it is not an easy job to do. It is thus required that these extension workers are trained well to mould and convince the farmers and to help change their mindsets.

Village-level resource persons have to be trained in the technical aspects of SRI along with motivational training. The focus of these training programmes will be on building and equipping village youth with the required knowledge, attitude and skills, to become involved in a transformational role. These resource persons, in turn, will help farmers to implement the full package of practices for a season.

CONCLUSION

The economic viability of SRI has been experimented with and tested by many community based organizations (CBOs), government agencies and academic institutions across the globe. The success of this method of cultivation in rice has led to

the adoption of this method in other crops as well such as with sugarcane, wheat, rye and vegetables. Small and marginal farmers are adopting this technology on a large scale in order to have maximum productivity from the small landholdings they possess. Its economic and social viability still remains to be tested among large farmers but given the results which this method has achieved among the small and marginal farmers, the outlook seems positive. And once the economic and social implication is established among the large farmers, SRI will definitely achieve new heights in terms of its coverage and output.

There is also strong need to develop a mechanism to reach out to the poor and small farmers in rain-fed areas, in which there is a large scope for the spread of SRI. There is need to have an institutional mechanism, which will provide hand-holding support to the farmers for at least three years so that they are able to understand the method and adopt it in their fields. The institutional framework also needs to address the capacity building need of the farmers so as to bring about a change in their mindset, and to mitigate the risk of the vagaries of nature. Although there has been tremendous achievement in the last decade, there still remains a long way to go, which will be possible only with strong governmental support and the presence of CBOs within this institutional framework.

SRI Promotion among Small and Marginal Farmers: SDTT–PRADAN Collaboration in Chhattisgarh

KUNTAL MUKHERJEE AND SAROJ MAHAPATRA

Promoting SRI with about 13,500 families, covering about 340 villages in nine districts across the northern hills, the plains and the Bastar plateau region of the Chhattisgarh state seems to have paid rich dividends by way of doubling yield and food grain sufficiency.

BACKGROUND

PRADAN, with the support of Sir Dorabji Tata Trust (SDTT)—one of the oldest philanthropic organizations in India—collaborated with other NGO partners in a pilot project to introduce the System for Rice Intensification (SRI) method of paddy cultivation in some of the poor regions of Chhattisgarh. The purpose of the project was to demonstrate SRI in the area and prepare NGO actors for large-scale replication of the pilot in other areas.

In 2008–09, PRADAN, in collaboration with 11 other NGOs, carried out field trials of SRI with 800 families on 80 ha of land. PRADAN provided the technical guidance in the training-cum-demonstration programme organized by the NGOs. The intervention showed encouraging results and, in 2009–10, the programme reached out to 3,200 famers in nine districts of Chhattisgarh.

The objective of the programme is to expand SRI through a partnership approach, with a focus on enhancing food-grain security of small and marginal farmers in Chhattisgarh. The plan is that, by the end of three years, families would have at least doubled their yield and would have improved their standard of living. Also expected is that this intervention would demonstrate the efficacy of the SRI method to a large number of farmers in the project villages and around.

In hist project, about 13,500 families, covering about 340 villages in nine districts across the northern hills, the plains and the Bastar plateau region of Chhattisgarh state, use the SRI method. The project envisages enhancing paddy productivity from the current two to three tonnes per hectare by 75–100 per cent, which will ensure year-round food sufficiency for the participating families.

Implementation Methodologies

The broad intervention strategies have been as follows:

Training for partners

Centralized training programmes on introducing SRI to farmers have been conducted for the NGO staff in the field. They have been provided with hands-on training, to carry out each critical step correctly. A group of cadres (one for 50 families) identified by the community has been trained and engaged to guide the community and ensure proper practices in every farmer's field. NGO personnel, trained by the state-level forum, are responsible for the training of these cadres and farmers.

Village-level Farming Support

All the participating families in the programme have been provided training. Exposure visits have also been organized for them. The implementing team helps the community select a group of men and women from among themselves who have been trained to provide on-site hand-holding support during the implementation of the SRI package of practices (POP). Community resource persons (CRPs) have been trained by the NGO staff and deployed in all the selected villages.

Constituting a State-level Forum

PRADAN and its partner NGOs have come together and formed a state-level forum. Each NGO has deputed a person to the forum, to be the anchor of the SRI activity of the organization. This forum holds bi-monthly meetings. All members contribute ideas for designing the future course of SRI in the state and its convergence with other developmental schemes of the government. The forum has also been very pro-active in monitoring the programme and has encouraged cross-learning among its partners.

OVERALL STRATEGY DESIGN

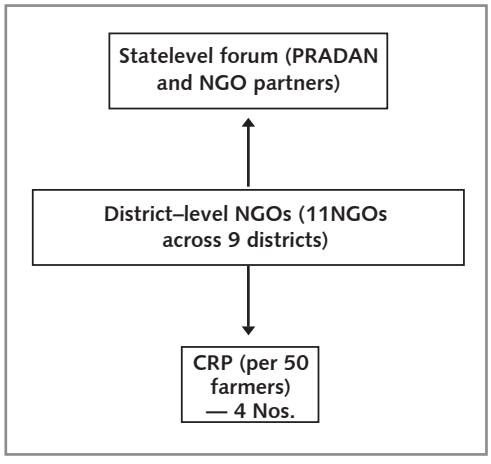
ROLE OF THE VARIOUS PLAYERS IN THE MODEL NGO (COORDINATOR AND SKILLED EXTENSION WORKER)

- Implementing agency at the field level
- Providing on-field support for farmers
- Training at the village level
- Motivating farmers to adopt SRI
- Promoting organic farming
- Collection and compilation of yield data
- Organizing panchayat-level meetings, interfacing among SRI and non-SRI farmers for large-scale dissemination.
- Interacting with the line department officials at the block level.
- Conducting regular meetings and trainings.

COMMUNITY RESOURCE PERSONS

- Following up on the PoPs and scientific practices on SRI—nursery raising, line transplantation, disease and pest management, etc.
- Organizing on-farm demonstrations.
- Providing need-based support to the farmers.

Fig. 1: Overall Strategy Design



MAJOR ACHIEVEMENTS

Due to adverse seasonal conditions in *kharif* 2009, the forum could only reach 3,200 families for SRI. During 2010–11, however, the forum reached 5,455 families, spread over 232 villages in nine districts on an area covering 931.95 ha.

PRADAN'S INTERVENTION

- Helping participant families to adopt fail-safe POPs for SRI.
- Promoting soil health improvement practices—including green manuring, vermi-composting and other organic and sustainable techniques.
- Building capacities of all participating families in adopting skills related to SRI technology.
- Promoting the adoption of small mechanization for weeding and post-harvest technologies, reducing drudgery.
- Disseminating learning among other stakeholders.

The forum has mainly worked on two crops—paddy and wheat. For yield estimation, samples were taken from 1,410 farmers' (25.84 per cent of the total farmers) fields. The average yield of SRI paddy was 5.84MT/ha, which is more than double the yield of conventional paddy in the state (2.2 MT/ha). In the coming season (2012), the forum's target is to reach 8,500 families over 1,420 ha of land and introduce the SRI technique, mainly for paddy and millet.

ANALYSIS OF THE PRODUCTION DATA OF 2010–11

The data in table 1 show that 83 per cent of the families that adopted SRI principles in their fields have achieved yields ≥ 4 MT/ha, which is about twice as much as that of the traditional yield. The average yield for the families measured so far (almost one-fourth of the 5,455 participating households) is 5.84 MT/ha. This is much higher than the average state yield of 2.2 MT/ha from traditional practices. The average paddy yield for the farmers in our sample was 2.1 MT/ha when they used traditional paddy practices on their farms. The same techniques were used for measuring both sets of the yield. Thus, it was seen that the SRI yield, on the same farms for the same farmers, was more than double and almost triple the yield from the traditional rice-growing practices.

Outreach till July 2011: The covered districts are of Surguja, Jashpur, Raigarh, Bilaspur, Korba, Raipur, Dhamtari, Kanker and Bastar.

STUDY OF FOOD GRAIN SUFFICIENCY FROM SRI

The sample data was examined to analyse the impact of SRI on food-sufficiency. It was found that the average per-family landholding under SRI is 0.17 ha (from the

Table 1: Productivity Analysis of 1,410 Sample Families (25.84 per cent of the Total Participant Families)

Productivity Range (MT/ha)	Number of Sample Families	% of Families
10–12	23	1.63
8–10	150	10.64
6–8	381	27.02
4–6	614	41.33
2–4	240	17.02
Up to 2	2	0.14
Total	1,410	100

Table 2: Area under SRI in Chattisgarh in 2010-2011

No.	Particulars	(*Kharif & Rabi* 2010–11)	Remarks
1	No. of Districts	9	In *kharif* 2011, the forum has a target of 8,500 families, covering 1,420 ha of land.
2	Villages	232	
3	NGOs involved	11	
4	Families	5,455	
5	Coverage (ha)	931.95	
6	Average area per family (ha)	0.17	

Table 3: Food-grain sufficiency of SRI and Traditional

	SRI Practice	Traditional Practice
Members/family (no.)	5	5
Average land holding (ha)	0.17	0.17
Daily rice consumption per household (kg)	3	3
Average production (MT/ha)	5.84	2.1
Food grain sufficiency from landholding (months)	7.5 (7.28)	3 (2.62)

sample data sheet) and the average number of members in a family is about five (also from the sample data sheet). They consume 3 kg of rice per day (from a random survey). One kilogram of paddy gives about 0.66 kg of polished rice—after threshing and drying.

From table 3, we see that from a landholding of 0.17 ha, shows, a farming household is able to increase its food-grain sufficiency by approximately four-and-a-half months compared to the output it recieved using traditional practices.

Reaching out to the poor and marginalized farmers is a task that involves regular monitoring and hand-holding support. The model being followed in Chhattisgarh, which targeting 13,500 families in three years requires a fund of Rs 22,877,572.

SRI in Gaya: Promotion Strategies

ANIL K. VERMA

Introducing and promoting SRI involved phased training, detailed planning and handholding of farmers who were only used to traditional ways of cultivation.

Low productivity in paddy and wheat has had an adverse impact on the food security of households. The average paddy yield of small and marginal households belonging to Self Help Groups (SHGs), formed by JEEViKA, ranged from 0.8 to 1.2 tonnes per hectare, which could meet only 4–5 months of the rice consumption needs of a household.

Professional Assistance for Development Action (PRADAN) piloted the System of Rice Intensification (SRI) in 2007 and SRI-Wheat in 2008, with support from Bihar Rural Livelihood Promotion Society (BRLPS), Patna. It then scaled up SRI-Paddy and SRI-Wheat under BRLPS, and Shri Dorabji Tata Trust (SDTT), Mumbai.

The project piloted SRI in 2007 with 128 smallholders belonging to SHG households in 30 ha of land. The average paddy yield was nearly 10 tonnes per ha, which was significantly higher than the existing productivity. Following the success of the pilot, the project scaled up SRI in the subsequent 3 years with 5,146; 8,367 and 19,911 smallholders (Colloquium on SCI)

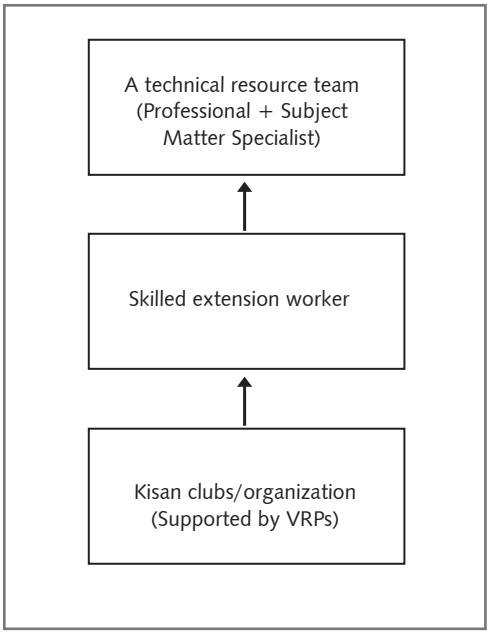
BRLPS and PRADAN intervened in the area by forming SHGs, each an informal body of 15–20 women organized for saving and credit activities. With these women members of the SHGs and the marginal farmers in the region, PRADAN piloted and scaled up the SRI project in the following years. A team comprising a professional, with more than 10 years of experience, a young and dynamic Subject Matter Specialist and a group of Skilled Extension Workers are implementing the project in Bihar.

STEPS TO PROMOTE SRI

1. **Campaigning in new areas** using vehicles/extension material/mike/SRI songs: The women SRI cultivators along with Village Resource Persons (VRPs) campaign in new areas and share their experiences of using SRI.

2. **Exposure** of new villagers to SRI villages: Whenever there is a plan to expand in the following year, exposure visits are organized for farmers to expose them to SRI plots. The identification and selection of VRPs also start at the same time.
3. **Phase-wise** training to identify VRPs of new areas:
   The farmers of the villages are trained in different phases. Usually the training is conducted in 3–4 phases.

Fig. 1: Structure for SRI Promotion



4. **Weekly** Meeting of VRPs
   Reviewing and planning for the coming week is done regularly. This meeting is attended by the Skilled Extension Worker. Occasionally it is also attended by the SMS.

STRATEGIES

Between the training of SRI facilitators and participant farmers, a large number of small and marginal farmers became willing to take up SRI. The facilitators, fully involved with the rural community, used the following strategies.

PHASED TRAINING ON SRI

THE FACILITATORS:

- Identified rural youth as VRPs, cum-facilitators
- Imparted hard-core training—in-house and in the field
- Applied the standard scanning process to know the social, intellectual and emotional maturity, giving priority to EQ than IQ.
- Assigned responsibility for 30–100 families, based on the capability
- Held weekly review and planning meetings with facilitators in the unit headquarters and sub-location meetings with programme co-ordinators.

TRAINING AND AWARENESS BUILDING IN COMMUNITIES

- Used audiovisuals and flex extension material
- Used experienced SRI farmers of the previous year to campaign in villages, using manuals extensively in April and May.
- Organized big meetings attended by programme co-ordinators and facilitators in villages, to motivate and create awareness among farmers.
- Associated with government extension officers and KVKs at all levels.
- Participated in *kisan melas* organized by government departments.
- Offered better training and hand-holding honorariums to facilitators/ VRPs associating themselves with landless SC families.

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Table 1: Year-wise Progress of SRI in the Project

Particulars/Years	2007	2008	2009	2010
No. of SHG members/smallholders	128	5,146	8,367	19,911
SRI land in hectares	30	544	786	1,412
SRI yield in tonnes/hectare	10	7.75	6.5	3.22*
Traditional paddy yield in tonnes/hectare	2.2	2.36	2.02	1.66*
Highest SRI yield in tonnes/hectare	18.8	19.3	14.2	6.5
State average paddy yield in tonnes/hectare			2.3	
Climatic conditions		Water stressed condition	Drought	Extreme drought

*Data of 74 villages analysed

(Source: Concept note on National Colloquium on SCI—BRLPS)

ROLES

The teams at various levels played different roles.

Technical Resource Team (Professional SMS):

- Developed package of practices (PoPs)
- Trained Skilled Extension Workers and equipped them with skills and robust PoPs.
- Developed strategies and approaches and developed plans of action
- Reviewed systems and processes to maintain quality
- Established various linkages

SKILLED EXTENSION WORKERS:

- Trained VRPs with SMS
- Builded the skills of VRPs and farmers
- Ensured and facilitated campaigning, exposures and village farmers clubs
- Build the capacity of common farmers on the SRI method of crop cultivation
- Piloted new initiatives on the SRI method of crop cultivation with SMS and professionals
- Ensured recording of data of SRI farmers in the field
- Attended weekly meeting of VRPs, reviewing and planning
- Provided training and handholding support to common farmers with VRPs

THE ROLE OF VRPs:

- Provided training and handholding support to farmers
- Participed in campaigns and exposure visits with SRI cultivators
- Helped farmers in following PoPs for the SRI crop
- Entered and recorded data pertaining to SRI cultivation
- Ensured meetings of SRI farmers at the village level
- Trained state and district officials when asked for by the government

SRI: Helping Enhance Rice Productivity of Small Farmers

B.C. BARAH

Low productivity and large regional differences in yield imply that there is ample scope to increase production and bridge the yield gaps.

There has been a decline in the per capita availability of food (rice) in the country. It reached an all-time low of 64 kg per annum in 2008–09, 20 kg less than the minimum annual requirement of a normal person (NSSO survey). With Indians being largely rice consumers, this declining productivity of the crop is of national concern.

To meet the nutritional needs of the people, food production has to be more than double of what it is. There are several factors affecting the productivity of food in the country. There are the biotic causes such as pests, weeds infestation, diseases and genetic decline, and the abiotic stress that includes problematic weather aberrations due to climate change such as flooding and drought, temperature fall, frost, submergence and cyclone. In addition, the country has to deal with year-to-year fluctuations in production and the fact that the sector loses around 40 per cent of its crop production annually, to system inefficiency and wastage. The loss affects household food security, particularly among the small and marginal farmers and the poor.

The picture becomes grimmer because of the stagnation of land under food crops. The pressure of increased population and the spate of urbanization add to the problem. The focus has to be on increasing the productivity of the land, to ensure food security at various levels (global, national and household levels). The smallholders in rain-fed areas, where a majority of the hungry people live (79 per cent of the poor in India live in rain-fed areas), are vulnerable to the low-level productivity trap as well as violent price volatility.

Low productivity and the large regional disparity in yield imply that there is enormous scope to exploit the vast untapped potential and increase production to bridge the yield gap. The System of Rice Intensification (SRI) provides ample scope for enhancing productivity and breaking the yield barrier in smallholders' fields. The advantage is that SRI produces 'more rice with less input', thereby reducing the cost of production and, at the same time, conserving precious water and other

resources. An intrinsic feature of SRI is that it is a pro-poor option of household food security. SRI involves a set of common practices, which synergistically result in a higher yield per plant.

Norman Uphoff, a professor at Cornell University, Ithaca, US, is fully convinced about the role of SRI in meeting the food security needs of the poor and has devoted his time to promoting its adoption and creating awareness about it globally. The origin of this simple technique can be traced to Madagascar where SRI was first practised. This method has recently been introduced in India, where farmers have improved productivity by using less water while incurring no additional cost.

The government, the civil society and the NGOs have been promoting SRI on an unprecedented scale and at great speed because of the emphasis on capacity strengthening of the farmers. The innovative initiatives to introduce SRI have helped spread the message widely in rice growing districts. Nearly one million hectares of rice fields were brought under SRI in India in 2009–10. This innovative system of rice cultivation is an integrated package of agronomic approaches to exploit synergistically the genetic potential of rice plants; create a better growing environment (both above and below ground); enhance soil health; and reduce the input cost substantially. The phenomenal saving in seeds (90 per cent) and water (up to 40 per cent) has attracted farmers to adopt SRI. Gender participation in SRI is also very encouraging, and women, in fact, are taking the leading role. The benefits of SRI, as observed at the farm level, include:

- Higher net incomes (86–165 per cent)
- Lower costs (11–20 per cent), less labour
- Less water (22–72 per cent) and less use of energy for irrigation
- Reduced dependency on purchased inputs: seeds (80–90 per cent), fertilizers and pesticides
- Climate change adaptability (drought tolerance, resistance to storms, reduced pest damage, enhanced natural resource base)
- Conservation of biodiversity (good response from indigenous varieties)
- SRI is fundamentally 'pro-poor' and effectively oriented to the small farmers (< one acre).

Over three million farmers have adopted SRI practices across the various states in India. On an average, SRI gives an advantage of at least 1.5 tonnes per ha yield, which is a great source of household food security for small and marginal farmers. Apart from an increase in farm income, the SRI practice has the built-in advantage of improved soil health and provides organic rice.

Being a set of care intensive practices, the imparting of knowledge of the SRI technique is important. Hence, capacity building and awareness of the stakeholders are crucial. It is, thus, essential to strengthen the institutional framework, including the rural credit system, crop insurance, marketing and remunerative pricing policy to boost this rural livelihoods.

By integrating the existing rice initiatives such as the National Food Security Mission and the rice research conducted by various government-owned institutes, it is possible to derive efficient strategies for scaling up the

innovation to a larger scale. This requires innovative institutional architecture by converging public and financial institutions and civil society initiatives. The development of stress-tolerant rice varieties and farmer-friendly practices, keeping the location specifics in mind, will be a further boost to the effort.

The government, the civil society and the NGOs have been promoting SRI on an unprecedented scale and at great speed because of the emphasis on capacity strengthening of the farmers.

The SRI method is preferred by scientists for breeder seed production and the SRI rice seed is preferred by farmers. Therefore, the SRI seed should be promoted. Policy interventions that build on the resource conserving property could be a source of sustainability. By pushing the irrigation facility in the rain-fed areas through the introduction of methods of harvesting rainwater and exploitation of ground water in a conjunctive manner, sustainable food production can be achieved. As SRI is suitable in the *rabi* season, given the availability of controlled irrigation, the problem of *rabi* fallow may also be addressed. This is an opportunity and incentive for converting fallow areas into a productive resource.

CASE STUDY: SRI PROJECTS IN BIHAR

Thirty-three SRI projects are being implemented in the state of Bihar. These projects are at different stages of implementation. Success stories, based on field visits, interactions with farmers, and reports are summarized here.

Shri Ashok Mahato, Shri Suresh Mahato and Shri Viswaroop Mahato of Yogiveer village of Jagdishpur block of Bhagalpur district had never imagined that they could realize a rice yield of over 40 quintals per ha from their fields. But the introduction of the SRI technique has changed their perception. They now think that they are a class apart and are proud to be known as those who took the risk and participated in the SRI project, supported by NABARD.

Although Yogiveer village receives abundant rainfall and has good quality soil, the farmers were not able to harness the full potential yield of rice from their fields. The reason for this was attributed to unscientific agronomic practices such as the indiscriminate use of fertilizers, no use of pesticide or organic manure and little concern for weed management and transplanting techniques, resulting in a lower yield.

Initially, the farmers were reluctant to let go of the traditional method of rice cultivation and follow the SRI practice; gradually, however, they shifted to the SRI method after a series of training, awareness and capacity building programmes. An audio-visual programme on the SRI technique and a video show depicting the success stories of SRI in various places were helpful in changing the attitude of the farmers. Assistance in the form of inputs such as vermi-compost, cono-weeder and fertilizers acted as an inducement in the initial years; subsequently more and more farmers have started to adopt SRI techniques.

There are similar stories from the farmers of other villages districts such as Bhagalpur, Patna, Munger, Purnea, Banka and Gaya. Crop cutting studies conducted in the SRI project fields reveal an increase of 170 per cent in the yield of paddy, 130

per cent the yield of straw and 140 per cent in tillering. Farmers Clubs, promoted with the assistance of NABARD, in the past played a crucial role in mobilizing farmers. The level of mobilization in the project area is so high that the farmers have pledged to discontinue traditional methods altogether.

Farmers, who have larger land-holdings, think that except for the high labour requirement for transplantation, which can be replaced by low-cost mechanized transplanters, in due course, this technique has a lot of potential for large-scale adoption, leading to higher productivity and net income accrual.

Using the SRI Methodology for Other Crops

ANIL. K. VERMA

Following the success of SRI and SWI, similiar methodologies were applied to different crops, resulting in the considerable increase in the yield of each.

Sugar-cane cultivation and the sugar industry are facing multiple problems despite sugar cane being an important crop in India. There are 35 million farmers growing sugar cane and 50 million more depend on employment generated by the 571 sugar factories and other related industries that use sugar. But despite India's long history of sugar cultivation and the large area under sugar-cane cultivation, in terms of productivity, sugar cane yields have been unimpressive. During the last 10 years, sugar-cane production in India has been fluctuating between 233 million tonnes and 355 million tonnes. India has the second largest area under sugar-cane cultivation in the world next to Brazil but the low yields and fluctuations in production are a cause for concern.

The average productivity of sugar cane is low, with certain regions reporting yields as low as 40 t/ha only. Not only is the cane yield low, the sugar yield—typically at less than 10 per cent of the weight of the cane—is also less than satisfactory, given that yields of 14 per cent of cane weight at the time of cutting (and sometimes much higher) are possible.

Sustainable Sugarcane Initiative (SSI) is a method of sugar-cane production that involves the use of less seeds, less water and optimum utilization of fertilizers and land, to achieve more yields. Driven by farmers, the SSI is an alternative to conventional seed, water and space-intensive sugar-cane cultivation.

The major features of the SSI are:

- Raising nurseries, using single budded chips
- Transplanting young seedlings (25–35 days old)
- Maintaining a wide spacing (5 x 2 ft) in the main field
- Providing sufficient moisture and avoiding inundation of water
- Encouraging an organic method of nutrient and plant protection measures
- Practising inter-cropping for effective utilization of land

OVERALL BENEFITS

In the conventional method, the cost of seeds is the most expensive part of the cost of cultivation; by practising SSI, the seed cost can be drastically reduced by about 75 per cent.

- Reduction in the plant mortality rate
- Increase in the length and weight of individual canes
- Easy to transport young seedlings over longer distances
- Easy inter-cultural operations because of wider spacing

OUTREACH

SSI has been introduced across various states in India such as Tamil Nadu, Maharashtra, Uttar Pradesh and Uttarakhand.

WHEAT

The System of Wheat Intensification (SWI) is a set of agronomic practices that involves modifying practices such as the seed rate, sowing of seeds at proper spacing, control of water in the main field, and weeding/hoeing, to ensure higher ratios of tillers to mother seedlings. This leads to an increased number of effective tillers per hill, enhanced panicle length and bolder grains or, in short, an enhanced yield of wheat.

MODIFIED PRACTICES

- Lower seed rate
- Seed treatment
- Sowing of seeds at proper spacing
- Control of water in the crop field
- Weeding/hoeing

OUTPUT/RESULTS

- Higher ratio of tillers to mother seedlings
- Increased number of effective tillers per hill
- Enhanced panicle length and bolder grains
- Enhanced yield

SWI IN BIHAR

After paddy, wheat is the second major staple food crop in Bihar. Bihar Rural Livelihood Promotion Society (BRLPS), an organization born of a collaboration among the Government of Bihar, the World Bank and the poor people of Bihar, was set up in 2009, to address rural poverty in the state. It was thought that if the yield of wheat could be enhanced through similar methodologies that were used for rice, the food security of the small-holders may be ensured.

Thus, the System of Wheat Intensification (SWI) was started with 415 small-holders during *rabi* 2008–09 on 16 hectares of land. The average yield was 3.7 tonnes per ha against a yield of 1.8 tonnes per ha through conventional methods in the same area. Following the success of the pilot, the BRLPS scaled up SWI in the following two years with

Table 1: Year-wise Progress of SWI in the Project

Particulars/Years	2008–09	2009–10	2010–11
No. of SHG members/smallholders	415	25,235	48,521
SWI land in hectare	16	1,200	2,336
SWI yield in tonnes/hectare	3.7	4.5	cont.
Traditional wheat yield in tonnes/hectare	1.8	1.6	cont.
Highest SWI yield in tonnes/hectare	8.4	10.012	cont.
State average wheat yield in tonnes/hectare		2.4	
Climatic conditions	Normal rainfall	Little shower at the end of of rainy season	Afer extreme drought

(Source - National Colloquium on SCI)

25,235 and 48,521 smallholders in Bihar. The year-wise progress of the SWI by the BRLPS is given here.

The System of Wheat Intensification (SWI) is a set of agronomic practices that involves modifying practices such as the seed rate, sowing of seeds at proper spacing, control of water in the main field, and weeding/hoeing, to ensure higher ratios of tillers to mother seedlings. This leads to an increased number of effective tillers per hill, enhanced panicle length and bolder grains or, in short, an enhanced yield of wheat.

CHILLI, TOMATO AND BRINJAL IN BIHAR

The seeds are treated with cow urine, warm water, vermi-compost, jaggery and trichoderma. The germinated or wet seeds are then sown in a nursery with two inches of spacing on either side. An organic environment is created in the nurseries. Organic compost and soils are treated with trichoderma. Every care is taken to minimize shock by taking the seedlings attached with the soil. The 8–12-day-old seedlings are uprooted carefully and transplanted in the main field. Shallow transplanting is done. A pit measuring one foot in depth and half a foot broad is made to provide the correct environment for intensification of roots. Farmers have to provide a favourable environment for profuse root growth. Shoot growth is the outcome of attention being paid to roots. Proper irrigation channels are made to facilitate aeration in roots, and two to three inter-cultural operations are done, using the SRI-*rabi* weeder. Productivity enhancement by using these methods is around 40–85 per cent.

Table 2: Difference in Yield of Chilli, Tomato and Brinjal through System of Crop Intensification (SCI) and conventional method

Vegetable Crops	Unit Description	No. of Small-holders	Conventional	SCI
Chilli	Kgs/Planat	69	1.5-2	4.5-5
Tomato	Kgs/Planat	168	3-4	12-14
Brinjal	Kgs/Planat	42	5-6	10-12

(Source - National Colloquium on SCI)

Table 3: Year wise progress of SCI in Green Gram and Rapeseed in the project

Particulars	2009-10	2010-11
Green Gram		
No. of SHG members/smallholders in green gram	490	2,400
Area in hectares	32	527
Average yield in quintals/acre	7.5	Cont.
Traditional green gram yield in quintals/acre	2.5	Cont.
Rape seed		
No. of SHG members/small-holders in rape seed	7	425
Average yield in quintals/acre	12.15	Cont.
Traditonal rapeseed yield in quintals/acre	6.75	Cont.

(Source - National Colloquium on SCI)

GREEN GRAM AND RAPE SEED

The technology of SRI has also been used for green gram and rape seed. It involves using a lower seed rate, seed grading and treatment, sowing with wider spacing or transplantation of young age seedlings with wider spacing, organic manuring, inter-cultural operations and proper weeding, leading to enhanced yield. During the successful scaling up of SRI and SWI, the project introduced the application of similar methodologies to different crops such as green gram and rape seed, with around 500 SHG households. The results were very positive and the yields were almost double for both the crops.

Introducing SRI in Chhattisgarh: The CARMDAKSH experience

DIP NARAYAN BANERJEE

Considering the urgent need to find ways to grow more rice, with less water and fewer inputs, the SRI method is proving to be of considerable advantage in exponentially increasing paddy output

INTRODUCTION

CARMDAKSH works with small and marginal farmers in an area that is totally rain-fed. The area is mono-cropped and the farmers have no other livelihood options round the year in Chhattisgarh. They mainly depend on paddy cultivation for their sustenance.

Small and marginal farmers in this region have fragmented landholdings and low capital to invest in agricultural inputs, and are vulnerable to climatic changes. Considering the existing situation of the present scenario in rural areas, some alternatives had to be identified to address the situation of these unprivileged sections of society. SRI seems to be one of the alternatives to address the issues of the farmers.

CARMDAKSH's staff had very limited knowledge of SRI; most of it was learned from newspaper cuttings. The staff took up the challenge at their own risk, saying that if they failed, they would make up the loss from their own pocket. It was also difficult to persuade the labour to transplant 12-day-old seedlings. Finally, the seedlings were transplanted by the staff but there was a delay of 15 days at the time of transplanting. The results, however, were encouraging. The farmer got two bags of produce more than what he usually was able to get (10 bags).

CARMDAKSH was encouraged to take up SRI in a more systematic way; so it approached NABARD under the Rural Innovation Fund. NABARD sanctioned the support to carry out SRI in rain-fed areas, with tribal farmers in different conditions. In 2007, CARMDAKSH implemented SRI with 10 farmers and got encouraging results. The increase in production varied from 30–80 per cent.

there has been remarkable increase in the yield with the use of limited resources, after the adoption of SRI in this region. Farmers are not expected to use any chemical inputs that they will not be able to purchase. They are encouraged to use more organic manure, which is readily available to them. The focus is on the agronomical approaches that can be controlled by farmers such as seed treatment, early transplanting, use of weeders for transplanting, maintenance of a low level of water and use of organic manure.

SRI may be a valuable alternative for small farmers with limited land endowment and very little capital to invest in agricultural inputs. The most difficult aspect of rice plantation in the predominantly rain-fed rice systems was obviously water management with alternating flooding and drying of the rice fields.

Preliminary results indicate drastic increases in the yield whereas the use of inputs such as seeds and fertilizers had reduced. Therefore, SRI may be a valuable alternative for small farmers with limited land endowment and very little capital to invest in agricultural inputs. The most difficult aspect of rice plantation in the predominantly rain-fed rice systems was obviously water management with alternating flooding and drying of the rice fields.

CARMDAKSH demonstrated SRI in 2006 on a 75 decimal plot belonging to a tribal farmer in a rain-fed area. It was a big challenge for the team to persuade the farmer to participate in such an innovation, which was so far removed from the conventional method that he was used to.

The main obstacles to adopting SRI remain mental and attitudinal. Other common problems farmers face are that:

That SRI demands more personal attention and constant involvement by farmers.

Farmers have apprehensions about the new way of raising seedlings, handling young seedlings and square planting. They also find it difficult to level the main field properly. Weeders are unsuitable for some soils.

STRATEGIES

The new techniques for implementing SRI are often greeted with skepticism by the farmer, who has been cultivating rice in the traditional manner for decades. Farmers have first to be convinced through demonstrations and training about the new techniques; next, they have to be encouraged to try SRI in a small part of their fields and then build up the cultivation from there.

FIELD VISITS

Farmers were taken on field visits where SRI was demonstrated so that they could discuss the process with farmers, who were already

Table 1: Productivity using SRI

	2007 (Kharif)	2008 (Kharif)	2008 (Rabi)	2009 (Kharif)	2010 (Kharif)
No. of farmers	05	10	50	522	1,200*
Area (in acres)	2	6	18	261	700*

(* Expected)

using SRI, and see the difference for themselves. It is easier to believe when you can actually see the results. The farmers find it especially difficult to believe that a single plant can give 40–50 tillers.

The cost of cultivation of paddy has been increasing consistently, owing to the costs of seed, fertilizer and labour. With the increasing labour scarcity due to urbanization, sustaining the interest of farmers in rice cultivation has become a challenge.

INTENSIVE TRAINING/ CAPACITY BUILDING PROGRAMME

Training forms a very important part in SRI expansion because the new method of cultivation needs lower inputs than the conventional method. In spite of repeated explanation that SRI needs only two to three kilogrammes of seed per acre, the farmers use six to eight kilogrammes of seed.

Second, farmers are unable to understand that 10-day-old seedlings can be transplanted. The farmers try to delay the transplanting because they find it difficult to believe that such a young seedling can survive the transplantation.

Third, during the period between transplanting and the first weeding (that is, 15–20 days), the field looks thin compared to conventional fields. At this stage, farmers tend to re-sow the plot with conventional methods because of immense social pressure from family, relatives and other farmers.

WHY SRI?

In the last decade, the Government of India (GoI) and various institutions have implemented many agricultural productivity improvement programmes. They have used different approaches and strategies to increase the yields of rice from the land-holdings of the small farmers. These programmes are expected to improve food security, increase rural income and reduce the vulnerability of rural households. The fertilizer split application and the integrated pest management (IPM) were promoted on a large scale. Many improved high-yielding varieties (HYVs) of seeds were introduced as well. However, the economic viability of the high input approaches for the poor farmers is being questioned, especially because the system has hardly been able to increase yields.

The cost of cultivation of paddy has been increasing consistently, owing to the costs of seed, fertilizer and labour. With the increasing labour scarcity due to urbanization, sustaining the interest of farmers in rice cultivation has become a challenge. There is clearly an urgent need to find ways to grow more rice but with less water and fewer inputs. Until recently, there were no new solutions for improving the productivity significantly.

HOW DOES SRI DIFFER FROM CONVENTIONAL RICE FARMING?

SEEDLINGS FOR SRI

In the conventional method, farmers usually transplant four-week-old seedlings from the nurseries into the fields. In SRI, younger seedlings (10–12 days old) are transplanted. This approach encourages profuse tillering because younger seedlings can be established quickly without suffering from the shock of transplantation. Transplanting young seedlings also increase the number of tillers because they are in the main field for at least two weeks longer than in the conventional method of transplantation. In

Table 2: Comparison between SRI and Traditional Practice

Conventional Practice			SRI Practice		
Variety: 1010	**Area**: 0.5 acre		**Variety: 1010**	**Area**: 0.5 acre	
Item	**Cost (Rs)**	**Cost on one acre of land (Rs)**	**Item**	**Cost (Rs)**	**Cost on one acre of land (Rs)**
Seed: 21 kg	195.3	390.6	Seed: 2 kg	18.60	37.20
Farmyard Manure (FYM) in nursery:30 kg	150	300	Farmyard Manure (FYM) in nursery:10 kg	50	100
Labour for seed bed preparation and seed treatment: 1 labour and 1 plough	140	280	Labour for seed bed preparation and seed treatment: 1 labour	40	80
Labour for ploughing and levelling: 2 labour and 2 ploughs	560	1,120	Labour for ploughing and levelling: 2 labour and 2 ploughs	560	1,120
Labour for transplanting: 26 labour	1,040	2,080	Labour for transplanting: 7 labour	280	560
Labour for interculture operations: 8 labour	320	640	Labour for interculture operations: 2 labour	80	160
Top dressing (7 kg urea)	42	84	Top dressing (7 kg urea) FYM	42 300	384
Labour for harvesting and threshing: 14 labour	560	1,020	Labour for harvesting and threshing:12 labour	480	960
Total Cost Incurred (Rs)	3,007	5,914	Total cost Incurred (Rs)	1,550	3,401
Total Income (Rs)	4,800	9,600	Total income (Rs)	9,600	19,200
Total paddy yield	600 kg = Rs 4,800	1,200 kg = Rs 9,600	Total paddy yield	1,200 kg = Rs 9,600	2,400 kg = Rs 19,200

SRI, only one seedling is planted per hill as compared to two or three seedlings in the conventional method, and the hills are spaced more widely than usual, which drastically reduces the density of the seedlings required for planting (from about 200/sq m to 16/sq m). Therefore, only 5 kg of seed are required to plant one hectare, instead of about 50 kg per ha required in conventional practice.

PLANTING

In SRI, planting is usually done in lines, often using a rope with markings at 25 cm intervals, to guide the line of planting. Square planting is important to facilitate the use of a weeder of a particular width. A minimum width is required in both directions and thus a square is optimal. After planting single young seedlings at 25 cm intervals, the plant density looks very low, but four weeks of robust tillering produces a healthy crop. There were concerns that labour requirements for transplanting in SRI would be higher than for conventional planting, despite the fact that the number of seedlings planted is drastically reduced. However, a recent analysis shows that the farmers employed an average of 60 workers for conventional planting and only 35 for SRI planting.

WATER MANAGEMENT

In the conventional method of planting, the recommendation is to irrigate to a depth of five cm one day after the previously standing water disappears from the surface. In SRI, there is no need to keep the field flooded—it is enough to keep the soil saturated. Up to the panicle initiation stage, it is recommended to irrigate the field to 2.5 cm, once the irrigation water has soaked away and hairline cracks have developed. After the panicle initiation, the field needs to be irrigated to 2.5 cm one day after the previously standing water soaks away so that the plants do not experience water stress. This involves alternate wetting and drying management.

INTER-CULTIVATING WITH A WEEDER

A key aspect of the SRI approach is to use a hand-operated weeder to disturb and churn the soil between the rows. This simultaneously removes weeds and aerates the soil. Farmers are concerned that the limited irrigation in SRI might lead to weed infestation. However, because weeder operations start after 10–12 days and are done every 10 days, weed growth is controlled. The cost of weed management in conventional cultivation (hand weeding twice at 15 and 30 days after transplanting) is about Rs 3,000/ha whereas the cost of inter-cultivation with a rotary weeder is about Rs 1,520/ha.

Thus, the profit in paddy cultivation with the conventional and the SRI techniques for 100 decimals is as follows:

Jayjeet Kumar: An Inspiring Story

PRATYAY JAGANNATH with ANIL K. VERMA

Jayjeet's journey proves that one is never too young to be an agent of change; most essential is the inclination to identify methods, the conviction that old ways must give way to newer, more cost-effective ways to ensure food sufficiency, and the spirit to take calculated risks

In 2007, Jayjeet Kumar was a 13-year-old middle-school student in Bihar, India, whose family managed to produce just about enough food to feed the family for seven months each year. By 2011, he had come a long way. The Government of Bihar honoured him as a 'Young Star' for the impact he had had on the lives of hundreds of farmers and the training he had provided to the agricultural officials; he was recognized by the President of India for his efforts to help marginalized rice farming households in his area improve their food security.

What altered his life? The sight of a farmer planting rice in his field in a neighbouring village, Shekhwara, made him curious. A keen observer, Jayjeet noticed that a farmer near his village school was doing something different. This was not how he had seen rice being planted. He was planting very young seedlings of rice.

He watched the process daily and began to follow and learn the methods of this unfamiliar way of rice planting. He noticed that the farmer used much less water and seeds and yet the plants that grew were thriving and heavy with grain. He saw that healthy tillers had started coming up in a seemingly poorly transplanted plot. He went to the field and interacted with the concerned farmer. He realized that this method would surely lessen his family's hassle for food security.

HOW IT ALL STARTED

He was very excited and shared his experience of observing the benefits of this low-cost cultivation, which promised high returns, with the villagers of Ghantadih, where he lived. In this remote area where people followed traditional methods with no modern farming technologies, the villagers rejected the idea outright and did not believe him.

In 2009, he trained 96 small and marginal farmers of three villages, including his own, and provided them support through careful attention, correction and reassurance in their first experiments with the SRI.

Jayjeet and his family were dependent upon agriculture as their primary source of livelihood. They devoted most of their time to cultivation. However, there was a basic difference between the traditional and the SRI method followed in Shekhwara village. The inputs there were low and production was significantly higher. Jayjeet's family could hardly meet their subsistence needs. They needed an impetus in their livelihood and he thought that his family should try out the SRI method in their fields. This would mean more production and better food security for his family.

He talked about it at home and was keen to use this new method on their land but his family was reluctant to take any risks. Only after much persuasion did his parents agree to try the new method on their 0.3 ha of land; they knew that if the crop failed, they would be destitute. However, instead of their usual 80 kg of rice, they harvested 240 kg, going from food deficit to food surplus in one season! The news spread, and at 13, Jayjeet began showing other villagers how to achieve the same dramatic results.

Jayjeet was a keen learner and an avid practitioner and he tried to observe, seek the guidance of his neighbouring villagers and learn the technique of the SRI. He learned that one of the fundamental differences between the two methods was that SRI did not consider paddy to be an aquatic plant. The SRI method does not require the field to be over-flooded. The same was true for the other inputs such as seeds, manure and pesticides. This meant lower recurrent costs to cultivate paddy. In spite of all these benefits, it was difficult for people to conceptualize an increased yield from such a system. Skepticism continued and the farmers were reluctant to adopt SRI, still preferring to continue with the traditional method.

PRADAN has been implementing SRI prototypes all over the country and it was Jayjeet who was instrumental in inviting PRADAN (a national-level NGO, promoting livelihoods for the resource poor in India) to his village in the Gaya district of Bihar. He persuaded two farmers in his village to allow their plots of land to be used for SRI demonstration.

He followed all the technical processes of SRI, beginning with the grading of seeds to the treatment of seeds, as suggested by extension workers of PRADAN. He was involved in the processes of raising nurseries and transplanting of seedlings to the field, as required for paddy cultivation. During a visit by government officials to his village, he escorted the officials and showed them the different stages of the paddy under the SRI method of crop cultivation. He interacted with all the government officials and got recognition among various stakeholders of agriculture.

The results were seen by the other villagers and soon government and non-government officials heard about the changes. People began to visit their land. Jayjeet was happy to share with the others what he had learned from the neighbouring village. With intense passion and energy, he demonstrated and

elaborated the SRI method of cultivation to all who wanted to learn it. The farmers were amazed at the results and inspired by the enthusiasm of this young boy. The Joint Director, Department of Agriculture, Government of Bihar, visited and praised the young man's efforts.

By his innovations in the area of preparing natural manure and natural pesticides, he showed how small and marginal farmers can avoid high costs of inputs in agriculture.

In 2009, he trained 96 small and marginal farmers of three villages, including his own, and provided them support through careful attention, correction and reassurance in their first experiments with the SRI. In 2010, in extreme drought conditions, he trained and provided support to 80 farmers in the SRI-Paddy and 70 farmers in SRI-Wheat (System of Root Intensification: the principle followed is the same as in paddy cultivation). He applied the principles of SRI to other crops such as vegetables and rape seed in his own fields and found the same magical results that he saw earlier in paddy. The phenomenon was magical for a region that had never seen such bumper yields in any crop. The farmers from other districts started coming to visit Jayjeet's field to see the SRI work and to draw lessons and adopt the technique. His success and efforts were made more popular by the local print media publishing his success story, which attracted a lot of public attention.

Recognition of his work and the recently conferred honour motivated Jayjeet to help fellow villagers to learn and adopt the technique. His leadership qualities were evident because, at the age of 13, he was training farmers about SRI. He has since trained over 150 farmers in the method. Impressed by his skills, the Government of Bihar invited him to train 50 Agricultural Extension Officers, all far more senior than him and all experts in their own fields.

TURNING POINT

Jayjeet is the second son of his father Basudeo Yadav and mother Kunti Devi. He has three brothers and two sisters. His eldest sister and brother are married. Before they adopted the SRI method, his elder brother and father worked as agricultural labour in the landlord's cultivable land.

Jayjeet Kumar is quite innovative and has introduced different methods of crop cultivation, including sugar cane, with support from PRADAN. He has helped farmers in other villages as well in adopting these new technologies. He did the *machan vidhi* of SRI vegetables. He has also tried low-cost polymer made vermi-compost. He tries out all these various innovations and helps other farmers to scale up innovative activities in the area. He has minimized inputs in various ways and has become a model for fellow farmers. He has introduced a reduced seed rate of paddy from 40 kg per acre (0.4 ha) to 2 kg per acre. He has demonstrated that the labour requirement in SRI is far less than in the traditional ways of cultivation. He has also demonstrated water-saving measures with the SRI method of crop cultivation.

By his innovations in the area of preparing natural manure and natural pesticides, he showed how small and marginal farmers can avoid high costs of inputs in agriculture. At the same time, he has also demonstrated how vegetables produced under natural farming are free from pesticides and, hence, are

He learned that one of the fundamental differences between the two methods was that SRI did not consider paddy to be an aquatic plant.

healthier to eat. All his efforts have not only ensured his family's livelihood but also have resulted in the enhancement of income of a large number of other peasants. He is greatly respected in the community and in the other villages where he has provided training and hand-holding support.

Jayjeet's popularity brought more laurels and he was invited by the Government of Madhya Pradesh, to provide training and hand-holding support to the farmers on SRI. He visited several districts to train their officials on SRI. At present, he is involved in training and providing hand-holding support to farmers in Katni district of Madhya Pradesh.

He has become a well-known face in the field of SRI by his sheer dedication, hard work and ability to influence people in his eloquent manner. He is a regular participant in all SRI promotion activities. Government officials, extension workers and many others have applauded the very young change agent aka Jayjeet. Prof. Norman Uphoff, the global leader on SRI, appreciated Jatjeet's work during a visit to India.

Jayjeet's family lives in a fairly remote part of Bihar, where people depend on agriculture for their food and income. He mastered the SRI techniques hoping for a better life for his family; his passion for teaching others is motivated by a desire to share the benefits of this technique.

IMPACT ON OTHERS

Besides higher yields with SRI methods, farmers cut their costs by using less water, seed and agro-chemicals. Among subsistence farmers, this can make the difference between chronic hunger and food on the table. By itself, the lower seed rate with SRI (2 kg per acre instead of 40 kg) is an enormous saving. Besides training others in these methods, Jayjeet is successfully applying the SRI principles to other crops such as wheat, rape seed, sugar cane and vegetables. In 2010, even in extreme drought conditions, the region saw bumper yields.

Jayjeet is respected in the community for his evident dedication, hard work, eloquence and an ability to bring about positive change. The story of his accomplishments has spread to Madhya Pradesh, which has invited him to visit several districts and train farmers and officials there on SRI. Jayjeet is also a tireless innovator. With support from PRADAN, he tries out new methods of cultivation for other crops such as sugar cane, experiments with vermi-compost and develops natural pesticides that are safe to put on vegetables. All along he helps other farmers to practice and scale up these innovations.

National Consortium on the System of Rice Intensification: A Summary

Summarizing two National level consortiums on the System of Rice Intensification that were held in New Delhi in October 2010 and March 2011. This article highlights the way forward for spreading the use of SRI in the country.

BACKGROUND

India is the world's second largest rice producer, accounting for more than 20 per cent of the global production. The System of Rice Intensification (SRI) may help substantially in reducing the embedded subsidies in every grain of rice and result in a yield increase of 15 per cent to 40 per cent.

Through the adoption of a technique such as the SRI, the country's rice production could be increased by more than five million tonnes annually, which will help in meeting the food security requirements in the coming years. In addition to fertilizer and price subsidies, electricity subsidies on rice have reached an untenable level and it is estimated that on a per hectare basis, SRI could reduce about 3,151 kwh of electricity and about Rs 12,607 on subsidies.

At present, about 42 countries have adopted SRI worldwide. In India, about 1.5 lakh farmers have adopted the technique, covering 12,000 ha across 160 districts. Tamil Nadu and Tripura are the leading states that have adopted SRI. It is now realized that remodelling the extention system in the framework of strengthening the 'innovation systems' would promote SRI."

SRI focuses on planting single seedlings instead of multiple seedlings in a clump, and not keeping irrigated paddy fields flooded during the rice plants' vegetative growth stage. This results in the reduction of the water required for irrigation by about 30 to 50 per cent and a substantial reduction in the application of chemical fertilizers and pesticides. Whereas civil society has played an important role in taking SRI forward, government agencies in Tripura, Tamil Nadu, Orissa, Bihar, Madhya Pradesh and Andhra Pradesh have innovated their extension strategies and have been able to take SRI further. "SRI is a bankable technology approved by NABARD, and it can enhance farmers' incomes and improve soil health and has the potential to become a leader in agro-ecological innovations."

SRI focuses on planting single seedlings instead of multiple seedlings in a clump, and not keeping irrigated paddy fields flooded during the rice plants' vegetative growth stage.

WHY A NATIONAL CONSORTIUM?

1. So much is happening in the area of the SRI, SCI. That there is need to form national-level policies.
2. The poor positioning of SRI, despite its enor-mous spread. India can be a world leader if SRI is brought into the mainstream.
3. Scaling up SRI requires working together and applying different institutional mechanisms for its extension.
4. Stronger research needs support. Not all ICAR and agricultural universities are on board.
5. Field-level agencies on SRI need greater support

RAPID SPREAD OF SRI IN SELECT STATES

- Nearly 7.5 lakh ha under National Food Security Mission and non-NFSM—Tamil Nadu (6.5 lakh ha), Tripura (75,976 ha) in 2009–10.
- Bihar through Jeevika or BRLP 19,111 farmers in SRI and 48,251 in System of Wheat Intensification (SWI), with a total of 1,412 acres. There is a plan to cover 3.5 lakh ha.
- One lakh farmers and 20,000 ha in 2010 through CSOs
- Strong small farmer focus in rain-fed and tribal areas of CSOs

IMPORTANT CONJECTURES, ISSUES AND QUESTIONS RAISED

Several issues were raised in the consortuim. These were:

1. SRI as a technology not only saves water but also increases the yield of the plant. The SRI technology can also be applied to wheat to increase productivity. Experiments using this technology with other crops such as mustard, rape seed as well as brinjals, have shown great results.

2. There is urgent need to focus on this issue. It is not the farmers who are 'against' SRI; instead, it is the scientists. This mindset needs to change. One can see the 'SRI glass' as either half-empty or half-full. In India, until now, the trend has been to see the 'glass' half-empty. This must be seen as the 'glass' as half-full now. SRI has brought together government officials, NGOs and many experts from different fields, who are all now interacting with and influencing each other. The most important aspect of this movement is that it should be propelled not only by civil society but by the government as well. Civil society is, in fact, a continuum of the government.

3. A sad aspect of scientific research is that when it comes to farming, it invariably rallies around the issues of genes. Everything is always very gene-centric. The most common misconception that one faces about SRI is when farmers ask what 'variety' the SRI is. SRI is not a variety; it is just a different approach to farming and farming methods.

4. SRI is even more valuable now than before because the effects of climate change is becoming evident now and it is time to buffer our crops against it. With SRI, farmers can be protected against climate change. Let us not only think of yield, money and income. Let us look at SRI from the perspective of food security—because India needs to be

made more food secure.

5. In addition, from the perspective of a human resource development initiative, there is need to work towards informed farmers and not just producers to whom 'technology transfers' are made. There is need for valuable partners. Therefore, in this sense it is a pro-poor initiative over and above the income perspective.
6. SRI works for both high and low yielding varieties. It works for large-scale and small-scale farmlands. It works well in mechanized farms and for hybrid varieties. Hence, it is adaptable and works for all models of agriculture. Farmers in Cambodia increased their yield five times and are working with vegetables such as squash, melon, etc. Hence, intensification can happen crop by crop. Once the method is applied to our staple foods, it can then be applied to other crops as well.
7. The thrust towards SRI has steadily grown and, in the recent past, the thrust towards hybridization is even more. We have to contextualize SRI and related efforts we make for its promotion within this larger context.
8. If in a certain area SRI has worked really well, specific characteristics of that area, water management conditions and what variety was used must be understood—and it must be seen whether these can be replicated to larger areas or even identify those conditions and areas where SRI can be practised. Location-specific success needs to be understood well so that it can be replicated with similar management practices.
9. SRI works everywhere except where the soil cannot be drained. It has worked in Afghanistan, in Iraq and almost everywhere except in the soil conditions where drainage is an issue. Farmers who are educated equip themselves with information and new practice techniques. The point is to reach the farmers who are small, marginal, uninformed and difficult to reach. That is when human welfare will be the greatest through SRI. The question really is how to make SRI more accessible.
10. There was a consensus on the critical role of SRI and/or SCI, which can act as a vehicle to increase crop productivity and farm income among small holders. These practices have proven the ability to increase productivity in a sustainable way, and are gaining the acceptance of farmers, particularly from those of the vulnerable section. The proposition is that public policy should be better informed by practices and analyses from the field.
11. There is need to develop clearer understanding of the adaptation of the SRI principles and practices to various circumstances (soil types, varieties, climatic conditions, socio-economic factors and constraints) so that these opportunities can be most productively used in a range of conditions and for those most in need. Evidence and experiences that have emerged from enabling the institutional framework at the grass-roots level show that SRI is

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good only in some conditions —for the *rabi* crop, only where there can be assured irrigation, and the best way to take hybrids further. It is important to study environmental settings that have enabled SRI to be effective and efficient so that it can be replicated and promoted for wider adoption and impact.

12. A better institutional framework is needed for scaling up SRI for wider adoption and adaptation, involving innovative partnerships among public institutions, financial institutions, civil society organizations, and the private sector in a consortium mode. BRLPS and the Orissa Learning Alliance are examples of such collaborative efforts, which have resulted in an unprecedented scale of adoption of SRI within a short span of time. Such collaboration is required for acceleration on a wider scale to more areas, farmers and crops, specifically targeting the vulnerable section of the farming community.
    - An operationable cluster strategy is suggested when considering scaling up SRI.
    - An implementable schema for scaling up SRI is required, which can serve as a starting point for discussions, based on the strategy for developing operational SRI clusters.
13. Farmer participatory local research needs to be encouraged to provide meaningful feedback for technology generation.
14. The quantitative impact of innovative practices should be documented and evaluated more systematically than in the past. Establishing support systems for sharing, learning, monitoring and evaluation, including forums for participation at the district, state and national levels are important. Socio-economic evaluations need to be made that compute the savings not just on water but reduced inputs.
15. The sustainable adoption and use of SRI and other agro-ecological methods should receive attention.
16. The need for harmonizing the mix of priority is essential. "What the central government thinks is a priority may be entirely different from what the thinking is at the state level. Therefore, the states should have the flexibility to implement what they think is right for the state at any point of time. State governments can play an important role in promoting the SRI, and therefore, the need for sensitization is crucial. The proposed working group on SRI can suggest mechanisms and guidelines on the matter.
17. The group suggested a specific place for SRI to be addressed in the 12th Five Year Plan formulation. A separate working group for SRI could be constituted to provide realistic and grass-roots level information for developing concrete strategies and mechanisms, in consultation with the concerned government and NGOs.
18. SRI requires more comprehensive research and evaluation and a deeper understanding of the biology of ecosystems. A detailed socio-economic

and technological research, based on the consortium concept, could provide a think-tank support for the promotion of SRI and for developing implementable monitoring and evaluation mechanisms.

19. Concretizing the structure of NCS as a think-tank of SRI and enhancing policy advocacy and communication among stakeholders requires urgent attention.
20. Members unanimously agreed that there was a need to identify a dedicated person/worker for the overall management of the consortium, work with various organizations, including the regional-level consortiums that have come up in recent times.
21. The NABARD representative suggested the need for strengthening the data base management system of SRI and other aspects of the MIS.
22. The need for core resource support for NCS was discussed at length. Subsequently, PRADAN has already agreed to provide support and office space to NCS. Various funding agencies such as the SDTT, NABARD, PRADAN, Watershed Support Services and Activities Network (WASSAN), Aga Khan Rural Support Programme (AKRSP) and the government departments were also urged to contribute to the core resource. PRADAN may be requested to take responsibility for resource management.
23. The Natural Resource Management Center (NRMC) may be approached for supporting the project on standardizing the data sheet for SRI (for all NABARD SRI programmes). This will include performance assessment, adoption issues and developing appropriate templates. This data can also have 'scientific' aspects.

ROUND TABLE DISCUSSION

1. There was a consensus on the critical role of SRI and/or SCI as a vehicle for increasing crop productivity and farm income among the small-holders.
2. To enhance knowledge of accounts and ensure continuity among various stakeholders, a need was felt for effective research by scientific organizations to provide technical support.
3. The criteria for identifying suitable/selected areas for the promotion of SRI was discussed at length. Simple typology and/or characterization of the SRI areas needs to be compiled.
4. Time was also spent in the meeting, discussing an effective mechanism for capacity strengthening and knowledge delivery among stakeholders. Sensitizing the state for efficient governance of SRI was considered the most important driver for a wider adoption of the technology. Future strategy must also consider this aspect as a pre-requisite for sustainable adoption.
5. There were discussions on technical issues that were addressed appropriately with empirical evidence. Consequently, there is more accumulated technical as well as socio-economic evidence available now than before, and this will help strengthen the policy thrust. There is also urgent need to summarize and disseminate existing knowledge. It may be inferred that at the experimental stations, individual aspects such as alternate wetting and drying (AWD), wide spacing, single seedling transplantation, nutrient analysis (micro- as well as macro-nutrient status in soil) show satisfactory results; however, it has been demonstrated that rather than the

individual effect, the synergy of all the principles resulted in full bloom genetic expression of the plant in SRI and SCI.

6. There was also an elaborate discussion on the critical role of the states in the promotion of SRI activities. The question of what would be an appropriate framework to identify a government agency best equipped to scale up SRI/SCI—the Ministry of Rural Development or the Ministry of Agriculture—was also discussed. This decision, it was felt, would be particularly important given that there is special focus on small and marginal farmers.
7. The need for an institutional framework to scale up in order to accelerate the wider adoption of SRI was a central issue for discussion. In addition to the success stories, it was agreed that there should also be a systematic documentation of the stories of failure, to help identify the conditions of geo-ecology, production systems and other constraints that cause failure or dis-adoption.
8. An important way forward that emerged was that NCS must engage with the Planning Commission to explore the possibility of setting up a working group/task force on SRI/SCI in the 12th Five Year Plan (FYP) formulation. The final statement on the active participation of the consultative process of the 12th FYP is an important outcome of the round table. On account of the potentiality of increased production as well as the conservation of natural resources: land and water, it was thought that it is inevitable that there be a new thrust towards implementing an innovative policy framework on SRI/SCI in the 12th FYP. It has thus become essential that NCS should strategically push for the constitution of a specific working group on SRI by the Planning Commission, and the representatives of NCS should participate actively in the working group. The expert task force, including NCS, will help design regionally differentiated action strategy for a wider adoption of SRI and SCI. A list of SRI literate experts is to be prepared from among the basic and strategic researchers, grass-roots SRI activists and policy experts.

In addition to the success stories, it was agreed that there should also be a systematic documentation of the stories of failure, to help identify the conditions of geo-ecology, production systems and other constraints that cause failure or dis-adoption.

MAJOR ACHIEVEMENTS AND WAY FORWARD

a. Challenges for a National Programme/Policy on SRI

1. Re-orienting the farmers towards 'management'
2. Reorienting their knowledge on rice agro-ecology
3. Establishing SRI labour markets with new skills and contractual wage rates
4. Reforming the irrigation systems towards a better control at the farmers' level
5. Establishing decentralized manufacturing of SRI implements
6. Building cadres of the SRI Resource Farmers

7. Mobilizing organic matter/resources for improving soil productivity
8. Establishing research back-up/support

b. Strategy for SRI in the 12th FYP

Recommendations of the National Consortium on SRI evolved after:

a) Analyzing SRI experiences across the country, led by both the government and civil society organizations.
b) Many deliberations over a period of nearly five years.

c. Key Policy Questions

How Can selected areas be transformed to SRI over a period of time?

Demonstration approach area-focused approach

1. Labour markets, knowledge and behavioural changes of farmers and irrigation reforms take place in collectives on the basis of geography
2. Tipping points come after some time.
3. Changes need to be embedded into local economies.

d. Pre-requisites of Scaling-up

- Working over a period of time in a defined area at a scale with facilitation and with support structures creating a large number of farmer-resource persons.

e. Strategy: SRI Clusters as a Unit

- Establish SRI clusters in the prioritized rice growing (administration) blocks in the country.
- An SRI cluster is about 100 ha of rice area transformed to SRI with all (or many) of its principles.
- Build a programme around identified SRI clusters with an agency and with full-time facilitation

f. Phasing of the programme in the 12th FYP

Phase 1

- Start block-wise SRI clusters—initially in all the blocks where experience exists and in rain-fed areas, to have control over the irrigation and drainage
- Start in a small way to build agency capacities in the rest of the blocks
- Pilot SRI with irrigation system reforms in select canal irrigated areas

Phase 2

- Expand to all blocks
- Initiate a larger programme on the SRI as well as irrigation sector reforms, building on the experience from the pilots.

The government, the civil society and the NGOs have been promoting SRI on an unprecedented scale and at great speed because of the emphasis on capacity strengthening of the farmers. The innovative initiatives to introduce SRI have helped spread the message widely in rice growing districts. Nearly one million hectares of rice fields were brought under SRI *in India in 2009–10. This innovative system of rice cultivation is an integrated package of agronomic approaches to exploit synergistically the genetic potential of rice plants; create a better growing environment (both above and below ground); enhance soil health; and reduce the input cost substantially.*

Pradan is a voluntary organization registered in Delhi under the Societies Registration Act. Pradan works through small teams of professionals in selected villages across eight states. The focus of Pradan's work is to promote and strengthen livelihoods for the rural poor. It involves organizing the poor, enhancing their capabilities, introducing ways to improve their income and linking them to banks, markets and other economic services. The professionals work directly with the poor, using their knowledge and skills to help remove poverty. News*R*each, Pradan's monthly journal is a forum for sharing the thoughts and experiences of these professionals working in remote and far-flung areas in the field. News*R*each helps them to reach out and connect with each other, the development fraternity and the outside world.

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