

## Scaling up of SRI (SCI) Method of Crop Cultivation in Bihar and Elsewhere in the Country

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### Brief Overview

The Preservation and Proliferation of Rural Resources and Nature (PRAN) is an offshoot of the PRADAN, a nationally recognized public charitable Trust registered under Indian Trust Act 1882. It piloted a resource conservation technology and an Agro-ecological Innovation as a pro-poor option of food production locally called Sri Vidhi method of crop cultivation in Bihar. System of Root Intensification as called in Bihar or System of Crop Intensification called globally is a resource conservation technology in agriculture which has multiple benefits (tangible as well as intangible) over the Conventional Management Practices in agriculture (CMP). The intensive methods of CMP being nurtured by main stream institutions in agriculture through its research, extension and education, has been facing several negative externalities viz, productivity decline, inefficiency in

resource use, severe market dependency, degradation of resources like land, water and biodiversity, which led to unsustainability. The salient features of SRI, a principle of “More with less” are as follows.

- It requires less inputs in agriculture such as seed, labour, water.
- The potential sustainability of the natural resources such as land, Water, Forest, animals, humans, i.e., the environment does not degrade.
- It produces more with less in agriculture.
- It enhances food security and enhance livelihood of small and marginal farmers of the country.
- It is an agroecological method branded as a climate smart practice, conducive under changing climatic situation due to global warming.



**Figure : SRI method of Paddy cultivation bringing food security among millions of farmers**



**Figure : SRI-Rapeseed (RP-09 at Maturity)**



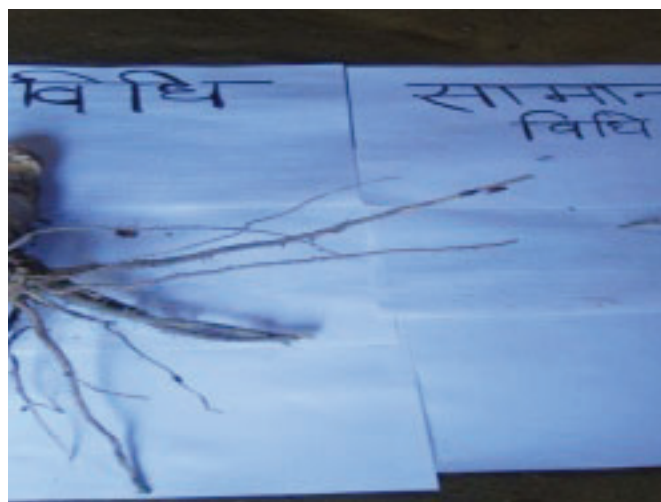
**Figure : Intensification of roots in wheat**



**Figure : Big panicles under SRI-wheat**



**Figure : Left (non-SRI-Wheat and right (SRI-Wheat)**



**Figure :Root of SRI-Rapeseed and Non-SRI rapeseed**

### **Principles of System of Root /Crop Intensification method of crop cultivation**

As the rural natural resources are declining, the rural livelihood is under threat. Adding to the worry is the declining land resources and of productivity land other factors of production. On account of unabated population, rural life is at stake. Therefore, a holistic approach is needed for increasing productivity in a different way. Because response to green revolution technology is confronting diminishing return.

The cutting-edge technology targeted the crop life above ground, and the mainstream R&D ignored the precious aspects of below ground activities. One of the bypassed factors is the root system and microbial life. Root means centre of core of life (as crop has life)/also the common meaning of root which is the mouth of the plant. The holistic approach of System of Root Intensification (SRI) is based

on providing conducive environment to all parts of plant in special attention to its roots enabling full exploitation of genetic potential of the plant. It integrates all agronomic principles and practices with the specific crop at its critical stages (provided by nature and not by educated mass only), which is the primary consideration of promotion of System of Root Intensification method of Crop cultivation.

The entire method of SRI consists of following considerations as experienced by farmers/ practitioners. All seed/planting material/rhizomes/tubers/leaves are source of living creature that is plant. Detailed protocol is given below:

- The soil is the heart of these planting material needs to be honored and owned by practitioners /promoters/farmers also scientists the same way the human beings treat and conduct with animal kingdom and themselves.

- The innovative grading and selection of quality seeds should be done after its procurement from the source. It means that only quality and healthy seeds/planting material should be considered under the method.
- Since root is the main mouth of the plant the seed or planting material should get proper space, aeration, nutrition, moisture, microbial population, etc to grow close to its potential. The more the growth of roots and its consortium more nutrition and other items /factors it can take up and transfer to the plant for robust production. The size of the pit varies from crop to crop and plant to plant depending upon its nature and physiology.
- The package of practices should be integrated with phyllocron of crops. Young age seedlings/Sprouted seeds should be used spped up phyllocron. Priming of seeds/Beej Sodhan along with treatment should be integral part of Package of practices.
- The land is the mother of most of living beings including plants. The soil needs to be healthy and nutrient supplementation should be sustainable hence natural and organic nutrient management should be essentially integrated in the package of System of Root intensification method of crop cultivation. Like the nursery beds may be treated with Sribeejamrit and Srineemastra.
- Horizontal and vertical growth spaces should be appropriated by capturing its potential in local agro-ecosystem, genotypic characters, and soil and water conditions.
- The plant, right from planting material procurement, nursery raising and till harvesting should be in organic/emotional relationship with its promoters/practitioners. It happens when the promoters / farmers/scientists/others regularly visit and take care for whole life period of the plant (sustained supervision).
- The enhancement of microbial biodiversity should be maintained to help every part of plant (stem, leaves, branches also) for its sustainable genetic expression.
- The plant should be transplanted/sown at a shallow depth to enable roots for proper uptake of nutrient and moisture which guides roots for early expansion of its rhizosphere in the soil.
- The intercultivation cum weeding should be done at critical periods to ensure aeration, availability of nutrients in natural forms such as Srijeevamrit, Srighanjeevamrit and tonics made from natural extracts, moisture as this activity enhances tillering /branching ability of the main crops. Depending upon the crop/plant type the earthening up should be done to provide support and better environment around roots and shoots.
- The pruning of leaves and early branches should also be done as per requirement of crops. For example, in Sugarcane the dry leaves should be discarded as it restricts thickening of canesett.
- In tuber crops eyes/nodes should be extracted and used for direct sowing after initial treatments. The seedlings may also be used as per nature and type of crops.
- There should be optimum moisture only and the field should not be flooded. Water stagnation is harmful for SRI crops.
- Without compromising with food security and cash surplus to small and marginal communities in initial period integrated doses of natural, botanical extracts, natural pesticides, Plant Growth regulators and naturally prepared fertilizers should be used.
- The diseases and insect-pests should be managed by physical, mechanical, natural and cultural control measures. In no case any chemical fertilisers or other inputs should be ever used during the cultivation of the crops.

### **Theme Building on SRI method of life and livelihoods**

PRAN as a public Charitable Trust build capacity of large local cadres in various regions to take low cost and resource conservation technique to large number of farmers across India.

Capacity Building of grass root organisations on SRI: To spread knowhow about SRI, the PRAN trains stakeholders including staffs and farmers associated with different organisations. We run five days to ten days training programmes for grassroots organisations in situ and farmers on SRI method of crop cultivation as well as fertiliser and pesticides preparation for promotion of SRI method of natural farming system. The training includes motivational and technical components. Linking Principles of development as well as principles and practices of



SRI method of cultivation of various crops is important components of training. Practical demonstration on preparing local fertilisers and pesticides in villages is also a part of this training. Three to Five days in-house and two to Five days' field training are imparted to the participants. Many farmers and grass root workers from different civil societies are benefitted from the training modules.

### Capacity building

PRAN gives special focus on building local cadres. For this the best practicing and socially prominent persons (male and female) identified by community are given rigorous training in four phases. In these 4 phases 75% training is imparted on motivational aspects and the rest 25% on technical aspects of SRI. This includes principles of development, principles of SRI method of crop cultivation, package of practices of SRI method of various crops, land measurement, positive attitudes and human behavior. All these trained cadres and officials are spreading SRI method of crop cultivation in various states of our country.

The students from Harvard University, Boston, USA; Gottingen University, Germany, Universities from France and Netherland sent their students to equip their skills and knowledge in SRI and working with the small and marginal farmers. Indian universities also like Amity University, TISS Guwahati, South Bihar Central University(Gaya), State Agricultural University sent their students to learn and acquire skills in SRI method of crop cultivation. The premier research institute of the country i.e., Indian Agricultural Research Institute (IARI), New Delhi under the chairmanship of Dr. B.C. Barah; NABARD chair professor, IARI New Delhi with group of scientists from agronomy soil science irrigation carried out experimentation on SRI paddy and SRI wheat for couple of years and found the method beneficial and climate resilient for the farmers.



### Dissemination of SRI knowledge

PRAN rendered services in various kisan melas organised by department of agriculture and agricultural universities. Institute generates various materials on SRI in local languages of Hindi and English to various stakeholders targeting government and civil societies in state of Bihar and elsewhere, in villages and block headquarters PRAN distributes various pamphlets relating to SRI method of crop cultivation and organic products for fertiliser and pesticides preparation using the principle of local product using local resources. Various research institutes also get in touch with us and ask for SRI package of practices.

### Awareness Events: Campaign

This year we were extensively engaged in capacity building of farmers through various events. First of all, we spread awareness among farmers in new villages through rickshaw Yatra, women promoters so that they can start SRI. In awareness events a group of 3-4 women in uniform of yellow sari go to a hamlet with big fur and pamphlets of SRI with prior information These Yellow Sari SRI farmers hang the fur on a wall or tree, sit below and start singing SRI-song. They start singing with a few but after listening to the songs the other women also join the SRI cultural event. After one song these yellow sari women discuss on experience and principles of SRI. Again, they sing a different SRI song there after they share the SRI methods in other crops. The audiences both women and men watching and listening to these women feel excited and ask for help from them in the coming season. The SRI vidhi songs which are the majorly used tools for campaigning are actually the step wise PoP of various crops and benefits from them. Therefore, the awareness spreading events are in themselves capacity building measures for farmers.

### State Level Workshops

PRAN organizes State Level Workshops in Bihar Agricultural University, Sabour, Bhagalpur and also two state level workshops. The scientist in large numbers participate and get all documents and extension materials prepared by PRAN. Director Research, Director Extension Education along with scientists from all faculties participated in the programme. Representatives from civil society organisations also participated in the workshop. In Rajendra Prasad Central Agricultural University, Pusa, Samastipur also one state level workshop on SRI was organised where researchers and teachers participated actively.

## District Level workshops

We organize district level workshops to sensitize the local officials. In all district level workshops Joint Director(agriculture), District Agriculture Officer, DDMs from NABARD and KVK scientists along with civil society organisations participated. In all these workshops we share most of the documents on SRI method of crop cultivation and also local fertiliser and pesticide preparation.

## SRI cluster Adhivesans

We organise SRI Vidhi cluster adhivesans in operational districts and states. Public representatives, SRI farmers

and officials participate in these events. Between 200 and 500 women farmers participate in each adhivesan.

## SRI Vidhi Jhanki on Republic Day

On every Republic Day farmer, VRPs display innovations in agriculture in Gandhi Maidan, Gaya and in project blocks. We are happy that there is a public recognition of the effort, every year we are ranked among first three Jhanki. Jhanki display of all of our innovations in agriculture draws attention of minister, higher officials and public in general. All SRI implements, fertilisers, pesticides, solar irrigation model are part of our Jhanki.



Figure: Women farmers along with their male counterparts participating in SRI Vidhi Jhanki on republic day.

## Public Policy Acceptance

### The Government of Bihar adopted this policy

The BRLPS organized a big meeting of women SHGs with the Chief minister of Bihar on the occasion of 2<sup>nd</sup> October 2009 in S.K. Memorial Hall, Patna. The honorable chief minister for the first time saw a manual on **SRI vidhi** Genhun (SRI method of Wheat cultivation). He said “**are sri vidhi se gehun bhi hone laga hai**” (aha, wheat is also grown through SRI method!). He spent 70% of his time allotted for stall visit on SRI stall. In his address to the SHGs and referring to the SRI method he said **Khadyan samasya ka hal hi nikal ayega** (It will serve as solution to our food security issue in the state).

During rabi season of 2009-10 ATMA, Gaya invited PRAN (the then PRADAN) to pilot one refinement, validation and adoption of technology of enhancing yield of oilseed through System of Root Intensification method of crop

cultivation. The growth and progress of the crops were quite exciting. Again large number of various stakeholders visited the SRI-Rapeseed plot. Dr Poswal from Wheat Research Institute and other scientists from Directorate of Rapeseed Mustard Research Institute at Bharatpur, Rajasthan became interested in SRI methods and there was exchange of experiences with these institutions. The SRI-Rapeseed yield were very attractive to local government and they supported PRAN (then PRADAN) in managing a women farm schools in 11 blocks of Gaya for spreading SRI methods in Rapeseed. During this period Dr. B. C. Barah Chair Professor, NABARD at IARI, New Delhi also visited different villages under SRI programme. During rabi season of 2009-10, 15808 farmers adopted SRI method in wheat cultivation.

In 2010-11 **the chief minister of Bihar** had a plan to visit different parts of Bihar. The CM instructed his cabinet colleague **Dr.(Mrs.) Renu Kumari Kusawaha (the then Agriculture minister, Government of Bihar)** to see the

early stage of SRI-Wheat plot in village Shekhwara under BodhGaya block. She visited the plot at late in the evening at 9.00pm. Having known her intention to visit farmers' fields, I had arranged a generator for facilitating her to properly inspect the plot of SRI-Wheat and Traditional wheat. She also interacted on experience of SRI-wheat farmers particularly women. After her visit, a high-power group of state level officials including the then Agriculture Production Commissioner, Principal secretary, Planning, Principal secretary, Animal husbandry and Director, Directorate of Rice Development, Ministry of Agriculture, Government of India

along with divisional commissioner and district magistrate visited the SRI-Wheat plot and observed closely the low-cost vermicomposting in the field. The experience of all the officials were quite enriching and useful. Then government of Bihar decided to conduct a special experiment of SRI-Paddy with 5 farmers each in every district. The government invited PRAN (then PRADAN) to act as resource in different divisions. We deployed village women to train the farmers and officials of the department. Even adverse effect of severe draught in 2009-10, could not change the excitement and confidence of farmers towards SRI.



**Figure: The then Agriculture minister along with state and district officials listening experiences of SRI-Wheat and also visiting SRI-wheat plot in Gaya**



**Figure: The then state minister of rural development Mrs Agatha Sangma, Government of India also visited the SRI-Wheat during harvesting time.**



On January 2011, the chief minister launched SRI kranti programme in Bihar. The programme started with a SRI song sung by our participant families. We had put a stall and acted as technical resource agency on SRI on that

occasion. As many as 2600 SMS (subject matter specialist) and District Agriculture Officers of different districts along with ICAR and NABARD participated in the programme. The government planned to take SRI in 3.5 lakh hectare. The

government is still continuing with its programme on SRI methods in Paddy and wheat. The then Director, BAMETI (Bihar Agriculture Management Extension and Training Institute) Dr. RK Sohane (now he is Director, Extension Education at Bihar Agriculture University, Sabour, Bhagalpur, Bihar) played a crucial role in organizing training and workshops in all divisions and districts of Bihar. The print media and the local electronic media played a crucial role in making the environment. At Patna SRI farmers like

Jayjeet Kumar, Barati Devi and Sunita Devi and many others shared their experiences at the highest level. In all the thirty-eight districts of Bihar a team comprising of two village women and one man from different villages of SDTT project shared their experiences, provided training on SRI and demonstrated seed treatments before officials and KVKs. In 2011-12 there was a good rain, therefore large number of farmers under SDTT project turned up for SRI-Paddy during kharif.



**Figure: The chief minister of Bihar, Mr. Nitish Kumar understanding SRI methods at Patna and inauguration of SRI Kranti at S.K.Memorial Hall,Patna**

### Scaling up of SRI Crops in Bihar and elsewhere

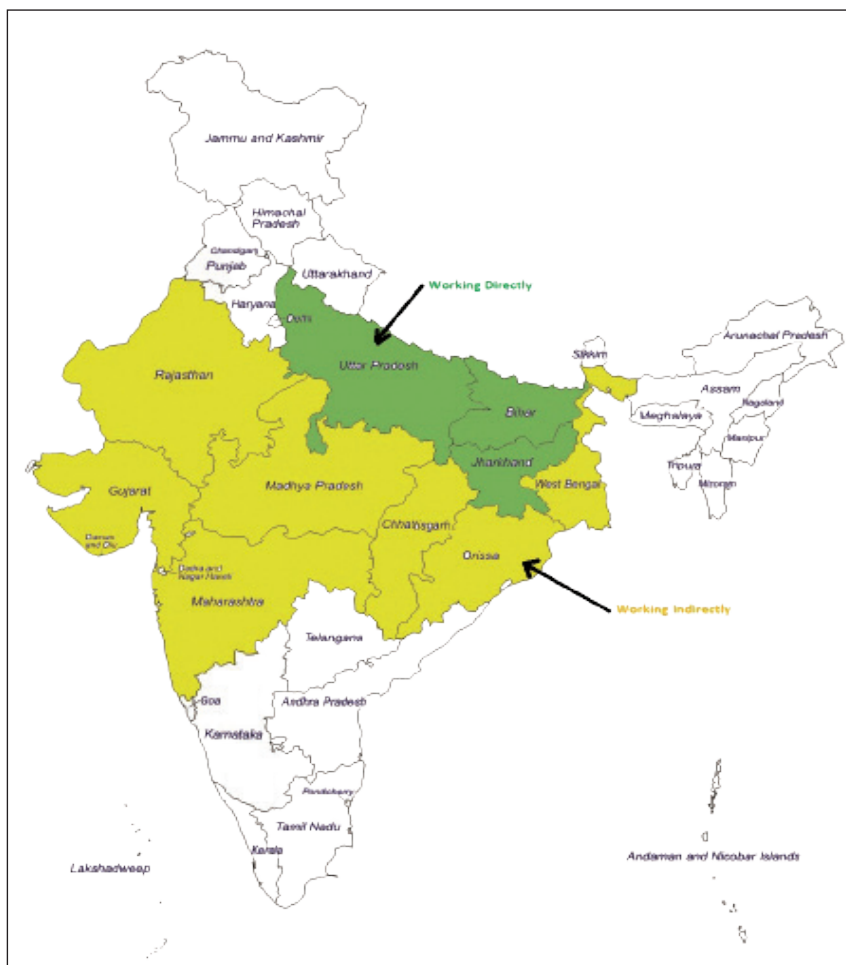
- Bihar Rural Livelihood Promotion Society (BRLPS), Patna has scaled up SRI/SCI with 1.50 million Small & Marginal farmers in the state.
- Govt. of Bihar through its Deptt. of Agriculture has continuously been promoting SRI since 2011 and has recruited 4000 officers and 8000 Krishi Salahkars for its scaling up. So far, Govt. of Bihar is involved with 2.0 million farmers.
- Civil societies are working with 0.30 million farmers and promoting SRI with them.
- PRAN has prepared 12000 cadres from 10 states and 4000 officials (Govt. & Non-Govt.) from various states to promote SRI of natural farming.
- Bharat Rural Livelihood Foundation (BRLF) through its partners across 0.50 million farmers.
- UPSRLM, Rajasthan SRLM, MPSRLM and NRLM New Delhi are involved in scaling up of SRI/SCI among small and marginal farmers.

- Before introduction of SRI in Bihar the maximum production of paddy in a year was 4.60 million tons whereas after introduction of SRI in 2020-21 it is 10 million tons.

### Outreach in direct project by PRAN

PRAN has a direct SRI project being implemented with support from SDTT, Mumbai; TATA Trust, APPI, UNICEF, ASHOKA, IIFL SAMASTA, UN Women, Govt. Deptt. (State & District), United Way etc. It provides training to all stakeholders who are in to SRI work. In our direct project the coverage is as under.

PRAN has promoted SRI method of crop cultivation in Gaya, Nalanda, Nawada, Madhubani, Aurangabad in Bihar; Varanasi and Jaunpur in Uttarpradesh and Simdega & Gumla districts in Jharkhand. In these areas PRAN has worked directly with small and marginal farmers. PRAN has also demonstrated SRI non-directly with Bharat Rural Livelihood Foundation, New Delhi partner organisations spread over in states of Jharkhand, M.P., Chhattisgarh,



**Figure: Map showing location where PRAN has worked directly or indirectly**

Rajasthan, Gujrat, W.B., Orissa, Maharastra by placing its staffs and cadres with all the partners of BRLF. PRAN has created 2400 cadres on SRI in all these eight partners' states of BRLF. These cadres and various partner organisations such as BAIF, PRADAN, FES, SRIJAN etc. are involved in scaling up of SRI in their operational districts and states.

### Impact analysis

The PRAN is happy to report a highly satisfying social impact with intervention of SRI as illustrated below. Multiple benefits achieved by the farmer communities:

S. No	Pre-deployment of SRI method of crop cultivation	Post deployment of SRI method of crop cultivation
1	Most of the families, food production in their own farm was sufficient for only for 3-6 months	Most of the families getting food grain security round the year
2	Earlier dependent on mahajans for credit in hours of need.	Those who are practicing SRI method of crop cultivation in cereals, vegetables are getting cash income apart from food grain security
3	The indiscriminate use of pesticides and chemical fertilizers.	They reduced the use of chemical fertilizers and pesticides.
4	The farmers were not using locally prepared fertilizers and pesticides	The farmers started using locally prepared organic fertilizers and pesticides



S. No	Pre-deployment of SRI method of crop cultivation	Post deployment of SRI method of crop cultivation
5	The poor farmers particularly Mahadalit were forced to migrate in search of food	SRI has reduced forced migration among SC communities in remote villages.
6	Earlier the farmers were using 40kg of Paddy seeds per acre, 54-81Kg of wheat seeds per acre and 7-8 kg of oilseeds per acre	Now they are using 2kg of Paddy seeds per acre, 10 kg of wheat seeds per acre and 250gm-1 kg of oilseeds per acre.
7	The Mahadalit community were taking only alternate meals to survive.They used to skip the meals.	The mahadalit community adopting SRI are getting balanced and sufficient diet daily.
8	Earlier farmers were purchasing fertilizers and pesticides only from market	In many villages farmers are themselves preparing vermicompost,local fertilizers and pesticides.
9	The women in villages were reluctant in speaking to outsiders	These village women are in the fore front and shown that they are capable of handling outsiders. They are also going to other districts and state to train officials and farmers on SRI.
10	Earlier the farmers were getting poor quality grains and vegetables to eat	The farmers and families are getting quality grains and vegetables to eat
11	Earlier all scientific institutions were opposing SRI	Indian Agriculture Research Institute and several others have started appreciating SRI
12	Earlier Bihar production of rice was only 4.6 million tones in a year	After introduction of SRI, Bihar produced 10 million tons of Paddy and won Krishi Karman award from President of India for high paddy production deploying new method

The SRI method of Paddy, wheat and Parali Integrated SRI Wheat cultivation has helped small and marginal farmers to attain food-grain security. Those small and marginal farmers who were having low productivity of 1.5 to 2 tons/hectare are now getting 6-7tons/hectare. Even if a farmer has half an acre own land is getting sufficient food grains to meet the household requirement.

PRAN builds local cadre through phased training. The best practitioners are identified by community and PRAN who in turn undergo phased training on SRI method of paddy cultivation. After 4 phases of training the farmer (Women or men) become Village Resource person(VRPs). One Village Resource Person provides training and handholding support to 50 small and marginal farmers in a village or a hamlet. We have large numbers such village Resource Persons 90% of them are women.

These Village Resource persons in SRI cluster of 25-30 hamlets organize weekly review and planning meeting where our Skilled Extension worker chair the weekly meeting. the status of fields of all farmers of a Village Resource Persons is segregated in to very poor, poor, average, good.18-20 Village Resource Persons are required to attend weekly meeting every week round the year. The group of Skilled Extension Workers are supported by Subject Matter Specialist(SMS) cum Project Managers and Project Supervisors. These Project Managers and Project Supervisors along with Executive/Project Leader/ Executive Director form Technical Resource Team of PRAN.The technical resource team of PRAN reviews the programme monthly.The agronomist of PRAN trains its staff and also builds capacity through training at Indian Institute of Horticultural Research, Bangalore and other organizations.