Towards a Learning Alliance

SRI in Orissa

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Dr. C. Shambu Prasad, Koen Beumer and Debasis Mohanty

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WWF Project 'Dialogue on water, Food and Environment'
c/o ICRISAT, Patancheru,
Hyderabad - 502 324
Websites: www.iwmi.cgiar.org/dialogue/godavari/
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Xavier Institute of Management
Xavier Square
Bhubaneswar - 751 013
Orissa
Website: http://www.ximb.ac.in

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WWF International - ICRISAT Dialogue Project

ICRISAT, Patancheru - 500 324
Andhra Pradesh, India
Tel: 040-30713762
E-mail: v.goud@cgiar.org

And

Dr. C. Shambu Prasad
Associate Professor, Xavier Institute of Management
Bhubaneswar - 517 013, Orissa
E-mail: shambu@ximb.ac.in

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A learning alliance has all the features of an open system. We hope that we would have more and varied partners in our continuing journey of SRI in Orissa and India and would welcome any comments and suggestions on this book.

Shambu Prasad
September 2007

Abbreviations

ANGRAU	Acharya N.G. Ranga Agriculture University
BOJBP	Briksha O'Jeevan Bandhu Parishad in Nayagarh
CBO	Community Based Organisation
CEC	Cation Exchange Capacity
CRRI	Central Rice Research Institute
CSA	Centre for Sustainable Agriculture
CWS	Centre for World Solidarity
DRR	Directorate of Rice Research
FYM	Farm Yard Manure
KVK	Krishi Vigyan Kendra
IAMWARM	Irrigated Agriculture Modernisation and Water-bodies Restoration and Management
ICAR	Indian Council of Agricultural Research
IMAGE	Institute on Management of Agricultural Extension
MASS	Manav Adhikar Seva Samiti
NFSM	National Centre for Development Cooperation
NRM	Natural Resource Management
NTFP	Non Timber Forest Produce
OUAT	Orissa University of Agriculture Technology
ORC	Orissa Resource Centre
PRADAN	Professional Assistance for Development Action
PSI	Peoples Science Institute
RCDC	Regional Centre for Development Cooperation
SHG	Self Help Group
SMI	System of Mustard Intensification
SP	Service Provider
SPARD	Society for People's Awareness and Rural Development
SRI	System of Rice Intensification
SVA	Sahabhagi Vikas Abhiyan
TOT	Training of Trainers
UAA	United Artists' Association
VLE	Village Level Expert
WALAMTARI	Water and Land Management Training and Research Institute
WASSAN	Watershed Support Services and Activities Network
WORLP	Western Orissa Rural Livelihood Project
WWF	World Wide Fund

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Towards a Learning Alliance - SRI in Orissa

Last year while documenting the innovation history of SRI in India we had just a couple of paragraphs to report on the SRI work in Orissa.[1] A year later as we attempt to take stock at a time that coincides with *Nuakhai*, the unique harvest festival being celebrated in Orissa (especially the Western regions), we seem to be celebrating *Nuakhai* with a rich harvest of experiences throughout the state. This volume is a tribute to the efforts of farmers, researchers, civil society organisations and government agencies that have made this possible. The traditional celebration of the harvest continues in most parts of the state even as its significance seems to have eroded with changing cropping patterns (few farmers choose to grow short duration varieties of the kind that makes new rice possible in the month of *Bhadrab*) and now even climate change.[2] Only seven of the last twenty five years have had normal or more than normal rainfall in the state. Variable patterns of rainfall in a state where rainfed paddy is the main crop has indeed put the livelihoods of a large number of small and marginal farmers under severe stress. Does SRI seem to offer a ray of hope to these farmers so that they could look forward to *Nuakhai* in the years to come?

From what appeared to be just few farmers trying out SRI in Orissa a year back there has been a consistent increase and spread across the state despite lack of any governmental support. The spread and its prospects warrant a fuller account of the experiences and insights of the practitioners of SRI who have made this possible. This volume intends to present these rich experiences on SRI and explore ways of strengthening an emerging 'learning alliance'. The idea of the volume came out of the first state level workshop on SRI held on June 23, 2007 where most of the contributors spoke, for the first time, about SRI. The workshop was unique in many ways. The Department of Agriculture, Government of Orissa, partnered in this workshop with four other organisations even as it was seeking to launch its own plan for rice in Kharif 2007. The event had over 80 participants including tribal farmers from the remote Koraput to resource persons sharing insights from Tripura and Andhra Pradesh. The event was a step in redefining boundaries and an open invitation for participants to learn and share from each other. It is not often that one witnesses Kharif plans of the government being open to ideas from civil society organisations, researchers keen to share their insights and state governments openly seeking knowledge from outside the state. The one day workshop proved too short. The participants had so much to say, discuss and debate.[3]

In a follow up they readily agreed to share and build a farmers database on SRI during Kharif 2007. The response to writing up their experiences was extremely encouraging and participants agreed voluntarily to contribute their experiences on SRI with detailed narratives on how they got involved in it, their results, areas for improvement and even what needs to be done to take SRI further.

The experiences that follow this introductory chapter reflect the concerns and aspirations of the actors and we have tried to maintain them with minimal editing of content and this reflects in the diversity of perspectives among the actors. In this introductory paper we hope to provide a context for the SRI efforts in Orissa. This paper is divided into four parts. In part I we speak about the overall context of rice cultivation in Orissa (of which *Nuakhai* is a part) and the crying need for change by most actors involved. In part II we broadly sketch the background of SRI in India and in part III we situate the SRI work in Orissa within the overall context of rice in the state. We show how SRI in Orissa has evolved in the last three years. Finally in Part IV we speak about the emerging concept of a 'learning alliance' and why SRI in Orissa and

[1] Shambu Prasad, C. 2006. System of Rice Intensification in India. Innovation History and Institutional Challenges. Patancheru & Bhubaneswar: WWF and Xavier Institute of Management.

[2] The Water Initiatives Orissa has just launched a campaign to generate public awareness on climate change. In thirteen years more than 7 percent of total geographical area has turned barren and unfit for agriculture. WIO hopes to collect 5000 responses to the issue of climate change in the state to feed into the the United Nations Framework Convention on Climate Change (UNFCC) meeting in Bali in December 2007.

[3] For a flavour of the workshop and the participant profiles please visit http://www.wassan.org/sri/documents/Orissa_Dialogue_Report.pdf.

in rest of India needs several learning alliances if it wants to live up to the rising expectations from farmers across the state and country. In this we draw upon SRI experiences both in India and the rest of the world. We argue that SRI as an innovation that is complex and constantly evolving and dynamic needs a different kind of system architecture. One that can not only keep pace with the evolving nature of knowledge – technical and institutional, but also one that can enable the faster generation and dissemination of new knowledge, or innovation in short. For this to happen *learning alliances* that build trust and synergise information flow across diverse actors are necessary.

Rice in Orissa

Orissa state is a part of the South Eastern Indian subcontinent, spreading through a geographical area of 155,707 sq. km. It extends from 17.5 N to 22.8 N in latitude and 81.2 E to 87.6 E in longitude. The state has a cultivated area (net area sown and current fallow) of 6.4m ha of a total geographical area of 15.5m ha out of which 2.9m ha are high land, 1.9m ha medium land and 1.6m ha low lands. The gross cropped area is 8.4m ha. Rice is the most important food crop in Orissa grown throughout the state covering over 53 % of the gross cropped area, often as a single crop though with tremendous diversity of rice varieties. The Jeypore tract of Koraput district in Orissa is recognised as one of the secondary centres of origin of cultivated rice in the world. The latin name of rice *Oryza Sativa* is believed to derive its origin from Orissa or *Odra Desha* that means the land of cultivators.

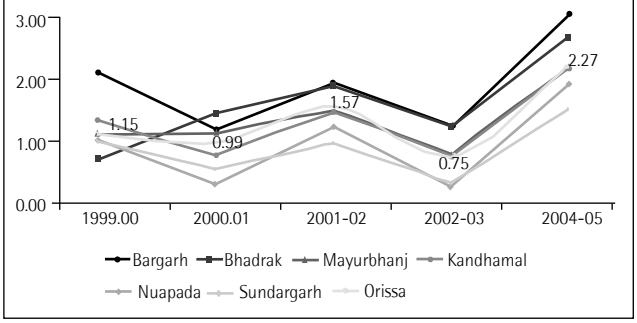
The cropping intensity is quite low in comparison to other states of India and most parts of the state do not have a second crop. The climatic conditions and landholding pattern (predominantly small holder) has meant that farming is largely subsistence and rainfed with low use of inputs. Despite several interventions in the past to improve productivity, there seems to be a mismatch between technological efforts and farmers' practices resulting in large yield gaps and stagnant and even declining agricultural productivity.[4]

Details of the production patterns of rice in the state have been analysed in the following chapters (see Tables 2.1 and 2.2, Figure 3.1 on rice productivity in comparison with Indian average). In this chapter we present some information on the vagaries of rice production across the thirty districts of Orissa. Rice is grown in all the districts of the state with varying intensity depending on the topography. The percentage of rice as total cropped area is higher in the coastal plain areas such as Puri, Bhadrak, Kendrapara and Balasore where the percentage is over 90% whilst for districts such as Koraput, Gajapati and Rayagada these figures are under 40% (refer to Appendix 1.1).

Apart from the low level of yields in the state overall and across districts, there is a lot of fluctuation from year to year. The variation in productivity across time is indicated in Appendix 1.2 for a five year time period (1999-2000 to 2003-04) and indicates that all districts are affected by seasonality and have wide fluctuations in productivity. Bargarh reported the highest yields of 3.1 tonnes per hectare (tph) in 2003-04 and Nuapada reported the lowest of 0.26 tph in 2002-03. For purpose of analysis two districts each have been chosen for high, medium and low productivity across the five year period. They are Bargarh and Bhadrak from the top five rice producing districts, Mayurbhanj & Kandhamal from medium productivity and Nuapada and Sundergarh of low productivity. Figure 1.1 captures this fluctuation for six districts of the state.

The highest rice producing district, Bargarh had a 43.46% decline in the year 2000-01 from 1999-00, whereas Bhadrak had an increase of 101% of the yield rate in the same year. In the year 2001-02 almost all the districts produced higher than two previous years except Khurda, which had a decline of 3.25%. Nuapada had the highest of 320% rise in yield rate in 2001-02. In the year 2002-03 again the rice yield fell down. Nuapada achieved an highest of 646.15% increase than 2002-03. Similarly Bhadrak, which faced a biggest fall down in 2002-03 with 81.05 % of its previous year rate, increased its productivity by 648.28%. It is indeed difficult to discern

Fig. 1.1: Year-wise rice yield in selected districts



[4] See Kshirsagar, K.G., S. Pandey and M. R. Bellon. 2002. Farmer perceptions, varietal characteristics and technology adoption: The Case of a Rainfed Rice Village in Orissa. *Economic and Political Weekly.* Feb. 23, pp 1239-1246.

any pattern in any district and rice in Orissa is thus very much a function of the vagaries of rainfall which, as many people observe, has become more erratic over the years.

Over the years this phenomenon of poor and fluctuating yields has been accepted by the agriculture department and the Government of Orissa and there has been an attempt to shift production towards other crops on the one hand and also peg the target yields at what is seen as achievable on the other. Appendix 1.3 has the district wise targets for the current Kharif in the state. It is quite clear that variations in rainfall, the impact of floods and increase in its frequency over the years have all contributed to rather modest targets with regard to rice.

Improving rice productivity in the state is a crying need and has major implications for food security of the farmers where poverty levels are one of the highest in the country. It is in this context that we need to appreciate the current efforts by various organisations in promoting SRI. Practices that rely on low inputs and yet provide increased productivity clearly have immense potential. Is the SRI strategy for Orissa different from the rest of India or the leading states in SRI such as Andhra Pradesh and Tamil Nadu? In the following section we seek to answer this by situating SRI in Orissa vis-à-vis the rest of the country.

Continuity and Change in SRI in India

Presenting an overview of a complex and continually evolving system such as SRI is indeed fraught with methodological difficulties. As we discovered while documenting SRI in India we were in a situation where we were soon getting 'obsolete'. Newer actors continually seem to be entering the system even as some have begun to become more circumspect and have revised their initial targets. We present here some broad features of change in the SRI climate with the caveat that the picture outlined is neither comprehensive nor a final statement.

Continuing Partnerships

There have been several actors who have continued to maintain their interest in SRI. The WWF (World Wide Fund) Dialogue project on Water, Food and Environment is prominent among them. The project that started with looking at specific instances of water saving through SRI and thereby reduced ecological stress in a water intensive crop has willy-nilly taken on the mandate of moving the SRI agenda further within the state of Andhra Pradesh where they are involved with a novel partnership with research and extension organisations of the Acharya N.G. Ranga Agricultural University (ANGRAU), the Directorate of Rice Research (DRR) and civil society organisations such as WASSAN (Watershed Support Services and Activities Network). At another level the coalition continues to take the SRI agenda forward through meetings and interactions with key policy actors.

Growing Technical Competence in SRI

India, and Andhra Pradesh in particular, has become an important technical resource centre for SRI. Regular training programmes are conducted at both DRR and ANGRAU on SRI for agriculture department and other researchers on SRI. Concurrently WASSAN with its partners such as the Centre for Sustainable Agriculture (CSA) has become a centre for information and insights on SRI in partnership with WWF. Farmers and organisations across the country have been in touch with the resource centre for information on SRI, accessing technical resource material and even implements. Notable among these is the growing popularity of the Mandava weeder named after a village in Karimnagar district where the design was established and experimented with. Orissa is no exception to this trend and farmers in Orissa found the weeders beneficial and organisations have started manufacturing them (see chapter 7 for more details). A template of an SRI manual has been developed that has now found several local translations in Oriya, Punjabi and Hindi apart from the already existing Telugu and English. A Tamil version of this open source innovation in training manuals is likely to come out soon. Some of these regional manuals are translations while those with some SRI experience in their regions have also added local insights and experiences.

It may be observed that the visual appeal of most SRI trainers have indeed undergone changes. A few years back it was not uncommon in training programmes to see pictures of a woman in a T shirt and a skirt explaining the process of careful transplantation. This odd implant in the Indian context (perhaps from Sri Lanka) is no more a feature with so much Indian experience on SRI and insights on SRI from India continue to feed the SRI knowledge community globally. Indian resource persons have been receiving requests from other countries such as Afghanistan for training in SRI and Indian farmers reflect on experiences in international forums too.

Scaling up SRI in India

The growing technical proficiency in SRI especially from the state of Andhra Pradesh has led to innovative institutions scaling out of SRI to other states of India where this expertise has been adapted. Uttarakhand, a state that in the last national symposium of SRI in November 2006 at Hyderabad had shown negative results, has now grown considerably through the sustained and systematic work of the Peoples Science Institute (PSI), Dehradun and resource support from Andhra Pradesh. Not only are the results favourable this year there have been some very interesting experiments on applying SRI to wheat.[5]

Similarly states such as Punjab, Bihar, Jharkhand have all seen increase in SRI activities with local organisations – either in collaboration with researchers and government agencies or by themselves – have spread SRI. When a collective estimate of the spread of awareness was taken in June 2007 it appeared that there were 18 states including the union territory of Puducherry. These states are Tripura, Andhra Pradesh, Tamil Nadu, Karnataka, West Bengal, Orissa, Uttarakhand, Jharkhand, Chattisgarh, Gujarat, Uttar Pradesh, Kerala, Punjab, Bihar, Himachal Pradesh, Jammu, Assam, Meghalaya and Nagaland. SRI clearly is not an unknown phenomenon that it was a few years back.

Systematic work in a few regions over the years has led to substantial scaling up of SRI activities. Amongst civil society actors PRADAN has been able to take up SRI in 11 districts of West Bengal, Orissa and Jharkhand among over 6500 families (over 1100 just in Purulia district alone) in over 632 ha. By far the largest scaling up of SRI has occurred in the small state of Tripura in North East India. The spread of SRI in over 16000 ha to date and prevalence of contiguous stretches of paddy through SRI in over 30-60 ha. are some of the notable features of SRI in Tripura. The state government of Tripura, through the efforts of its dynamic officer and senior agronomist Baharul Mazumdar, has been able to establish synergy between research and extension and close collaboration with the agriculture line departments and the decentralised village level Panchayati Raj officers and workers in the state. The government has also been able to establish good policy support through timely support to farmers with timely availability of implements and creating an enabling environment for farmers to organise organic manure in their farms. The second national symposium on SRI is being held at Tripura in October 2007 in recognition of the rapid strides made by the small state in SRI.[6]

In the larger states of Tamil Nadu and Andhra Pradesh the scaling up efforts have been mixed. A major thrust to popularise SRI in Tamil Nadu has been through the World Bank funded project "Irrigated Agriculture Modernisation and Water-bodies Restoration and Management (IAMWARM)" with a total project cost of Rs.2547 crores. SRI has been chosen as the technology to be popularised in the 63 sub-basins of this project where the landholding size over an overwhelming number of farmers is less that 0.55 ha. The scaling up efforts in Andhra Pradesh has been more modest with second order institutional issues coming to the forefront. The size of the state and variations in agroecology do not provide for standardised applications of packages of practices. In those places where there has been local adaptation the spread has been more. The limitations of strategies in the past that did not have a strong poverty focus are being realised. Big farmers who have had record yields in the past are facing newer technical and managerial challenges. Synergy of actors among the agriculture department, research agencies, university, irrigation departments etc. have not been as high leading to reduced scale up. These issues are not insurmountable but will need actors in the state to address the institutional issues of SRI more closely even as Andhra Pradesh continues to provide leads in the technical issues.[7]

Greater Policy Support and Changing Climate

This acceptance and awareness of SRI is not restricted just to the field but reflects awareness amongst key policy actors in the country. A good indicator of this is that SRI figured in at least ten questions in the Indian parliament in the last couple of years. The questions asked during Question Hour were general ones on the measures taken by the government to increase productivity or changes in farming practices to very specific ones on SRI. The responses to the questions from the Ministry of Agriculture are indicative of the thinking amongst top policy makers in the country. SRI has been referred to often as a strategy to improve productivity of paddy and as one of the Government of India's schemes to improve productivity, as a means to ensure greater resource conservation and enabling farmers to change some of their farming practices and as an important method to overcome the scarcity of irrigation water. Answers to the

[5] See http://www.wassan.org/sri/documents/PSI_SRIReport.pdf for details.
[6] See www.sri-india.net for details on the National Symposium at Tripura and the field report indicating the spread of SRI in the state.
[7] For details on the AP experience see Ramanjaneyulu, G. V., N. Rajitha and A. Ravindra. 2007. *Taking Roots: Experiences with SRI in AP*. Hyderabad: Centre for Sustainable Agriculture and WASSAN.

questions as in many questions in parliament are based on information received from leading research organisations including the Central Rice Research Institute (CRRI) in Cuttack. The favourable representations of SRI in policy circles indicate the recognition of its possibilities from research organisations as well.[8]

The Government of India sees SRI as playing an important role in the newly launched National Food Security Mission (NFSM) that envisages substantial increase in rice production in the next four years. It would not be incorrect to state that the overall climate of SRI has become more hospitable than it was a few years ago when it was close to hostile and there was a great disbelief in many research organisations and government agencies on SRI prospects.

Greater Poverty Focus

The spread of SRI significantly in the more recent areas has been towards farmers who have been largely small, marginal and from tribal pockets. This is in contrast to the more well endowed green revolution farmers in the past. In some cases this poverty focus has been conscious because of the pro-poor agenda of the agency involved. In other cases it has emerged as a feature of SRI in India where the uptake has been much higher with small and marginal farmers more keen on taking SRI. The marginal or even modest improvements of their yields have had strong implications for food security and have provided a new dimension to SRI uptake. The earlier focus in some states has been in areas where larger farmers have been keen to achieve bumper harvests through SRI. The results of the smaller farmers have been above the district or state averages and seem to suggest newer directions in scaling up operations of SRI even as the institutional issues in irrigated areas need to be sorted out. We shall see this feature being repeated in our discussion on SRI in Orissa as well.

SRI in Orissa

In comparison to other states SRI in Orissa is of more recent origin. Yet there had been a very encouraging spread of SRI in the last year and a half. Recent estimates indicate that SRI is currently being practiced in 17 of the 30 districts (Bolangir, Ganjam, Kalahandi, Kandhamal, Keonjhar, Koraput, Mayurbhanj, Nuapada, Rayagada, Sundergarh in what are considered low productivity districts; Puri, Jajpur, Khurda and Nayagarh in medium productivity districts; and Bargarh, Sambalpur, Cuttack in high productivity districts). Table 1.1 below indicates the current spread (for details of the classification see Table 2.1 in chapter 2).

Table 1.1: Introduction and spread of SRI in various rice productivity zones

Rice Productivity Zone (in tonnes/hectare)	Total Districts	SRI Districts
Low (less than 1.55)	16	10
Medium (1.55 – 2.07)	8	4
High (over 2.07)	6	3
Orissa	30	17

Though the numbers of farmers are still not very high in these districts and estimates are not available, it is interesting to note that the spread of SRI has been more in the low productivity zones of Orissa. This perhaps explains the rapid spread of SRI in the non-coastal regions where there are large numbers of tribal and small and marginal farmers. Accounts of farmers, as the various papers in this volume reveal, shows how SRI has contributed significantly to increased yields and helping these farmers achieve food security and surplus.

The earliest experiments on SRI in Orissa were in 2003 by PRADAN in Karanjia and Keonjhar. Some actors however had heard about SRI even earlier (see Natabar Sarangi's and Debasis Mohapatra's accounts in chapters 10 and 15) but the information was sketchy and there was no way to actually see things for themselves. An independent farmer Pravash Chandra Satpathy carried out his first trial of SRI in Mayurbhanj after reading about it in a farming journal (chapter 9). Another farmer in southern Orissa, D Narayan heard about SRI from the media sometime in May 2005 and followed it up with a trial on 0.27 acres (chapter 11).[9] Sahabhagi Vikas Abhiyan also decided to undertake trials the same year (chapter 6).

The principles of SRI were outlined in a booklet in Oriya in February 2006 by the Regional Centre for Development Cooperation (RCDC), Bhubaneswar. Around the same time organisations interested in promoting sustainable agriculture like the Orissa Resource Centre of the Centre for World Solidarity took a lead in organising a workshop to familiarise themselves and their partners on SRI. The workshop created a demand for practical training and a

[8] See http://ciifad.cornell.edu/SRI/countries/india/inParliamentSRIref.pdf for details.
[9] The media, especially Eenadu Television through its programme *Annadata,* incidentally played a big role in promoting SRI in Andhra Pradesh. Narayan watched an Oriya version of the same.

follow-up was held in March 2006 at Sambhav in Nayagarh. The workshop though late for the cropping season evoked a lot of interest with organisations deciding to take it up in earnest later in the year. Many contributors to this volume were participants in this landmark event (see chapters 5, 8, 11, 14). By 2006 SRI trials were in place in 10 districts of Orissa with no formal support.

It is to the credit of the innovative spirit of these actors that they choose to work on SRI despite incomplete knowledge on SRI. They did not choose to carry out trials only until they acquired complete knowledge of SRI. They in fact were intuitively recognised as a key principle of SRI namely its knowledge or skill intensity. If SRI is indeed skill and knowledge intensive why delay participating in skill development and knowledge generation until the knowledge is perfectly understood? Why not start right away? This entrepreneurial spirit prevailed in these endeavours. A spirit that enabled them to learn faster with each cropping season as the following chapters demonstrate.

Noticeably the trials in SRI were not in favourable locations. For example SRI was practiced in Gamanda, a tribal village under Beguniapada block of Ganjam district with the guidance of UAA (United Artist Association) in 2006 Kharif. The remote village is inaccessible but that did not deter either the villagers or the organisation. Early results in Southern Orissa indicated great success especially from tribal farmers. D. Narayan attended the National Symposium on SRI at Hyderabad on 17-18 November 2006 representing an Orissa farmer.

The success in Kharif 2006 motivated the actors to continue their learning processes through facilitated training. The year of 2007 saw the release of the first Oriya manual on SRI by Sahabhagi Vikas Abhiyan (SVA). Ideas from Andhra Pradesh were incorporated in the manual together with local experience. The spirit of sharing ideas and knowledge was typified by the Experience Sharing Workshop on SRI held on 1st and 2nd April 2007 at Sambhav. The event was announced even as funds were not mobilised. Later the regional office of Oxfam supported some of the costs. Orissa still had no official policy support or appreciation of SRI and the experiences were scattered in two pockets – Southern and North Western Orissa. When the experiences were shared with the new Director of Agriculture he immediately suggested including SRI in the Kharif orientation plan of the department for its agricultural officers. A doctorate in agriculture, he had earlier heard about SRI from PRADAN and others. The preliminary opening and openness of the Director and discussions with other national and international actors led to the first state dialogue on SRI (June 23, 2007) where the idea of a learning alliance was floating.

Appendix 1.4 lists the various organisations involved in SRI in the state with some of the features of their contribution to the SRI system in the state. It is interesting to observe from a systems point of view that there is little repetition of activities and the possibility of complementarity amongst the actors. Learning alliances as we shall argue in the next section could capitalise on the diversity of these SRI actors.

Learning Alliances and SRI

The state level dialogue workshop sought to bring different partners with varied capacities in a dialogue. The workshop sought to draw from insights on institutions and innovations in an earlier understanding of SRI innovation in India (Shambu Prasad 2006). Amongst the stated objectives were the building of SRI innovation capacity, creating a learning platform for agriculture officials of the state and the formation of a 'learning alliance' that would increase partnership between civil society organisations, state agencies and research organisations.

In this section we briefly introduce the idea of a learning alliance through a post-facto appreciation of the literature and analyse why we think such a strategy is suitable for SRI in India and Orissa in particular. A closer look at the history of SRI would reveal that diversity of actors is necessary for its spread. Throughout its history one of the most important features of the innovation system has been that it has no uniform characteristic nor any single agency or organisation driving it. From governments to farmers, NGOs to extension centres, and from universities to interested individuals, diverse actors are experimenting with the technique, creating knowledge and skills through their SRI practice.

What is often not sufficiently understood is that SRI is more a system of practices rather than a technology and thus diversity is an important feature of the system. SRI represents a set of management practices that need to be locally adopted, constituting a knowledge intensive system that requires flexibility and learning. As its history shows, SRI needs a lot of information and knowledge flow amongst the various actors that surpasses the traditional institutional boundaries of research, extension agencies and farmers in

a linear flow of knowledge and innovation. Process issues of learning however are often assumed while they perhaps hold the key to appreciating the complexity of the SRI innovation system. The system architecture of SRI is of an open system that is complex and constantly evolving, which necessitates greater attention to the institutional setting of innovation and the nature of information flows between actors in the up scaling of operations. Actors in the system (individuals and organisations) that have been able to take SRI further seem to intuitively recognise the open nature of the system and have seized opportunities to root SRI in their respective regions.

Success in the uptake of an innovation such as SRI has been due to the actors creating a micro culture of innovation around them. This micro culture allows for learning and sharing of information leading to innovation. Innovation does not refer per-se to absolutely new concepts and can also mean mediated introduction of existing information to a group of actors or to a context in which it has not been applied before. In that sense in the SRI innovation system all the actors and not just the research actors, are innovators and need to be appreciated for their contribution.

How does one convert processes and institutions from micro cultures of innovation so that innovation is widespread? This could hold the key to scaling up of SRI. While it could be argued that civil society organisations are better equipped to create micro cultures of innovation amongst their partners and farmers, the challenge becomes more complex when we speak of larger organisations such as government agencies and research centres. These organisations are not as connected with the users of their efforts and operate with different understanding of innovation. As has been argued in our earlier study past conventions of linear or pipeline models of innovation have constrained these larger organisations from creating cultures of innovation that are more broadbased. Scaling up of SRI is perhaps not possible by grassroot organisations alone. Greater demand for the innovation would require collaboration and novel partnerships with other agencies with different cultures. In the absence of facilitators or mediators and mutual trust past habits and practices of these contrasting cultures of innovation in the SRI system could lead to parallel systems of SRI.[10] At another level there is a need to create an overall enabling framework through appropriate policy interventions that could promote SRI like in the case of Tripura and other states. SRI does require more public investment for scaling up.

The value of a learning alliance is in enabling this transition from micro cultures of innovation to larger cultures of innovation. What exactly is a 'learning alliance' and why are they necessary? Moriarty el al (2005) provide a useful definition of learning alliances:

At its simplest Learning Alliances are a series of linked platforms, existing at different institutional levels (national, district, community, etc.) and created with the aim of bringing together a range of stakeholders interested in innovation and the creation of new knowledge in an area of common interest. The stakeholders involved should have complementary capabilities which, when combined, will allow the new knowledge created in the innovation process to be brought to scale. Some of the key capabilities required are in: implementation, regulation, policy and legislation, research and learning, and documentation and dissemination.[11]

The learning alliance approach is deemed necessary for trying to learn from past failures and successes that include the failure to consolidate learning, share knowledge and build capacity. The concept of Learning Alliances is built around the central proposition that only an integrated approach to the process of innovation, bringing together all stakeholders (practitioners, researchers, policy makers, activists), can address failures in scaling up innovations. Learning alliances, as Lundy and Gottret state, "contribute to healthy innovation systems by building bridges between islands of experience, helping to assess how these results were achieved and what others can learn from this experience"[12].

Learning alliances require facilitation to overcome barriers to interaction and communication within and between the stakeholder platforms. They aim to enable a shared learning process in which barriers to horizontal and vertical information sharing are broken down. It builds on the insight that greater coordination and synergy among the actors and the concomitant knowledge creation and sharing is

[10] Tamil Nadu is a good example where civil society groups refer to SRI in one way and government agencies and research organisations to another.
[11] Moriarty, P., Fonseca, C., Smits, S., and T. Schouten (2005). Learning Alliances for scaling up innovative approaches in the Water and Sanitation sector. Symposium Background Paper. IRC International Water and Sanitation Centre, Delft, The Netherlands.
[12] Lundy, M. & Gottret, M.V. (2005) Learning alliances: an approach for building multi-stakeholder innovation systems. Retrieved from www.idrc.ca/uploads/user-S/11605726301Anexo_1-IRC_LA_book_chapter.pdf

only possible through building trust and nurturing a culture of learning and innovation. In doing so the processes of interaction within the Learning Alliance should foster a sense of ownership of the founding concepts and approaches, ensuring that the innovation developed is appropriate to the local situation and capable of replication with existing (or realistically achievable) resources, institutions, and policies.

We hope that this volume will contribute this process of building trust amongst the diverse actors of SRI in Orissa and collectively work towards its scaling up. We hope that by facilitating continuous feedback loops between users, promoters and users adopting the technique the speed of understanding will be significantly increased.

The articles in this volume have been arranged to provide the reader a feel for SRI in the state. We begin with the bird's eye view from the Director of Agriculture that has just begun its SRI work in earnest and has lined up various training programmes for its officers. The directorate has already started building the farmer database in the state and the paper has details of the information being collected by the department. Throughout the volume we have tried not to modify the formats of reporting SRI results as much as possible. Each table made by an actor indicates a grid of knowledge that is user focused and could be important in appreciating their perspectives. The paper is followed by the two leading research organisations in the state with a lot of history. Their active involvement and openness to SRI is reflected in their papers even as their research trials continue and they provide greater insights on SRI processes.

These sets of articles are then followed by leading civil society organisations that have rooted SRI in Orissa. PRADAN was the earliest to put Orissa on the SRI map of India and has since been very successful in upscaling its work through novel partnerships with self help groups. Sambhav's story is inspiring for their success through SRI in growing paddy in summer. The few training workshops that they have held have been important for several organisations taking up SRI and this continues to date. SVA has forged successful links with WASSAN in taking further their current work on implements and expanding, cautiously, in their areas of operation and for popularising SRI through the publication of the Oriya manual. Pragati was one of the groups that made the best of the workshops on SRI at CWS and Sambhav and translating this in tribal fields at Koraput. The banner of the state level workshop was with the backdrop of the success story of Dibakar Jani, a tribal farmer.

These articles are then followed by farmers who have been at the forefront of innovation. Satpathy had actually discovered the System of Mustard Intensification (SMI) even before his entry into SRI. His restless innovative spirit has made him think about innovations in SRI as well. Natabar Sarangi's experiments in the waterlogged areas of Cuttack indicate how actors in Orissa have been actively networking with international actors to learn about SRI. Sarangi brings in the seed saving and its implication through SRI. For Narayan of Ganjam his search for information has not been easy. It is the perseverance of farmers above that has paved the way for a wider SRI knowledge base in the state.

The next set of papers from MASS and Vasundhara though yet small in scale provide insights on how SRI can be taken further, some as recent as the ongoing Kharif crop. The volume ends with accounts by two of the partners of the state level workshop who have played important roles in facilitating a learning alliance. Their accounts indicate how donors might often need to take pro-active and pursue unconventional methods to invest in and provide opportunities for their partners or clients.

It is still early days to assess the success of the emerging learning alliance in Orissa. However the goodwill generated through the workshop and the enthusiastic participation of the participants indicates that even if formally not seen as a learning alliance the actors are willing to share and help each other out. This volume is built on that goodwill and hopes to promote it. While the stories here are Orissa specific we do believe that the process lessons would be as relevant for other states in the region and at the national level too. In Orissa the hope is that *Nuakhai* in future would continue with renewed vigour given new possibilities in rice production through SRI – a system that is both modern and traditional.

Appendix 1.1: District-wise Target of Rice Area for Kharif 2007

Sl. No.	District	Area (in ha.)	Total Crop Area (in ha.)	% of Total Crop Area
1	Puri	131000	139210	94.10
2	Bhadrak	161000	176280	91.33
3	Kendrapara	151000	165650	91.16
4	Balasore	222000	244500	90.80
5	Jagatsingpur	94000	106580	88.20
6	Khurda	109000	125560	86.81
7	Cuttack	136000	158820	85.63
8	Jajpur	132000	159250	82.89
9	Mayurbhanj	310000	392910	78.90
10	Sonepur	102000	129690	78.65
11	Nayagarh	100000	131700	75.93
12	Sundargarh	205000	284040	72.17
13	Baudh	63000	87420	72.07
14	Jharsuguda	54000	78040	69.20
15	Bargarh	215000	313130	68.66
16	Sambalpur	114000	185210	61.55
17	Ganjam	227000	379400	59.83
18	Dhenkanal	94000	161160	58.33
19	Keonjhar	170000	293040	58.01
20	Deogarh	40000	71200	56.18
21	Bolangir	170000	326410	52.08
22	Nabarangpur	90000	172980	52.03
23	Malkangiri	70000	140750	49.73
24	Kalahandi	172000	349450	49.22
25	Nuapada	90000	198290	45.39
26	Angul	89000	210840	42.21
27	Kandhamal	50000	124650	40.11
28	Koraput	102000	279470	36.50
29	Gajapati	27000	78740	34.29
30	Rayagada	50000	183630	27.23
	Orissa	3740000	5848000	63.95

Source: Kharif Campaign-2007, Department of Agriculture, Government of Orissa.

Appendix 1.2: District-wise and Year-wise Rice Yield Rate (t/ha) in Orissa

Sl. No.	Districts	1999-00	2000-01	2001-02	2002-03	2003-04	Average of Five Years
1	Bargarh	2.14	1.21	1.96	1.27	3.1	1.93
2	Gajapati	1.62	1.78	1.95	1.02	2.41	1.76
3	Sonepur	1.97	1.3	1.87	1.04	2.21	1.68
4	Sambalpur	1.85	0.72	1.83	1.12	2.66	1.64
5	Bhadrak	0.73	1.47	1.93	1.25	2.73	1.62
6	Koraput	1.4	1.49	1.5	1.04	2.38	1.56
7	Balasore	1.01	1.56	1.76	0.95	2.37	1.53
8	Rayagada	1.52	1.05	1.51	0.85	2.66	1.52
9	Ganjam	0.76	1.21	2.16	0.87	2.32	1.46
10	Nabarangpur	1.54	1.13	1.27	0.54	2.51	1.4
11	Jharsuguda	1.65	0.4	1.49	0.69	2.72	1.39
12	Mayurbhanj	1.16	1.16	1.53	0.81	2.21	1.37
13	Jagatsingpur	0.36	1.34	1.71	1.18	2.05	1.33
14	Kandhamal	1.36	0.78	1.51	0.78	2.21	1.33
15	Dhenkanal	0.85	0.59	1.85	0.48	2.75	1.3
16	Nayagarh	0.71	1.15	1.63	0.61	2.38	1.3
17	Puri	0.86	1.25	1.67	0.88	1.83	1.3
18	Baudh	1.48	0.53	1.24	0.46	2.71	1.28
19	Cuttack	0.65	1.21	1.67	1.15	1.72	1.28
20	Khurda	0.79	1.54	1.49	0.47	2.09	1.28
21	Kalahandi	1.22	1.29	1.37	0.44	1.96	1.26
22	Angul	1.31	0.41	1.64	0.39	2.28	1.21
23	Keonjhar	0.81	1.04	1.33	0.51	2.33	1.2
24	Kendrapara	0.53	1	1.44	0.92	1.9	1.16
25	Jajpur	0.67	0.8	1.6	0.74	1.91	1.14
26	Bolangir	1.24	0.36	1.53	0.29	2.17	1.12
27	Malkangiri	1.23	0.69	1.08	0.59	1.99	1.12
28	Deogarh	1.14	0.43	1.29	0.43	2.18	1.09
29	Nuapada	1.04	0.3	1.26	0.26	1.94	0.96
30	Sundargarh	1.02	0.55	0.98	0.32	1.54	0.88
	State Yield	1.32	1.04	1.59	0.76	2.27	1.4

Source: www.indiastat.com and Ministry of Agriculture, Government of India and Department of Agriculture, Government of Orissa.

Appendix 1.3: Trend in Yield of Rice in Orissa (yield in t/ha)

Sl. No.	Districts	1999-00 Yield	2000-01 Yield	Variation (in %)	2001-02 Yield	Variation (in %)	2002-03 Yield	Variation (in %)	2003-04 Yield	Variation (in %)
1	Angul	1.31	0.41	-68.70	1.64	300.00	0.39	-76.22	2.28	484.62
2	Balasore	1.01	1.56	54.46	1.76	12.82	0.95	-46.02	2.37	149.47
3	Bargarh	2.14	1.21	-43.46	1.96	61.98	1.27	-35.20	3.1	144.09
4	Bhadrak	0.73	1.47	101.37	1.93	31.29	1.25	-35.23	2.73	118.40
5	Bolangir	1.24	0.36	-70.97	1.53	325.00	0.29	-81.05	2.17	648.28
6	Baudh	1.48	0.53	-64.19	1.24	133.96	0.46	-62.90	2.71	489.13
7	Cuttack	0.65	1.21	86.15	1.67	38.02	1.15	-31.14	1.72	49.57
8	Deogarh	1.14	0.43	-62.28	1.29	200.00	0.43	-66.67	2.18	406.98
9	Dhenkanal	0.85	0.59	-30.59	1.85	213.56	0.48	-74.05	2.75	472.92
10	Gajapati	1.62	1.78	9.88	1.95	9.55	1.02	-47.69	2.41	136.27
11	Ganjam	0.76	1.21	59.21	2.16	78.51	0.87	-59.72	2.32	166.67
12	Jagatsingpur	0.36	1.34	272.22	1.71	27.61	1.18	-30.99	2.05	73.73
13	Jajpur	0.67	0.8	19.40	1.6	100.00	0.74	-53.75	1.91	158.11
14	Jharsuguda	1.65	0.4	-75.76	1.49	272.50	0.69	-53.69	2.72	294.20
15	Kalahandi	1.22	1.29	5.74	1.37	6.20	0.44	-67.88	1.96	345.45
16	Kandhamala	1.36	0.78	-42.65	1.51	93.59	0.78	-48.34	2.21	183.33
17	Kendrapara	0.53	1	88.68	1.44	44.00	0.92	-36.11	1.9	106.52
18	Keonjhar	0.81	1.04	28.40	1.33	27.88	0.51	-61.65	2.33	356.86
19	Khurda	0.79	1.54	94.94	1.49	-3.25	0.47	-68.46	2.09	344.68
20	Koraput	1.40	1.49	6.43	1.5	0.67	1.04	-30.67	2.38	128.85
21	Malkangiri	1.23	0.69	-43.90	1.08	56.52	0.59	-45.37	1.99	237.29
22	Mayurbhanj	1.16	1.16	0.00	1.53	31.90	0.81	-47.06	2.21	172.84
23	Nabarangpur	1.54	1.13	-26.62	1.27	12.39	0.54	-57.48	2.51	364.81
24	Nayagarh	0.71	1.15	61.97	1.63	41.74	0.61	-62.58	2.38	290.16
25	Nuapada	1.04	0.3	-71.15	1.26	320.00	0.26	-79.37	1.94	646.15
26	Puri	0.86	1.25	45.35	1.67	33.60	0.88	-47.31	1.83	107.95
27	Rayagada	1.52	1.05	-30.92	1.51	43.81	0.85	-43.71	2.66	212.94
28	Sambalpur	1.85	0.72	-61.08	1.83	154.17	1.12	-38.80	2.66	137.50
29	Sonepur	1.97	1.3	-34.01	1.87	43.85	1.04	-44.39	2.21	112.50
30	Sundargarh	1.02	0.55	-46.08	0.98	78.18	0.32	-67.35	1.54	381.25
	State Yield	1.32	1.04	-21.21	1.59	52.88	0.76	-52.20	2.27	198.68

Source: www.indiastat.com and Ministry of Agriculture, Government of India and Department of Agriculture, Government of Orissa.

Appendix 1.4: Research and Non-research Actors in Orissa Promoting or Interested in SRI

Governmental and Research Organisations

Sl. No.	Actors	Address	Remarks
1	Department of Agriculture and Food Production, GoO*	Bhubaneswar	Introduced SRI in Kharif-2007 through its officers.
2	Western Orissa Rural Livelihood Programme	Kousana, Kalahandi	Interested in SRI working with some agencies of the state.
3	Central Rice Research Institute*	Cuttack	Doing research on SRI since 2005. Official partner for Second National Symposium.
4	Orissa University of Agriculture Technology*	Bhubaneswar	Research trials since 2006.

Non-research Actors

Sl. No.	Actors	Address	Remarks
1	Professional Assistance for Development Action (PRADAN)*	Karanjia, Mayurbhanj	Extensive practice of SRI, the first to introduce SRI in Orissa.
2	Sambhav*	Rohibank, Nayagarh	Provides trainings on SRI. An important resource centre.
3	Sahabhagi Vikas Abhiyan* (SVA)	Bhubaneswar Field Office: Nuapada	Published Oriya of SRI manual. Supplies Mandava weeder in W. Orissa.
4	Pragati*	Pujariput, Koraput	Experiments on SRI with tribal farmers of Koraput district.
5	Manav Adhikar Seva Samiti (MASS)*	Sambalpur	Took to SRI after state workshop in 2007 Kharif.
6	Vasundhara*	Bhubaneswar	Promoting SRI in Nayagarh district.
7	Society for People's Awareness and Rural Development (SPARD)*	Niali, Cuttack	Independent access to SRI through organic farming networks. Impressed by seed saving possibilities.
8	United Artists Association	Ganjam	Introduced SRI with tribal farmers of Ganjam district.
9	Briksha O' Jeevan Bandhu Parishad (BOJBP)	Kesarpur, Nayagarh	Promoting SRI in Nayagarh district.
10	Regional Centre for Development Cooperation (RCDC)	Bhubaneswar	Published an Oriya booklet on SRI in 2006.
11	SOLAR	Konark, Puri	Started SRI in Puri district.
12	Pallishree	Jajpur	Started SRI in Jajpur district.
13	FARR	Muniguda, Rayagada	Interested to take up SRI.
14	WORD	Keonjhar	Interested to take up SRI.
15	CARR	Badamba, Cuttack	Interested to take up SRI.
16	VICALP	Berhampur Ganjam	Interested to take up SRI.
17	ISWO	Dhenkanal	Interested to take up SRI.
18	CYSD	Bhubaneswar	Interested to take up SRI.
19	Living Farms	Bhubaneswar	Wrote a brief on SRI after workshop.
20	Centre for Community Development (CCD)	Paralakhemundi, Gajapati	Interested to take up SRI.
21	Agragamee	Bhubaneswar	Interested yet to take up SRI.
22	RUPA	Dhenkanal	Interested to take up SRI.
23	Foundation for Ecological Security	Angul	Interested to take up SRI.
24	International Development Enterprises (India)	Bhubaneswar	Has taken up SRI in parts, keen to expand profile.

Other Supporting Agencies

Sl. No.	Actors	Address	
1	Centre for World Solidarity – Orissa Resource Centre*	Bhubaneswar	Supporting promotion of SRI in Orissa with its partner organisations.
2	Xavier Institute of Management*	Bhubaneswar	Facilitating a learning alliance.
3	Oxfam (India) Trust*	Kolkata	Supporting promotion of SRI in Orissa.
4	WWF	Hyderabad	Extends support for promotion of SRI.

(The last four mentioned supporting agencies partnered with the Department of Agriculture, Government of Orissa in conducting the State Level workshop)

* Contributors to the current volume.

Dr. Arvind Padhee
Director, Department of Agriculture

System of Rice Intensification in Orissa: A Bird's Eye View

Orissa is the tenth largest and eleventh most populous state in the country accounting for 5% of the geographical area and 4% of the population of the country. The state has a geographical area of 1.56 lakh sq. km and a population of 3.68 crores as per 2001 census, out of which SC & ST constitute 17% and 22% of total population respectively. 85% of the population lives in rural areas and 47% are below poverty line. Cultivators and agricultural labourers constitute 65% of the total work force. Agriculture contributes 26% of the Net State Domestic Product. Thus, Orissa is predominantly an agricultural state.

Some Features of Agriculture in Orissa

Land and Soil

The state has a cultivated area of 62 lakh ha, out of which 27 lakh ha is high land, 19 lakh ha medium land and 16-lakh ha low land. The state is broadly divided into four physiographic zones namely Coastal Plains, Central Table Land, Northern Plateau and Eastern Ghats. They are further sub-divided into 10 Agro-climatic Zones. The soil types differ widely from highly acidic to slightly alkaline and from light sandy to stiff clays. Further about 4 lakh ha to flooding and 0.75 lakh ha to water logging, particularly in the deltaic areas.

Land Use

The per capita availability of cultivated land was 0.39 ha in 1950-51, which has declined to 0.13 ha in 2006-07. According to agricultural census 1995-96 there are 39.66 lakh operational holdings in the state out of which marginal and semi-medium holdings account for 78.5%, medium 16.8% and large only 4.7% of the operational area. In this backdrop, increase in productivity per unit land area and cropping intensity hold the key to agricultural development.

Climate

The state has tropical climate, characterised by high temperature, high humidity, and medium to high rainfall with short and mild winter. The normal rainfall of the state is 1451.2 mm, about 80% of which is received between June and September. Even though quantum of rainfall is so high its uneven & erratic distribution during monsoon makes agriculture often unsecured. Moreover, natural calamities like flood, drought and cyclones frequently occurring in the state either alone or in combination also severely affects crop production. The available information reveals that while flood & cyclones occur almost every year with varying intensity, drought conditions are experienced once in every three to four years. A study of meteorological scenario over a period from 1964 to 2001 shows that there were only 12 normal years out of these 37 (roughly 1:3).

Rice is the principal food crop occupying about 45 lakh ha. The Kharif paddy area is 42-lakh ha, which consists of 8.5

Table 2.1: Production and productivity of Kharif and Rabi rice

Year	Area in Lakh Hect.			Prodn. in Lakh Tonnes			Productivity in kg/ha		
	Kharif	Rabi	Total	Kharif	Rabi	Total	Kharif	Rabi	Total
2002-03	40.9	1.8	42.7	28.2	4.2	32.4	690	2352	759
2003-04	42.5	2.5	45.0	62.0	5.3	67.3	1459	2112	1496
2004-05	42.0	2.9	44.9	58.8	6.5	65.3	1401	2230	1455
2005-06	41.5	3.3	44.8	62.5	7.1	69.6	1504	2193	1554
2006-07	41.80	3.00	44.8	62.44	7.50	69.94	1491	2500	1559
2007-08(P)	37.40	3.00	40.40	77.42	7.84	85.26	2070	2603	2110

Table 2.2: Rice productivity zones

Sl. No.	Productivity Zone	Productivity Range in kg/ha	No. of Blocks Constituting the Zone	Name of the Districts
1	Low	< 1554	198	Deogarh, Angul, Bolangir, Baudh, Gajapati, Ganjam, Kalahandi, Kandhamal, Keonjhar, Koraput, Malkangiri, Mayurbhanj, Nuapada, Nabarangpur, Rayagada, Sundergarh
2	Medium	1555-2077	78	Balasore, Dhenkanal, Jharsuguda, Puri, Jajpur, Kendrapara Khurda, Nayagarh
3	High	> 2078	38	Bhadrak, Bargarh, Jagatsingpur, Sambalpur, Cuttack, Sonepur

lakh ha of high land, 18 lakh ha of medium and 15.5 lakh ha of low land. The entire Rabi area of 3 lakh ha is irrigated and covered by high yielding paddy whereas only 36% of Kharif paddy area is under irrigation. The yield rate of rice is 1.6 t/ha as against national average of 2.1 t/ha.

Basing on the productivity of rice the state can broadly be divided into three productivity zones as follows.

Strategies to Increase Productivity in Orissa

Given below are some details on zone wise strategies that are being tried out to increase rice productivity in Orissa.

Low Productivity Zone

Emphasis will be given on following measures in medium land rice eco-system.

1. Seed replacement at the rate of 10% yearly
2. Fertiliser Consumption should be increased to 40 kg. per ha.
3. Effective utilisation of water resources like minor flow, minor lift, WHS, dug wells, private LIs, river LIs and other perennial resources for live saving irrigation.
4. Timely Credit flow.
5. To bridge the gap between actual yield and potential yield the extension support should be strengthened.
6. In each GP minimum 50 ha. Compact area programme will be taken up for proper input management to increase the yield in 16 low productivity districts.

Medium Productivity Zone

1. Seed replacement at the rate of 10% yearly.
2. Fertiliser consumption should be increased to an average 75Kg per ha.
3. Integrated water management is to be followed.
4. In each GP minimum 100 ha. Compact area programme will be taken up for proper input management to increase the yield in eight medium productivity districts.

High Productivity Zone

1. Seed replacement at the rate of 10% yearly.
2. Fertiliser Consumption should be increased to 100 kg per ha.
3. Crop Intensification and Mechanised Farming is to be adopted.
4. Proper Drainage Management.
5. Substituting more area under Hybrid Rice.

Beside this the other alternatives to increase the rice yield are substituting more area under Hybrid Rice, *practicing SRI Method,* and varietal substitution in problematic areas of high soil salinity and waterlogged areas.

What is SRI?

The System of Rice Intensification (SRI) was developed at Madagascar almost 20 years ago by Fr. Henri de Laulanie, S. J. and subsequently popularised there by an NGO, Association Tefy Saina (ATS). It is a "system" rather than a technology because it is not a fixed set of practices. SRI involves a number of specific techniques that are always to be tested and adopted accordingly. The package of practices followed is the one in which synergistic interactions can produce much higher grain yields than usually achieved by conventional practices with new varieties/hybrids and external inputs. SRI is being practised in our neighbouring state Andhra Pradesh successfully. By adopting this technology the farmers of AP harvested more from a unit area as compared to the conventional method. Keeping this view, to popularise this technology among the farmers of Orissa, it is proposed to conduct demonstration (1 Acre each, @ Rs. 6500/- per acre) in SRI on pilot basis.

The combination of plant, soil, water, and nutrient management practices that are used in SRI promotes:
(a) measurably greater root growth
(b) more number of tillers
(c) greater grain filling, higher grain yield.

The main focus in SRI is the water saving potential i.e. more grain yield per drop of water. Little water is used in SRI so that during plant growth, the soil remains well drained and reasonably aerated while still meeting the plant's water requirements. During reproductive phase that follows a thin layer of water (1-3 cm) is kept standing in the field.

There are six main basic principles in which SRI stands. They are:
(a) Early transplanting
(b) Careful transplanting
(c) Wide Spacing
(d) Weeding and aeration
(e) Water management
(f) Use of organics.

Early Transplanting: Transplant young seedlings of 10-12 days in nursery.

Careful Transplanting: Life seedling with seed, roots and soils from the nursery and transplant one plant per hill within 15-30 minutes without plunging the plant in the mud ensuring the roots end not turning upwards.

Wide Spacing: Give a spacing of 25X25 cm. or 30X30 cm. to provide adequate space for roots for facilitating nutrient uptake including micro nutrients from a wider soil area, with more space for the predators to move around facilitating biological control of pests. By this we can accommodate only 16 plants/m^2 and the seed required is only 5 kg/ha.

Weeding & Aeration: Use a hand push weeder (Mandava weeder or cono weeder) 3-4 times to uproot and incorporate the weeds into soil and to increase soil aeration.

Water Management: No standing water during growth period, intermittent wetting and drying until panicle initiation is required. After panicle initiation 1-3 cm. of water is kept for about three weeks. About 50% less water is adequate.

Table 2.3: Comparison between conventional and SRI method of cultivation

Practices	Conventional Method	SRI Cultivation
Seed rate/acre	20 kg.	2 kg.
Nursery area/acre	10 cents	1 cent
Nursery raising	Flat beds	Raised bed-dry nursery
Age of the nursery at transplantation	21-30 days	8-10 days
Stage of the crop at the time of transplanting	5 or more leaves	Only 2 leaves
Spacing	Random	30x30 cm, 16 hills/sq.mt
Condition of the main field at the time of transplanting	Flooded with water	Perfectly levelled with sticky muddy condition
Transfer of nursery	Nursery is pulled, made into small bundles and transferred at one time	Seedlings are lifted from underneath soil gently and transferred as and when required
Method of transplanting	Deep and random	Shallow- to be planted along with seed and attached soil at required spacing
No. of plants per hill	2-3	Single
Channels	Not required within the field	Required all along the field to drain out excess water
Inter-cultivation	Application of weedicide and manual weeding as per requirement	No weedicide application. Repeated inter cultivation through rotary weeder and line weeding
Water management	2-3 cm. water level is maintained	Intermittent weeding and drying for aeration. A thin film of water is maintained from primordial initiation stage to physiological maturity.
Root development	Less and shallow	Profuse and deep
Pest and disease incidence	More	Less
Availability of organic matter	Less	More

Use of Organic/Compost: Use straw, green manure and animal manure to enrich the organic content of the soil for promoting populations of earthworms, micro-organisms and to facilitate nutrient availability. Use reduced amounts (<50%) of chemical fertiliser assessing the requirement.

The Reason for Success in SRI

- Planting of young seedlings prolongs the vegetative growth period of the variety and facilitates the production of maximum number of tillers under aerobic condition.
- Mechanical weeding with cono weeder facilitates soil mulching, fresh growth of root system and incorporation of weeds.
- Improvement in the activity of the beneficial microbes in the root zone due to aerobic situation.
- Maximum utilisation of available carbon.
- Proper utilisation of fertilisers, which will otherwise be leached out due to excess water under traditional method of cultivation.

Advantages of SRI Method of Cultivation

- Higher yields
- Reduced duration (7-10 days)
- Low incidence of pests and disease due to lustrous and healthy growth of the crop
- SRI method is a boon to the production of Breeder/ Foundation/ certified seed
- Farmers can produce their own seed easily by ensuring quality
- Rouging is very easy and 100% genetic purity can be maintained
- Better utilisation of fertilisers
- Less water requirement
- Soil structure improves through microbial activity
- Low seed rate @ 2 kg/acre
- 8-12 days old nursery is used for planting; hence the farmers can take up sowing even after receipt of rains
- Mechanical weeding with cono weeder facilitates the incorporation of green matter into the soil
- Better utilisation of solar energy resulting in higher number of grains per panicle.

Plan for Popularisation of SRI by DoA

1. The DoA plans to conduct 20 demonstration-cum-training of farmers in SRI in coming Rabi 2008 in different agro climatic zones of the state to measure its adoptability. In each demonstration programme ten farmers are to be trained in five phases starting from nursery preparation to harvesting. During this training period the trainee farmers are to organise demonstration (0.5 acre) in their own field by associating ten other farmers from their localities. An incentives of Rs.1000/- is to be given to each trainee farmer for organising the demonstration programme.

2. Training of Trainers for SRI
   Eighty Agriculture officers are to be trained on SRI in four batches. The resource personnel from CRRI/ OUAT/XIM / IMAGE will impart the training programme. After successful completion of the training the trained Agriculture Officers will impart training to the farmers and also guide them for organising demonstration programmes.

3. ATMA Programme
   During 2007-08 Rabi under ATMA, it is decided to organise one acre demonstration on SRI in villages under major/ Medium/ Minor/ Lift Irrigation ayacut.

4. A workshop on Orissa State Dialogue on SRI was organised by the XIM, Bhubaneswar on 23rd June at IMAGE, Conference hall with four other partners including DoA. 25 officers participated in the workshop.

5. In departmental pre-seasonal orientation training to extension officer for Kharif 2007-08, resource personnel of OUAT, XIM, CRRI shared and expressed their research experience on SRI to 150 officers.

6. A few officers have undergone training on SRI at DRR, Hyderabad.

Sharing and Experience on SRI

SRI status in Orissa is now in embryonic stage. In some pockets of the inland districts it is slowly gaining popularity. Presented below are the preliminary efforts of the Government of Orissa to collect information on SRI in Orissa. The information has been collected by the respective agriculture region officials.

SRI Farmer Database in Orissa: A Preliminary Assessment[13]

SRI farmers in 2007 Kharif of DDA Keonjhar range

Sl. No.	Name of the Village	No. of families taking up SRI	Area Covered (ha)
1	Baliaposi	83	16.40
2	Purandarpur	12	2.40
3	Padmapur	30	6.00
4	Nuagaon	16	3.20
5	Ninhua	10	2.00
6	Dhanuriaypur	10	2.00
7	Bhrungarajposi	25	5.00
	Total	186	37.00

SRI farmers in 2007 Kharif in Karanjia agriculture district

Name of the AAO/ JAO Circle	Name of the G.P.	No. of Village	No. of SRI Farmers	SRI Area in Ac.
Karanjia	Patbil	4	30	7.5
	Kuliposi	6	25	6.5
	Rasamtala	3	3	0.8
	Bad Deuli	1	2	0.5
	Kerkera	10	40	10.0
	ChitarPosi	1	2	0.5
Total		25	102	25.8
Tato	Miraraginandi	4	20	5.0
	Badagaon	2	18	4.5
	Batpalasa	2	10	2.5
	Tato	1	12	3.0
	Dari	2	14	3.5
	Bala	3	4	1.0
Total		64	282	71.0
Jashipur	Tangabilla	1	5	1.3
	Ektali	3	16	4.0
	Pantho	3	11	2.8
	Rugudi	3	32	8.0
	Maudi	2	16	4.0

PRADAN is the implementation partner in all this area working closely with the agriculture department.

[13] Following the workshop in June 2007 the organisers felt that there was a need for developing a farmers database for the state of Orissa and all the participants were given a format to help build up this database. The tables that follow are due to the commendable efforts of the DoA to consolidate the department's information base on SRI in the region. A few entries in the tables contain contact information as well but have not been included here.

SRI Farmers in Panposh, Sundargargh district (DAO Panposh)

Sl. No.	Name of the AAO/JAO Circle	Name of the Farmer/ Organisation	Address	Land Holding (in Ac.)	Total Paddy Area (in Ac.)	SRI Area (in Ac.)
1	**Bisra**	Goutam Mohato	Purna Bisra, PO: Bisra	3.00	3.00	0.35
2		Etwa Ekka	At/PO: Kapatmunda	4.50	4.00	0.35
3		Rukmani Mohato	R.S. Colony, Bandamunda	3.00	2.50	0.35
4		Kamal Ku. Panda	Jabaghat, Jhirpani	4.50	4.00	0.40
5		Birua Oram	At/PO: Jagda	2.00	2.00	0.35
6		Padman Singh	At/PO: Jhirpani	2.50	2.50	0.35
7		Kishor Lohar	Prograbahal, Santoshpur	3.00	2.50	0.35
8	**Dhatkidihi**	Ganeswar Mundary	Bangurkela, Udusu	2.50	2.00	0.35
9		Mahiram Gope	Sanbambua,Theteiposh	3.00	3.00	0.35
10		Iswar Ch. Mohato	Mahipani, Bhalulata	3.60	3.00	0.35
11		Sashi Bhumij	Bhumijtola, Dareikela	2.40	2.00	0.35
12		Abhimanyu Sartia	Barsuan, Manko	3.50	3.00	0.35
13		Trilochan Bhumij	Kokeroma, Manko	3.60	3.20	0.35
14		B.B. Mahato	Thatidihi, Jareikela	3.00	2.50	0.35
15		Jayaram Mahato	Badabambua,	3.50	3.00	0.30
16		Bisu Mahato	Barasuan, Manko	4.50	4.00	1.00
17		Rohidas Mahato	Barasuan, Manko	4.50	4.00	1.00
18	**Lathikata**	Triloknath Singh	At/PO: Lathikata	4.50	4.00	1.00
19		Lalmohan Puran	At/PO: Suidihi	3.00	3.00	0.35
20		Dhadu Binjia	At/PO: Ramjodi	3.00	3.00	0.35
21		Raghunath Singh	Mundajore, Ramjodi	3.00	3.00	0.50
22		Kalicharan Singh	Kanear, Jalda	5.00	5.00	0.35
23		Krushna Ch. Pasayat	At/PO: Jalda	3.50	3.50	0.40
24		Birsa Oram	At/PO: Jalda	5.00	5.00	2.00
25	**Kalunga**	Pruthiraj Samal	At/PO: Jhartarang	5.00	5.00	3.00
26		Sukhlal Kisan	Kilinga, Katunga	5.00	5.00	0.35
27		Ghanasyam Masanta	At/PO: Beldihi	2.00	2.00	0.35
28		Gopal Majhi	At/PO: Balanda	5.00	5.00	0.35
29		Tukundar Kisan	At/PO: Garjan	4.00	4.00	0.85
30		Birsa Kerketa	Khairbandha, Rantobirkera	4.00	4.00	0.35
31		Baruna Naika	Arbajharabahal, Jodakudar	3.00	3.00	0.35
32		Etua Sahu	At/PO:Tainsar	5.00	5.00	0.40
33		Kalicharan Singh	At/PO: Birda	5.00	5.00	0.35
34		Pareu Oram	At/PO: Baddlki	4.00	4.00	0.35
35	**Nuagaon**	Francis Ekka	Ghodabandha, Limida	4.00	4.00	0.35
36		Dillip Kumar Goala	Katepur, Sorda	3.00	3.00	0.40
37		Samar oram	FuljharTetekela	4.00	4.00	0.50
38		Bijaya Pradhan	Sanjojada,Tainda	3.50	3.00	0.35
39		Birsa Kujur	Jhanatoli, Sorada	4.50	3.00	0.35
40		Surendra Sahoo	Garda, Bagdega	4.00	3.00	0.40

Sl. No.	Name of the AAO/JAO Circle	Name of the Farmer/ Organisation	Address	Land Holding (in Ac.)	Total Paddy Area (in Ac.)	SRI Area (in Ac.)
41		Anil Dharwar	Urmer	4.50	4.00	0.50
42		Prasanna K Kujur	Balipeta	3.50	3.00	0.35
43		Sama Minz	Khuntagaon	4.00	3.00	0.50
44		Sanika Tirky	Sajuadi, Nuagaon	4.00	4.00	0.35
45		Ganesh Sahu	Gopapur, Nuagaon	4.50	3.00	0.40
46		Siba Sahu	Gopapur, Nuagaon	4.00	3.50	2.00
47	**Hatibari**	Raj Kumar Pradhan	Bhogia, Kandarkela	3.00	2.00	0.55
48		Minaketan Sahu	Bareiguda, Ankurpalli	4.00	3.00	0.40
49		Kihirod Ku. Mirda	At/PO: Kardega	3.50	3.00	0.35
50		Nabin Ku. Horro	Jamdhara, Hatibari	4.00	3.50	0.35
51		Bhojeswar Singh	Bhojpur, Purunapani	4.50	3.00	0.50
52		Benudhar Rana	Baidyanathpur, Hatibari	3.50	3.40	0.30
53		Bholeswar Singh	Junapahad, Pokerama	3.00	2.00	0.35
54		Sabam Dang	Menmera, Pokerama	3.50	3.00	0.35
55		Falindra Singh	Purunapani	3.00	2.00	0.40
56	**Kuarmunda**	Purna Ch. Majhi	Lakkhotola, Kuarmunda	4.5	3.50	2.00
57		Mandal Oram	Chandiposh, Kuarmunda	3.00	3.00	0.35
58		Jharana Kujur	Dumerjore	2.50	2.00	0.35
59		Bharat Rout	Sankaria, Sinha	2.50	2.00	0.55
60		Ajit Bera	Kachur	2.50	2.00	0.35
61		Sarat Kalo	Tangarani, Kachur	3.00	2.40	0.40
62		Jaiprakash Nanda	Kukundabahal	3.50	3.00	0.35
63		Uddhaba Ranga	Putrikhaman	4.00	3.50	0.35
64		Bimal Bhagat	Rajchapal, Kumjharia	4.50	4.00	0.35
65	**Raiboga**	Phimus Bahal	Raiboga	4.00	4.00	0.35
66		Jidan Modka	Progaposh, Pratappur	4.50	4.00	0.35
67		Ajit Soy	Jaingabira	3.00	2.50	0.35
68		Prafulla Girdhi	Andali	3.00	3.00	0.35
69		Indocent Kujur	Salanga Bahala	2.50	2.00	0.35
70		Jagabandhu Sahu	Dalki	4.00	3.00	0.35
71		Powal Xess	Kadobahal	4.50	4.00	0.35
72		Bhagirathi Sahu	Andhari, Biramitrapur	3.50	3.00	0.35
73		Aswani Sekhar S.Deo	Jharabedha, Jumur	4.00	4.00	0.35
74		Sunil Bage	Gopapur, Jhumur	3.00	2.50	0.35
75		Jugal K. Das	Majhapada, Salangabahal	3.50	3.00	0.35
			Average or Total	**3.66**	**244.5**	**107.1**

SRI farmers information base in Ganjam, (DDA Ganjam, Berhmapur)

Sl. No.	Name of the DAO/ ADAO Circle	Name of Village	Block	Name of the AAO/JAO	Name of the Farmer/ Organisation	Land-holding (in ac)	Total Paddy Area (in ac.)	SRI Area (in ac.)	Where from Heard about SRI
1	DAO, Chatrapur	Makarjhal	Chatrapur	Chatrapur	D. Narayanan	8.00	6.00	2.00	Agril Department
2	DAO, Chatrapur	Baranga	Chatrapur	Chatrapur	Simanchal Nahak	4.00	4.00	0.50	Agril Department
3	DAO, Chatrapur	Madhurchuan	Ganjam	Ganjam	Pradeep Dalabehera	3.00	2.00	0.20	Agril Department
4	DAO, Chatrapur	Madhurchuan	Ganjam	Ganjam	Mochiram Nahak	3.00	2.00	0.30	Agril Department
5	DAO, Chatrapur	Madhurchuan	Ganjam	Ganjam	Susanta Kumar Nahak	3.00	2.00	0.30	Agril Department
6	ADAO, Bhanjanagar	Dumchuan	Bhanjanagar	Bhanjanagar	Sripati Ram	10.00	10.00	4.00	KVK, Bhanjanagar
7	ADAO, Bhanjanagar	Tanarda	Belaguntha	Belaguntha	Bibhu Prasad Pathy	6.00	5.00	0.50	KVK, Bhanjanagar
8	ADAO, Bhanjanagar	Cihapadal	Bhanjanagar	Bhanjanagar	Birendra Nayak	8.00	7.00	0.50	KVK, Bhanjanagar
9	DAO, Berhampur	Dokhali	Digapahandi	Digapahandi	Bijaya ku. Pradhan	6.00	6.00	0.50	Agril Department
					Total	**51.00**	**44.00**	**8.80**	

SRI farmers of Sambalpur agricultural district (motivated by agriculture department)

Sl. No.	Name of the DAO/ ADAO Circle	Name of the AAO/JAO Circle	Name of the Farmer/ Organisation	Address	Land Holding (in Ac.)	Total Paddy Area (in Ac.)	SRI Area (in Ac.)	SRI History
1	Sambalpur	Dhankauda	Natu Bihari Biswal	Dengimocha Garamunda Dhankauda	14	13.5	0.75	1st time
2	Sambalpur	Sindurpank	Prafulla Moharana	Vill-Kalami Murha, Maneswar	10	8	0.5	1st time
3	Sambalpur	Sindurpank	Trinath Pradhan	Themera Maneswar	8.9	8	0.5	1st time
					32.9	**29.5**	**1.75**	

SRI farmers, Bargargh agricultural district

Sl. No.	Name of the DAO/ ADAO Circle	Name of the AAO/JAO Circle	Name of the Farmer/ Organisation	Address	Land-holding (in Ac.)	Total Paddy Area (in Ac.)	SRI Area (in Ac.)	SRI History
1	Bargarh	Sarasora	Ranjana Biswal	Balijori	15	10	1	1st time
2	Bargarh	Bargarh	Netranada Ratha	Haladipali	25	20	0.5	1st time
3	Kuchinda	Bhojpur	Sudhir Rana	KatangaPani	3	1	3	1st time
				Total	43	31	4.5	

SRI farmers of DDA Jeypore, Koraput range

Sl. No.	Name of the DAO/ ADAO Circle	Name of the AAO/JAO Circle	Name of the Farmer/ Organisation	Address	Land-holding (in Ac.)	Total Paddy Area (in Ac.)	SRI Area (in Ac.)	SRI History
1	Jeypore	Jeypore	Praffula Ku Sahu	Bamunigaon, Tankua,	32.00	32.00	2.00	1st time

SRI farmer-wise information, Baripada Agril district (Mayurbhanj district)

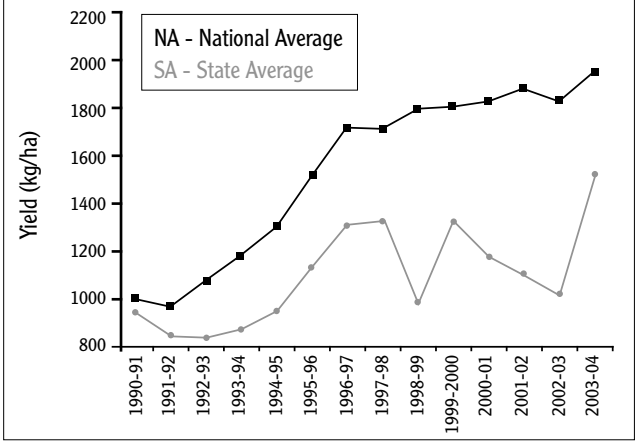
Sl. No.	Name of the DAO/ ADAO Circle	Name of the AAO/JAO Circle	Name of the Farmer/ Organisation	Address	Land-holding (in Ac.)	Total Paddy Area (in Ac.)	SRI Area (in Ac.)	SRI History	Remarks
1	Baripada	Shyamakhunta	Chitreswar Behera	Sivajambani, PO: Shyamakhunta	3	3	3	Growing since last two years	Yield-74Q/ha
2	Baripada	Shyamakhunta	Bhaskara Jena	Sivajambani, PO: Shyamakhunta	5	5	1	Growing since last one years	Yield-48Q/ha
3	Baripada	Shyamakhunta	Nabin Ch. Mahanta	Bholagadia, Balidhia	5	5	0.5	1st time (Hybrid)	Motivated By Agril dept.
4	Baripada	Shyamakhunta	Panchanan Behera	Sivajambani, PO: Shyamakhunta	3	3	1.5	1st time (Hybrid)	Motivated By Agril dept.
5	Baripada	Shyamakhunta	Ram Ranjan Mohapatra	Ambasikida, Sirisabani	120	120	8.5	Growing since last two years	Yield-72Q/ha
6	ADAO, Betanati	AAO Betanati	Kamala Kumar Jena	Bahanada, Betanati	5	5	1	1st time	Yield-60Q/ha
7	ADAO, Betanati	AAO Badasahi	Lokanath Chodhury	Belam	8	8	1	Growing since last two years	Yield 55.40Q/ha
8	ADAO, Betanati	AAO Badasahi	Pravash Ch. Satpathy	ABC pur, Belam	3	13	2	Growing since last three years	Yield-69.20Q/ha
				Total	**152**	**162**	**18.5**		

P. K. Roul and D. Mishra[14]

System of Rice Intensification (SRI) in OUAT

In Orissa food and agriculture, to a considerable extent means growing rice. Rice covers more than 70% of cultivated area and is the major cereal crop covering about 63% of the total area under food grains. Rice in Orissa is grown over an area of 4.5 million hectares and accounts for 91% of the area under cereals and contributes about 93% of total cereal production in the state. As rice is the staple food of almost entire population in Orissa, the state economy is directly linked with the improvement in production and productivity of rice in the state.

Fig. 3.1: Rice productivity



The enhanced productivity levels has to come from declining and degrading resource base in terms of land, water and other inputs and through use of more and more chemical fertilisers, more irrigation and more pesticides that have adverse impact on soil health/quality and on its productivity.

Table 3.1: Contribution of varieties and agronomic measures to rice yield

Evolution of Varieties	% Increase in Yield	Agronomic Measures	% Contribution to Yield
Local variety	-	Quality seeds	13.5
HYVs	12-15	Planting geometry	13.5
Hybrid	20	Fertiliser management	39.4
Bt rice	20-28		
Super rice	35		

[14] The authors are from the Department of Agronomy, College of Agriculture, Orissa University of Agriculture and Technology (OUAT), Bhubaneswar-751 003.

The farmers, especially those who are resource-poor, are losing interest in rice cultivation as its profitability is declining with increase in input cost. At this juncture, System of Rice Intensification appears as a ray of hope and a viable alternative to conventional method of rice cultivation that claims to save the expensive inputs, improves soil health/quality and protects the environment substantially.

What is SRI?

SRI is an acronym for System of Rice Intensification. This was originated in Madagascar and was first synthesised in 1983 by Fr. Henri de Laulanie, a French Jesuit priest. Under the drought conditions of that year, the farmers of the region surprisingly got 7-15 t/ha of paddy yield by transplanting very young seedlings of only 15 days old in soils with low inherent fertility, using much reduced irrigation and no mineral fertilisers or other agricultural chemicals.

SRI is a sort of management method that raises productivity of land, labour and capital. Research has demonstrated that SRI is a model of sustainable agriculture that reduces inputs, conserves water, improves soil structure and increases yield. It mainly emphasises on careful transplanting of younger seedling at a wider spacing, which ensures more root growth and profuse tillering.

There are three basic principles in SRI. They are to be followed with adjustment in agronomic practices. These include: (i) Transplanting the juvenile seedlings (10-12 days old) at second phyllochron (2 leaf) stage. This preserves the potential of the plant for tillering and root growth, which would have been reduced with aged seedlings. Careful transplanting of young seedlings facilitates uninterrupted growth process. (ii) Wider spacing at 25X25 cm – with a single plant per hill in a square pattern. This provides the scope for profuse growth of tiller and root. (iii) Keeping the soil both moist and aerated so that roots have access to both oxygen and water. Under hypoxic situation plant roots degenerate and about 70-80% roots become non-functional by the time of primordial initiation. Thus under aerobic conditions the root growth is profuse and prolonged as compared to submerged situation.

People Differ on SRI and so do We....

• Go for SRI	• Modify SRI	• SRI is a fallacy
• SRI gives higher yield	• Apply inorganic fertilisers	• Yield is not more than conventional method
• It maintains soil fertility	• Reduce spacing	• Scientists have not tested
• It saves water and labour	• Practise only during Rabi season	• Results from farmers, field are erratic
• Other states have adopted it successfully		

What is our role now? *There is need for field experimentations and on- farm testing*

Materials and Methods

Field experiment was conducted during summer season of 2006-07 to evaluate the performance of rice cultivar-PHB-71 (120 days duration) under SRI method of cultivation. The treatments included:

T_1: Twelve days old seedlings transplanted on beds at a spacing of 25 cm. X 25 cm. with organic sources of nutrition.

T_2: Twelve days old seedlings at spacing of 20 cm. X 20 cm. with organic nutrition.

T_3: Twelve days old seedlings at a spacing of 25 cm. X 25 cm. with inorganic sources of nutrition.

T_4: Twelve days old seedlings at a spacing of 20 cm. X 20 cm. with inorganic sources of nutrition.

T_5: Conventional method of growing rice with 25 days old seedlings spaced 20 cm. X 15 cm.

The organic sources of nutrition comprise of application of 20 t FYM (Farm Yard Manure) +1t Vermi compost +0.25t Neem cake/ha, the inorganic sources include application of chemical fertilisers @ 120:60:60 kg. N: P_2O_5: K_2O/ha and in case of conventional rice chemical fertilisers @ 120:60:60 kg. N: P_2O_5: K_2O /ha was also applied. The experiment was conducted in a randomised block design with four replications.

Results and Discussion

The observations on ear bearing tillers (EBT), length of panicle and grain yield revealed significant variations among the treatments (Table 3.2). In case of all these parameters 12 days old seedlings planted on beds, irrespective of their sources of nutrition performed better than conventional planting with 25 days old seedlings. The highest number of EBT was noted in 12 days old seedlings transplanted on beds at a spacing of 25 cm. X 25 cm. with inorganic sources of nutrition (T_3) but the panicle length and grain yield were highest in 12 days old seedlings transplanted on beds at a spacing of 20 cm. X 20 cm. with inorganic sources of nutrition (T_4). However, the difference between T_3 and T_4 were non-significant for panicle length and grain yield. Relatively low performance under organic sources of nutrition as compared to inorganic could be possibly due to immobilisation and fixation of available soil nutrients during a short period of crop cycle. However, continuous organic nutrition over seasons may overcome such effects in subsequent seasons. The study indicated higher yield with wider spacing (25 cm. X 25 cm.) under organic sources of nutrition but with inorganic sources of nutrition closer spacing (20 cm. X 20 cm.) performed better. This could be due to the differential nutrient availability in soil with organic and inorganic sources of nutrition.

The study infers superior performance of rice seedlings planted at 12 days stage on raised bed as compared to conventional method of planting. But this needs to be further verified with respect to seasons and varieties.

Table 3.2: Effect of organic and inorganic sources of nutrition on yield components and yield of rice at various spacing

Treatment No.	Ear Bearing Tillers (No.)	Panicle Length (cm)	Grain Yield (q/ha)
T_1	11.8	24.0	56.43
T_2	8.4	25.1	51.91
T_3	14.7	24.7	58.29
T_4	10.8	25.3	59.45
T_5	5.9	20.5	47.00
C.D. (0.05)	0.9	2.4	4.32

Constraints

There are some limitations on practicing SRI. The most important one is the need of having good water control to get best results. It is possible to save water and make

the soil aerated so as to get the benefits, only if farmers keep the soil saturated followed by hairline crack drying alternatively, avoiding flooding. In real field situation our farmers practice field-to-field system of irrigation. Thus there is need to improve water control by sacrificing a little land area for field channels.

Initially SRI method requires more of labour. Even the markings that were done at 25 cm. X 25 cm. or 20 cm. X 20 cm. spacing for planting were done manually with the help of planting ropes. Use of roller markers or wooden markers will reduce the cost. Further, transplanting tiny seedlings at very tender stage also appears labour consuming but as our experience goes this is more a practice that gets transformed to habit. After completion of transplanting in our SRI plots when the labourers resumed back to their conventional planting techniques in other plots we have observed them facing inconvenience in planting multiple seedlings. Thus for SRI there is need for motivation and skill. When the farmers will be convinced about the yield advantages, become more conscious, knowledgeable and confident, all these factors will be overcome.

Prospects of SRI in Orissa

From rice production point of view, the state of Orissa can be broadly divided into two physiographic regions i.e., the Coastal plains and the Plateau region. The agro ecological opportunities as well as constraints for rice production vary widely between these two regions. The coastal plains suffer from drainage congestion and water stagnation, whereas in the plateau region, undulations of topography lead to well drained situation and sometimes suffers from water scarcity due to surface runoff. Thus in Kharif season there is greater opportunities of SRI in inland region.

The above facts indicate a bright prospect of SRI in Orissa. However, it needs to be evaluated further and refined to suit to the local environments before widespread adoption.

A Ghosh[15], K.S. Rao[16], M.P. Pandey and A. Poonam[15]
Central Rice Research Institute

System of Rice Intensification – A Holistic Management Towards Enhancing Rice Production in Future

The concept of system of rice intensification (SRI) dates back to late 1980 when Father Laulanie, a French Jesuit priest synthesised a system of improved rice crop management in Madagascar. Seemingly this system could enable the farmers to harness magnificently, as has been proclaimed, compared with that produced under conventional system. However since recent past there is lots of hue and cry, both in favour and disfavour of this apparently new concept of rice crop management. The proponents proclaim its high and sustainable yield while detractors criticise it as a gimmick having no scientific base.

This article analyses the merits and demerits of SRI critically, and also narrates the methodology taking into account of the research information generated in the Central Rice Research Institute, Cuttack. Thus, it could help farmers, rice researchers and other enterprises & agencies involved in rice cultivation to crystallise their future strategies for boosting rice production.

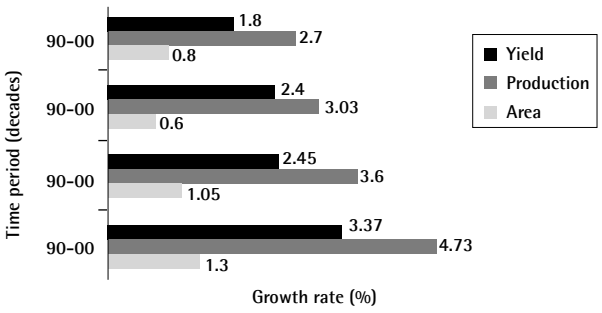
What is SRI?

There are many reported statements defining SRI. A comprehensive definition could be that it is a holistic agro-ecological crop management technique seeking alternatives to the conventional high-input oriented agriculture, through effective integration of crop-soil-water-continuum.

Rice area of 36.44 million hectare on the eve of green revolution period (1967-68) increased to 45.16 million hectares in 1999-00 and again has declined to 43.70 million hectares in 2006-07 (Fig. 1). The production of 37.61 m tons on the eve of green revolution period (1967-68) increased to 93.34 m tons in 2001-02 and 91.05 m tons in 2006.

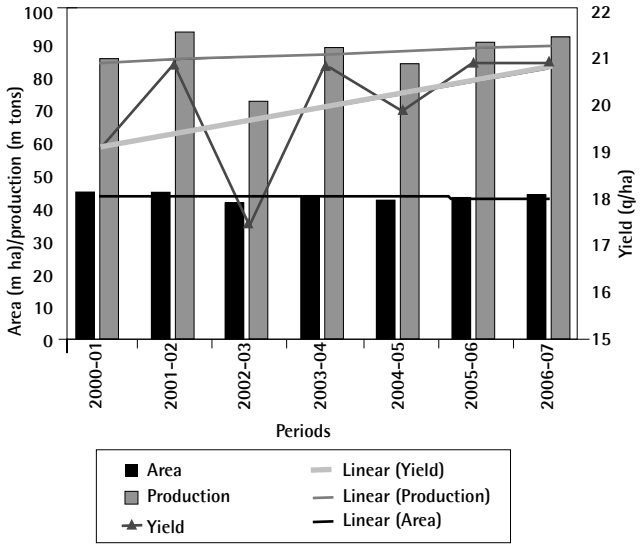
Despite the 'pillar to post' efforts, the Compound Annual Growth Rate (CAGR) of the productivity has declined from 3.25% in 80s to only 1.54% in 90s, which is pronounced more in the most productive North zone, 4.20% in 80s to 1.72% in the 90s. The CAGR in South zone has also shown declining trend from 2.88% in 80s to 0.75% in 90s; while it is quite impressive in the Eastern zone accounting for 2.45% during 90s[17]. Taking present rate of population growth of 1.5 % into account, requirement of rice by 2020 is projected to be around 110 m tons implying production not less than 2.0 to 2.5 m tons of milled rice annually for sustaining the present level of self sufficiency in rice production.

Fig. 4.1: Variation in growth rate of area, production and yield in rice over the decades (mean)



[15] Senior Scientist
[16] Principle Scientist and Head, Division of Crop Production
[17] Sharma, S.G. & Rao, K.S. 2004. Rice research in India – current status and future directions. In: Proceedings of the National Symposium on recent advances in rice-based farming systems. Association of rice research workers, Central Rice Research Institute, Cuttack, pp. 6-19.

Fig. 4.2: All-India rice scenario



Conceptual Base and Global Scenario

SRI technique does not claim to be a novel concept; rather it has been emanated from some earlier practices. Several studies have reported likely ideas in rice cultivation in either of the ways. During early sixties, concept of clonal/ vegetative propagation was introduced in the Central Rice Research Institute, Cuttack, where rice roots were given much emphasis for stand establishment. Later on SRI technique has been called as 'root revolution' or 'one grain rice revolution' in rice cultivation. Another concept of crop establishment, skip row methods of planting also indicates advantages of leaving inter-row spaces within the crop configuration to encourage crop growth. In this regard, edge/boarder effects on plot yield was obvious, which shows higher yields in crops grown adjacent to the field boundaries than that obtained from the crops grown inside the plot. Keeping those views into account, it can be inferred that explanation for yield benefit in SRI has been underlying within some age old management practices.

Now SRI is in practice in countries like China, Indonesia, Cambodia, Thailand, Bangladesh, Sri Lanka and Cuba. Like other rice – growing regions, India had a rather delayed start, somewhere during 2002. As per literature goes, Tamil Nadu has initiated SRI for the first time in India during 2001-02. There, it was coined as '*Thirunthia Nel Sakupadi'* (transformed rice cultivation) and *'Ottrai Naatu Nadavu'* (single seedling method). At present, SRI technique has got access in almost all rice growing regions in the country like Andhra Pradesh, Orissa, Karnataka, West Bengal, Puducherry, Gujarat, Kerala, Tripura, Jharkhand, Chhattisgarh and Maharashtra.

Important Considerations and Package of Practices

Following are the important considerations, which can help us conceptualise the SRI methodology:

- Rice is neither an aquatic nor even hydrophilic plant, it is better to say water-tolerant.
- In SRI methodology, the uptake of nutrient should be a demand-led rather than a supply-driven process.
- The principle of 'feed the soil, it will feed the plant' may hold true in SRI technique.
- Rice plant growth can be usefully analysed and promoted in terms of phyllocrons, not merely growth phases.
- Nutrient management relies more on organic sources than synthetic/chemical sources.
- No need of ponding the field with 5-8 cm. standing water always, rather soil should be kept saturated always, except 5 cm. standing water during seedling establishment, tillering, flowering and grain filling stage.
- Below, surface soil (hidden treasury) plays a vital role than above surface emphasising more attention to soil microbial constituent.

The following packages of practices are the major determinant for boosting the yield in SRI methodology:

- Special type of nursery bed preparation using a mixture of soil, FYM and SSP at 2:2:1 ratio.
- Careful uprooting of tiny seedlings without disturbing/ stripping off the tender roots.
- Main land preparation to a soft-muddy appearance.
- Adequate drainage facility allowing no stagnant water.
- Making the grid of square planting at 25 cm. X 25 cm. configuration.
- Transplanting young seedling of 9-12 days old along with intact soil.
- Provide irrigation only to saturate the soil, moisture and stop irrigation after milk stage.
- Nutrient management with FYM @ 10 t/ha and NPK-40,20,20; from third year onwards.
- Application of synthetic fertilisers should be avoided.
- Bio control of insects, pests and diseases or very less application of pesticides.

Table 4.1: Comparative yield performances in SRI and conventional method

Method	Panicle/plant	Grain/ panicle	Panicle Length (cm)	Maturity (days)	Grain Yield (t/ha)
SRI	28	166	21.0	134	7.1
Conventional	10	162	21.4	145	5.7

Table 4.2: Economics in SRI vs. conventional method

Item	LRP*	SRI	Difference
Yields (t/ha)	5.0	8.0	+60%
Cost of cultivation (Rs./ha)	22,000	18,000	-18%
Gross returns (Rs./ha)	30,000	40,000	+78%
Net returns (Rs./ha)	8000	22,000	+175%
Rice- Rs. 5/kg.			

*- LRP- Local recommended practices

Benefits of SRI and Future Plans for Increasing Rice Production

Followings are the important features, which can show the advantages of SRI technique:

- Low seed /seedling requirement – contributes 0.46-0.78 t/ha more grain yield.
- Less water requirement-contributes 0.85-1.41 t/ha more grain yield.
- Transplanting tender/young seedling (8-12 days) - contributes 1.35 – 2.48 t/ha more grain yield.
- "Root revolution", or "One grain rice revolution".

In SRI methodology, it is noticed that the productivity will not only increase but cost of cultivation as well as input use efficiency will also be enhanced. Although, the cost of cultivation during first couple of years, particularly labour cost during planting would be higher, this will decrease in subsequent years. Following table shows the benefit out of this technique.

Table 4.3: Yield advantages - global scenario

Country	Conventional Method	SRI Technique
China	10.9	12.4
Indonesia	5.0	7.4
Sri Lanka	3.6	7.8
Bangladesh	4.9	6.3
Philippines	3.0	6.0
India	5.7	7.1
Madagascar	2.6	7.2

To meet the food demand of the burgeoning population by 2010, production of rice needs to be enhanced. Dissemination and adoption of SRI methodology has a great concern in this context.

	Factors	Benefit
1.	Seed requirement	65-75 % reduction
2.	Water requirement	35-45 % reduction
3.	Fertiliser requirement	No or initially 50% less
4.	Head rice recovery	20-25% increased
5.	Maturity period	Uniform
6.	Duration	10-15 days less
7.	Yield	25-30% increased
8.	Strong root anchorage	Withstand cyclonic gales
9.	Pest & disease management	Less
10.	Soil health	Sustained improvement

Table 4.4: Strategic plan for dissemination of SRI during the period of XI five year plan

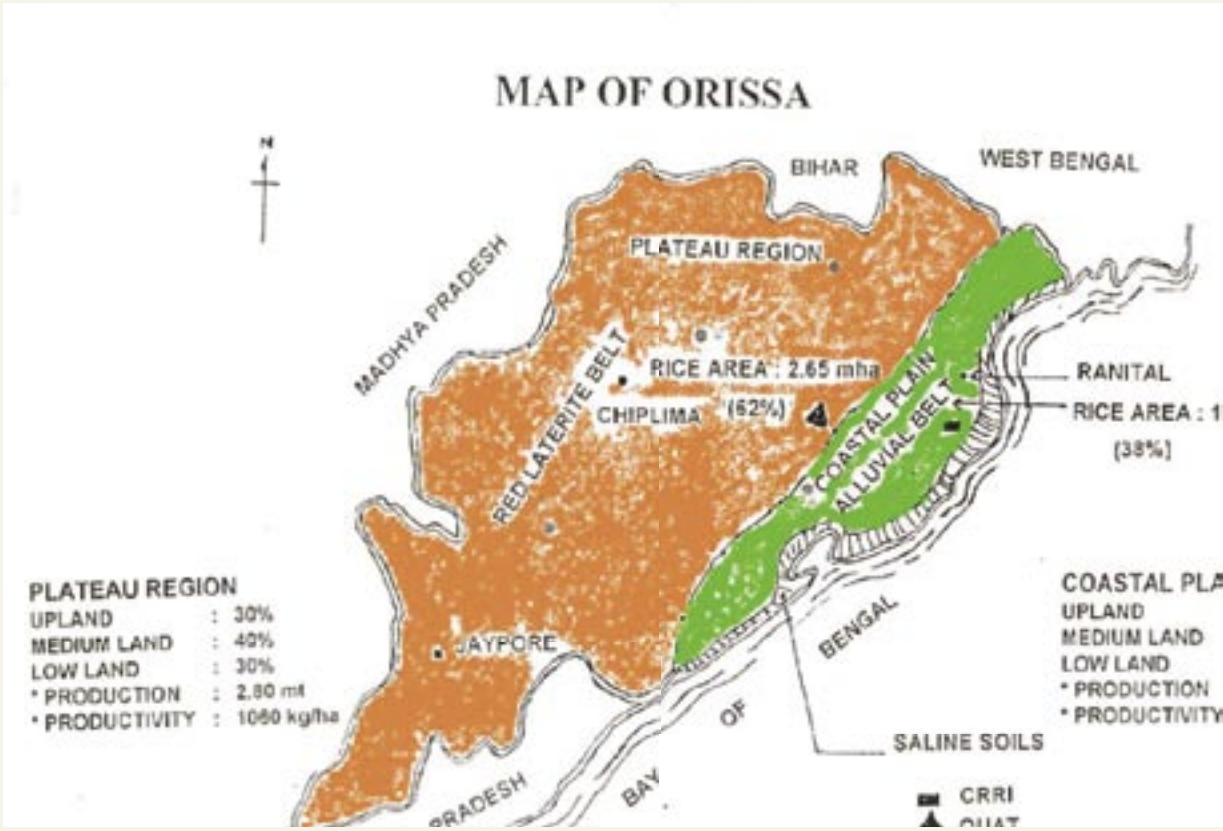
Total target of rice production	+ 10 million tones
Demonstration on SRI	Target area 5 million hectare, One Demonstration on every 100 ha area
No. of Demonstration	0.5 lakh
Target States/area	Eastern UP, Bihar, W.B., Orissa, Assam, TN, AP, Karnataka, Jharkhand and Chattisgarh

Conclusion

As on today, agriculture advances from traditional wisdom towards future conviction of food, nutritional and environmental security. Rice cultivation is passing through a critical phase of achieving the targeted demand of rice from dwindling resources of less land, water, labour and investment. Under this juncture, SRI may hold promise to become the boon in modern agriculture by not only producing more rice but this technology could also enhance the resource use efficiencies substantially.

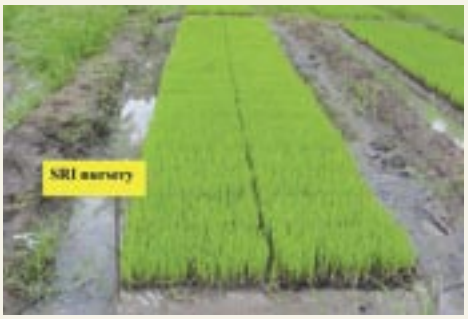
Images of SRI in Orissa

Participants at Orissa State Dialogue on SRI

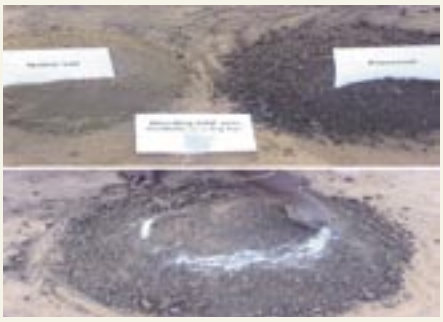


Physiographic regions in Orissa

Package of practices - CRRI

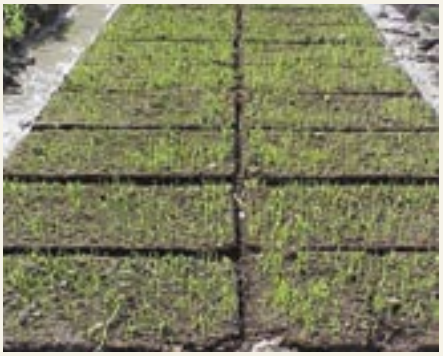


Nursing home of SRI


Soil mixed with FYM and SSP (2:2:1)


Small raised bed of 40 sq.m size


Broadcasting of germinated seeds


Seedlings after 5 days


Seedling of 12 days, ready for transplantation


Preparation of planting grid


Seedlings awaiting planting


Transplanting at wider spacing (25X25 cm)


Mechanical weeding after 15 days


Mechanical weeding after 25 days


Increasing rhizosphere development and yields

SRI at Sambhav

Soil mixed with sand and vermi compost for seed bed

Third ploughing just before transplantation

Seed bed preparation

Seed beds covered with vermi compost

Careful transportation of seedlings

Main field preparation

SRI at Sambhav

SRI fields with tank in background

Vermi compost unit

Row with extra plants

Weeding with Mandava weeder

Manual weeding

Crop ready to be harvested

SRI at PRADAN

Brine solution for seed selection

Seed testing

SRI nursery beds at 12 days

Taking out seedlings for transplantation

SRI plants at village Pingua, Karanjia

Rice grains from SRI fields

Seed bed preparation at SVA

Transplanting using rope marker at SVA

SRI field at harvesting stage with Mr. Parija

Preparation of main field with canals at Pragati

Marking the field with local marker made by farmer at Pragati

Taking young seedlings with care for transplantation at Pragati

Manual weeding in the field of Dibakar Jani

SRI demonstration field at Koraput, Pragati

Mr. Pravash Satpathy at his rice field

'System of Mustard Intensification' at Mr. Satpathy's field

Mr. Natabar Sarangi

Indigenous seed conservation at SPARD

Gopal Khuntia a farmer of Kotapokhari village stands in his SRI Field

Preparation of seed beds under guidance of MASS

Transplanting under guidance of MASS

SRI field before weeding under guidance of MASS

SRI at MASS, Kharif 2007

Sabarmatee, Sambhav[18]

System of Rice Intensification: Enabling a Joyful Interaction with Nature

Settled cultivation has a history of hardly ten thousand years. It is still evolving. Is it not important that we still have to learn a lot from nature to discover her potentials to our benefits? Once upon a time modern agriculture was thought to be the ultimate answer to our problems of production and hunger. Today people have started realising the limitations of modern agriculture. Though scattered, the search for alternatives is continuing. The result of one such effort is SRI.

Sambhav is a grassroots level non-government organisation born on 8th March 1989 dedicated to the twin causes of sustainable development (mainly environmental issues) and gender issues. Located on the border of Nayagarh and Ganjam districts of Orissa, it is a rain shadow area experiencing extreme temperatures, strong winds, hailstones and long dry periods. Out of 90 acres, we carved out 1.5 acres of paddy land from a deep gully created out of soil erosion. Soil depth is 1 to 1.5 inches and one finds calcinated stones with alkaline soil. In these soils paddy is not supposed to do well normally, let alone SRI. Still we are trying our best to continue our experiments so that we learn from nature. None of our team members is educated in the science of agriculture, nor were we doing agriculture before joining Sambhav. What we present here is based on the observations and experiences of a 'lay practitioner'.

I need not explain about basics of SRI here. It is a method of cultivation, and does not advocate a specific variety. Realisation of higher yields with lesser external inputs is evident in SRI. This restores faith in organic farming. From the beginning we have been giving importance to the use of less external inputs in farming as a principle of organic farming. So SRI suits us very much psychologically and philosophically. The greatest thing about SRI is that it encourages a culture of innovation, understanding and observation, but does not prescribe uniform rigid practices. It empowers us to think differently. We would like to present our experiences from the points of a practitioner and of a trainer. We practice 'Eco-SRI' by which we mean that all practices are completely organic in SRI.

Paddy in Summer and Our Land

We heard about SRI and were keen to take it up in October 2005 but we missed the cropping season. We had a CD on SRI practices of the irrigation department of Andhra Pradesh (Water and Land Management Training and Research Institute, WALAMTARI) and Prof Radhamohan had earlier visited the organic farmer Narayan Reddy's farm in Karnataka where SRI was being practiced. We decided to have a training programme on SRI to know more. We never cultivated paddy during summer (March to July) ever. Just because Mr. Nagaratnam Naidu from Andhra Pradesh had to conduct a practical for the CWS training programme that was to be held on our campus, we prepared seedlings for that. After preparing the seedlings a lot of seedlings were left over. We did not feel like wasting them. However we knew that it would be difficult for us to keep them from rotting since we normally do not have surplus water for irrigation during the summer and we could not apply any manure to the field. Curiosity and hope on some more yields encouraged us to take up the risk. RNDA and Lalata varieties were used, seeds whose qualities were unknown to us.

For more than a month, the crop did not show much improvement. We thought that since we were doing it at a wrong time the performance is not up to the mark. In May we stopped watering. After 15 days of dry period, we watered the field again out of compassion for the plants. It was then that we realised that SRI paddy can withstand water stress up to such great extent! Tillering started and

[18] I dedicate this paper to Dr. Richaria who lived and died for rice and Fr. Laulanie who pioneered SRI, to my team members and labourers without whom SRI could not be done at Sambhav, to Shri Narayan Reddy, Prof. Radhamohan, Dr. Shambu Prasad who inspired us to practice SRI, and Shri Nagaratnam Naidu who demonstrated SRI to us and to all other NGOs, farmers who helped us to learn more by learning from us and practicing SRI and to all others who are dedicatedly working on SRI.

we started observing the crop more keenly than we ever did earlier. Paddy in summer in our kind of land! It was like an impossible dream for us.

In the off season there were 30 to 40 tillers per plant. In the third week of June there were two strong cyclonic storms, but not a single bush was lodged. Wow! It withstands storm also! Even though many plants started flowering, not much damage was noticed. The plants grew so strong that one person just could not uproot a single bush.

We got only 1 bag (75 kg.) of paddy from 30 decimals of area (0.625 t/ha); most of the crop was damaged due to monkeys and parakeets. Even so we were encouraged greatly. The crop was standing in the field till July. So when people saw the matured rice panicles, the land preparation for the next crop, sesbania still standing in one patch while seedlings were raised in another patch, they were all together dumbstruck. It was for the first time in our life that we experienced this. It is difficult to express our joy in words. This is how the foundation of SRI was laid.

Why were we interested in SRI? We were not driven by emotions. Rather reasons prompted us to try SRI. People like Dr. Shambu Prasad and Prof. Radhamohan encouraged us a lot, but some other factors were also responsible for creating interest with SRI in us. They were the unexpected results of the first trial which though were not big by SRI standards, but pushed our practice to domains that we otherwise thought were beyond reach. What we like about SRI is that it encourages a culture of creativity and allows for innovation by farmers. It is a method of cultivation that does not advocate a particular variety or any particular input and rigid and uniform applications of them. It is based on less external inputs that suits our organic farming principles and is consonant with our philosophy and attitude to farming. It creates an attitude to understand nature and experiment with the promise of more production, less water requirement, and allows for the curiosity to experiment.

Second Trial: From July to November 2007

During the second trial we grew *Dhanicha*, added fermented oilcake, liquid manure, compost and some Gliricidia leaves to the soil. We were still doubtful whether SRI would do well in our poor and predominantly alkaline soil or not. Still with a lot of hope and enthused by our experiences in the summer, we converted all our paddy land to SRI. We did not know the properties of any of the seeds we used, so it was really difficult to make a complete study about their performance. The varieties were Gobinda Bhoga, Tulasibasa, Kalajira, Jagatsingpur Local Basmati and Phulbani Local (*Badakodingamali*). Except the last variety, all other varieties were scented ones. Ten seedlings of Nadiaphula were also planted. Below are some of our major experiences.

In the beginning we remained busy designing and testing our own markers. We used the local materials that can be farmer friendly and increase efficiency as well, and are easy to handle especially by women. We discovered that we also have the potential to design our own equipment. We experienced that the stickier the soil is, more drainage channels are required. In sandier or lighter soils fewer channels are required and in our [morum] laterite patch which is highly porous no channels were required. Initial land levelling was difficult to do though, particularly in sticky alkaline soil and it is labour intensive. After proper land preparation was made, we should prepare the seed bed.

Soon the tillers came in greater numbers, and the duration of the paddy was shorter. There was no gap between the summer SRI and Kharif. So when the bullocks were taken to the field they could not plough because of higher and stronger root mass. Though the bullocks are the healthy ones, they just got tired. So there should be gap between two SRI crops which allows the roots to decompose. We have since tried staggering our SRI crops. In our experience the incorporation of root mass adds to the soil fertility. The earthworm population increased much beyond our imagination.

We found that with finer grains 1.2 kg. of seeds are required and with coarse or bigger grains 1.8 to 2 kg. of seeds are enough for an acre of land. Since transplanting is done manually, it is also important that we should train the labourers properly before entering into the field; otherwise they would not be able to do it properly.

The varieties which we cultivated could not tolerate late transplantation. Since transplanting greatly depends upon the mercy of rain in rain-fed areas and on the availability of labour, we are looking for varieties which will be able to perform well even if they are planted late (towards the end of August or the beginning of September). And we will be experimenting more with varieties. The varieties we selected performed well in red laterite soil, but badly in alkaline soil. So we have to test other varieties which can perform well in

alkaline sticky soil. If sesbania (*Dhanicha*) is not decomposed well, it is difficult to level the land, make drainage channels, transplant properly and to use the weeder.

We noticed that the scented varieties were more affected by pest and diseases. The major pests we found were rice hispa in seedlings, Leda caterpillar, leaf folder, case worms, stem borers, green leaf hopper (Diali), gundhy bug etc. Some of them were never seen in Sambhav earlier. But of course we cannot yet tell if this happened due to SRI since agriculture itself is a very complex thing and controlled by many factors. Only if we experience the same thing at least for 10 years, then we can conclude that it could happen due to SRI. We made and used bio pesticides along with light traps and some other pest repellent measures. We for example installed bird perches to manage the pests. Another thing we observed was that plants that were transplanted late were more affected by pests and diseases. This increase in pests were not altogether a negative thing, because it helped us first of all to find out the reasons and contributing factors in the increase, and second helped to find out the required management practices.

The tillering potential is different in different varieties, and we feel that the effects of SRI are not same in every variety. It is difficult to compare among varieties on this basis, but SRI certainly enhances the tillering performance. It is clear that early transplantation, timely transplantation, maintenance of minimum gap between two plants, timely weeding, good soil health and proper water management contribute to a great extent to tillering performance. Not only tillers, also the number of panicles, number of grains, grain weight is more in SRI. The number of grains per panicle and grain weight is also more in Fukuoka San's zero tillage method.

Not all weeders work in all types of soils, so we have to select appropriate weeders for our own type of soil. If we do weeding manually it is better to allow the weeds to grow little bigger, this may be up to 4 or 5 inches, and then to uproot them. This makes it manageable. When putting the uprooted weeds back in the soil in manual weeding, it is better to bury the weeds near to the weaker plants.

In our opinion we should plant some reserve seedlings on the borders of the fields, so that if there will be mortality in the plot we can easily replace the plants. Though mortality of seedlings was negligible, we found it difficult to replace since we exhausted all seedlings.

Cost of cultivation varies from place to place due to various reasons. There are differences in (i) labour charges, (ii) in the percentage of labour contribution of farmer's family and paid labour, (iii) in the training and skill of labourers, (iv) the percentage of mechanisation, (v) the cost of seeds, etc. We thus have to be very careful while calculating the costs of production. For example, to plough the land we use bullocks; some might be using powertiller or tractor. Costs will certainly vary. In our case we do not have a roller marker or an appropriate weeder, so our cost of marking and weeding will be different from that of a farmer who has these equipment. In the first year land levelling costs are high if you do not have plain land, but this will not be the case for a farmer who has a levelled land. But in normal case, if we compare the cost with the local people, 30% less labour is required.

Like costs, production also depends upon various factors. It, for example, depends on the variety that is cultivated, on the soil health and soil type, on the timeliness of various activities like transplanting, weeding etc. and the occurrence of pests and diseases, on the water management, the overall rainfall of the season etc. In other words, genetic potential and conducive environment lead to better yields. But whatever may be the seed variety, SRI promises a greater yield provided that the right variety is cultivated in right soil and it is properly managed. Whereas earlier we were not able to harvest more than 15 bags (1 bag is 75 kg.) per acre or 2.6 tonnes/hectare of scented varieties, in SRI it came up to 35 bags. Besides grains we got very good straw which was long and heavy. Even our labourers found it quite heavy while harvesting.

We were under the impression that there would not be much residual moisture left during harvest since we do not allow standing water in the field, but though the field developed cracks, grasses were green below paddy. That helped us to go for second crop. Of course, we could not harvest any second crop since most of it was damaged. A major part of our crops was destroyed by monkeys, antelopes, wild boars, parakeets and other birds, field rats and other pests. When we keep the field dry, field rats often destroy the plants. Of course it did not happen because of SRI, but we could not harvest the whole yield of SRI because of them.

Since this is new to us, everybody becomes so enthusiastic and feels like observing the field very keenly. It created a kind of scientific attitude amongst the farmers and farm labourers. With new findings, everybody was getting more

encouraged. This is a subjective aspect, but it is nevertheless a very important aspect. Team members are not only observing the developments, they are also thinking creatively to solve problems. Even the labourers participated in the experiment enthusiastically. They were feeling empowered since they learnt a new thing that is different than their traditional practices. They were sharing their experiences with their friends in the villages and giving us the feedback. They were proudly explaining their experiences to visitors also. Some observations on performance are given below:

1. Maximum tillers 85, minimum tillers 8, average 40
2. Average labour days for transplantation per acre (including levelling sub plots, making channels, uprooting and transportation to the field, and transplanting etc.): 30.
3. Maximum grains per panicle noticed: 480 (Govinda Bhoga variety), Minimum grains noticed per panicle: 192 (Nadiaphula variety), average grains noticed: 330.
4. Maximum chaffy grains noticed: 120 (Govinda Bhoga variety), minimum chaffy grains noticed (Nadiaphula variety). The major reasons for chaffy grains were a small bird damaging the grains at milking stage and the occurrence of stem borers and gundhy bugs. Average grains and chaffy grains per panicle are different in different varieties.
5. Plants that grew more than 5.6 feet lodged before harvest. We felt that the tillers of the scented varieties are thinner or less strong than the non-scented varieties and they could not tolerate the weight of the heavy panicles.
6. Maximum length of panicles (measured from where the grains start) : 13.6 inches, minimum length 9.6 inches, average 11-12 inches.
7. Phulbani Local variety performed well even though it was planted late. The average grains per panicle were 210 with a maximum of 245, and the number of chaffy grains was 35. It was less vulnerable to pests and diseases and did not lodge because of low height and performed better in alkaline soil than other varieties.
8. We did not see uniform tillering in all plants.
9. 80-90% of the tillers had panicles in which the number of tillers was more, but 95-100% of the tillers had panicles where the number of tillers was less.
10. More tillers, better root anchorage and stronger plants were noticed in the patches where soil had more food and where less water stagnated.
11. Root colour was vibrantly white and the numbers, length, etc. were more than traditionally grown crops.
12. Plants near to the water channels did not perform very well compared to those inside the bed.

We not only learnt what to do, but also what not to do. It made us aware of the limitations and potentials of the technology/method.

Sambhav as a Resource Centre on SRI

Sambhav is recognised by many farmers and NGOs for its training in sustainable agriculture in the state. We were however new to SRI. Our learning started from a training programme organised by CWS in December 2005 that was more of a preliminary exposure. This was not complete for us, so we had to practice and learn first in order to train people. In the beginning, we had to give more emphasis on theory, and as we gained experience we started to give more weight to our experiences along with theory even though we still do not have more local experiences to sight upon. We did not have much learning materials. We had neither video, reading materials or access to internet in the early stage. Because of this we had to work hard to prepare the content and method of the training. But as our understanding matured, we found it easier.

We found that irrespective of the training programmes, all the groups were interested to learn about SRI, and after our practical experiences created confidence in us, we were able to provide proper training and answer people's questions. When we talk about SRI, people find it hard to believe that one acre of land can be cultivated with only 2 kg of seeds! After listening to the whole process some say that they can not do it because of water problem and labour problem. In general poor, marginalised and tribal people take more interest in SRI than rich farmers, and people are more convinced by seeing the standing crop. Unfortunately it is not always possible for us to have standing crop in the field.

Institutions like UAA (United Artists Association in Ganjam) and BOJBP (Briksha O' Jeevan Bandhu Parishad in Nayagarh) conducted exposure visits of farmers specifically on SRI. Later (April 2007) Oxfam in Kolkata sponsored their partners to visit Sambhav to learn about SRI. The experience sharing workshop was a great event with several farmers from 6-7 districts inspired by what little experience we had came to discuss about their crops and results. We are still in the process of collecting more information and knowledge on SRI and develop our own materials for better training. Though we are sharing the theory and practice with so many people, we actually do not know how many people are practicing SRI and what their experiences are. If we could know then we could know the impact of our training,

and we would probably also learn better and share better. We think that all practitioners are trainers at one point of time when they share their experiences with others. Mutual learning is better than one way learning.

This year, to develop our own capacities and enhance our training centre resources we have been doing video documentation of every process. A cropping season is a long process involving several local adaptations and though professional documenters can do better production of the videos it is often only the farmer or people involved in the farm who can capture the intimate knowledge on crops. We are hoping that we could bring these through our video on SRI that should be ready after the harvest this November.

Our SRI story would be incomplete if we do not share with you some of the other events that have occurred during the past two years. I mention a few below.

We were pleasantly surprised to know that a young rural school child chose to take up SRI as a project for a local science exhibition. The exhibit did well and was selected for the district level competition. We have visitors to Sambhav from neighbouring villages often asking us for some 'SRI seeds'. I narrate these to indicate that people are talking and thinking about SRI in their own way and we need to capture these understandings.

Differences between Earlier and Present Practice - Some Notions Demystified

Methods of cultivation are different in our previous practice and with SRI. Let us highlight a bit on other assumptions which we had earlier and how SRI demystifies them. A big difference is of course square vs. staggered planting. Common sense assumptions that proved to be wrong was that more plants (and hence more seed) give more production. As we saw with SRI, fewer plants also can give more production. Another difference was that in conventional production the field acts like a mini dam in rainy season by holding and percolating water. In SRI the field should be moist only. We used to believe that rice requires more water, and preferably standing water, but now we see that rice can do well without standing water.

Last but not least is the former belief that rice cultivation is like studying hard for matriculation examination and never knowing what would the result be – a conception of rice cultivation that is now replaced. It is like doing PhD that requires not blind following of predecessors, but involves more knowledge input and one can be certain about harvesting more. It encourages one to go on discovering the potential of a plant. It makes a farmer a scientist.

Challenges Remain

There are many challenges ahead if we want to fully explore and realise the potential of SRI. This is not to indicate the limitations of SRI but challenges that we are thinking of and all of us perhaps need to collectively engage with. I pose them a few questions.

- How to convince farmers of this counter – intuitive method?
- Can SRI work in difficult soils like alkaline soils and saline soils, low lands etc?
- How to find out the right variety for the right soil?
- What would be the ideal weed management practices in SRI?
- Can we try direct seedling method and do away with transplanting?
- What should be the land and soil preparation in undulated terrain?
- How can we establish thumb rules for proper and locally adaptable water management?
- How to respond to reaction or opposition of non practitioners, scientists, government officials, and even family members?
- How to ensure that the practice of SRI goes hand in hand with proper understanding of rice cultivation and soil plant interactions?
- How to enable proper documentation and preparation of learning materials?
- What kind of support is required from the government, scientific community and other institutions?
- How to train a committed band of trainers?
- How to enable innovations and sustainability of the practice?

What Next?

We are immensely encouraged by the performance. So, we will:

- continue to practice SRI
- try to modify/correct our mistakes
- try to convene an experience sharing workshop of the people we trained
- continue to share our experiences with as many people/ institutions as possible

- continue to promote SRI
- build up a resource centre on SRI in particular and paddy in general
- study various aspects more systematically
- learn from others
- work on people friendly equipment and methods
- document the practice and result of ours and others as well.

In other words, there are many challenges ahead if we want to fully explore and realise the potential of SRI. A good scope is there for further research, and the promising results must encourage us to take up promotion of SRI.

We hope that SRI will help the needy and marginalised people. Let us dream to uproot hunger. We invite friends to visit us and help us to learn more. Let us learn together for a better future.

Expanding Pro-poor Livelihoods through SRI: PRADAN's Experiences in Orissa

Professional Assistance for Development Action popularly known as PRADAN[19] is a Delhi based Non-Government Organisation (NGO), working in seven states of India. It was founded in 1983 inspired by the belief that capable and caring individuals are more critical than the material resources for removal of mass poverty. PRADAN's strategies, programs, activities and methodologies have evolved over the past decades; the abiding features have been to put such individuals to work directly with poor rural people, build people's capabilities, develop and introduce new ideas to expand livelihood opportunities for poor people and to collaborate with all significant players in development. PRADAN personnel promote livelihoods on an ever-expanding scale in diverse sub-sectors, ranging from agriculture and natural resource management to farm enterprises.

PRADAN's work in Orissa began in 1993 and works in the four districts of Keonjhar, Mayurbhanj, Rayagada and Kandhamal. The topography is undulating and hilly with medium to high rainfall, and a sub-humid climate. The districts have a high concentration of Scheduled Tribes, lower level of landlessness and a preponderance of small and marginal farmers. Agriculture is the primary livelihood of which paddy accounts for 85-90% of gross cropped area with an average yield of 2-3 t/ha. The region's production of cereals, pulses, vegetables and other food articles are insufficient making this a food insecure region. The issues that PRADAN seeks to address in the region relates to reducing the uncertainties and setbacks in locally available livelihood opportunities and migration of people and increasing the food security, availability of basic seeds as well as proper technical support and market linkages.

Agricultural Practices in the Region

PRADAN's interventions in the region is through projects on sustainable livelihood options through NRM (Natural Resource Management) for forest dependent communities, capacity building of local communities and improvement of local environment through better water resource development, biomass production, green manuring, plantation, System of Rice Intensification (SRI) method of paddy cultivation etc. The project beneficiaries are the tribal and marginal farmers, who are practicing subsistence agriculture with limited inputs and low yields. Strategies for intervention include promotion of women's Self Help Groups (SHGs), Livelihood enhancement of SHG members, improving the husbandry of natural resources etc.[20]

Agriculture is largely rain fed and irrigation where exists is dependent on few non perennial streams (locally called *nala*). Paddy is grown in Kharif and vegetable are grown in Rabi. The soil is clayey with a pH of 5.5. Direct broadcasting is widely prevalent. Transplantation is a relatively recent phenomenon and has spread since 1998. Transplanting is done on plain lands with 4 to 8 plants per hill and varies between 21 - 45 days. The average yield of paddy is less than 2t/ha. All households have each type of land (upper reach, middle and valley), though the poorer households may have most of their land in the upper reaches, with very little valley land.

Introduction of SRI in Orissa

PRADAN's vast SRI experience in Purulia district of West Bengal provided a learning platform for SRI in Orissa[21].

[19] http://www.pradan.net

[20] One of the major innovations practiced by PRADAN in Integrated Natural Resource Management (INRM) has now become popular as the Jaldhar model for in-site rain water conservation also referred to as the 5% method.

[21] Shekhar Kumar Sinha & Jayesh Talati (2007). Productivity impacts of the System of Rice Intensification (SRI): A case study in West Bengal, India. Agricultural Water Management. 87: 5 5–6 0.

Purulia had demonstrated the potential of food sufficiency for the tribal and marginal farmers through SRI. With the experience at Purulia, PRADAN experimented with SRI in two blocks of Keonjhar (Patana) and Mayurbhanj (Karanjia) districts in the year 2003. No material support was provided except technical guidance to the farmers. Farmers were given training on SRI; a film on SRI was shown to the farmers. The uptake by farmers was not very high in the first year. PRADAN then organized an exposure visit to Purulia for some farmers in 2004 and this was the turning point and SRI spread rapidly in the following years. From a humble beginning with four families in two districts, SRI has now spread to 1075 small and marginal farming families over 105 hectares in four districts (see Figures 6.1 & 6.2). For the current year PRADAN plans to extend SRI to 2000 families in the region.

Process and Practices

With repeated experiments and modification with the SRI principles, a standardized package has been developed by the expert team of PRADAN with consultation of SRI farmers. Table 6.1 shows an explanatory comparison of nursery raising with conventional and improved methods of paddy cultivation. Like nursery bed preparation, a fixed package of inputs with detailed guidance is provided by the PRADAN team to be practiced by the SRI farmers. Table 6.2 has details of this package of practice in comparison with conventional paddy cultivation followed by the local farmers.

Table 6.1: Nursery preparation (Agronomic practices for one hectare)

Character	Traditional Method	Improved Method	SRI Method
Seed rate	50-60 kg.	40-50 kg.	5 kg.
Nursery Bed Size	No specific data	10,000 to 12000 sq ft	1000 sq ft
Input	No specific data	DAP-7.5 kg. MOP-2.5 kg. Urea-4 kg. Phorate-1 kg. DM-45-150 gm	DAP-2 kg. MOP-1.5 kg. DM-45-150 gm
Bed preparation	No specific data	10-12 man days	1 man day

DAP-Diammonium Phosphate, MOP-Muriate of Potash,, DM-Dithane M-45

Table 6.2: Main-field preparation for SRI paddy (Agronomic practices for one hectare)

Character	Traditional	Improved Method	SRI
Age of seedlings	21-35	21-35 days	8-14 days
Process of uprooting seedlings	Forcefully washing of roots, sometimes keeping seedlings more than one day	Forcefully washing of roots, sometimes keeping seedlings more than one day	Carefuly and quickly (20 to 35 minutes) transplanting-minimum trauma to plants
Spacing	15 cm. X 10 cm.	20 cm. X 15 cm.	25-30 cm. X 25-30 cm.
No. of seedlings/ hill	4-5	3-4	1-2
Transplantation	52 man days	52 man days	37-38 man days
Weeding & Hoeing	90-120 man days	90-120 man days	90-120 man days can further reduce to 40 by using cono weeder /Japanese
Basal application	Gromer- 75 kg .	DAP-100 kg. MOP-70 kg.	DAP-100 kg. MOP-70 kg.
Top dressing	Urea-75 kg.	Urea-90 kg.	Urea-60 kg. (2 splits) NPK- 30 kg. (once)

DAP-Diammonium Phosphate, MOP-Muriate Of Potash, Nitrogen-Phosphorous-Potash

Promoting SRI through Self Help Groups

PRADAN's interventions in the region are largely implemented through Self Help Groups (SHGs) and SRI is no different. The farmers get to know about SRI first through SHG meetings. Interested farmers then take up initiatives to adopt SRI in their own field with the assistance of the concerned VLE (Village Level Expert) or SP (Service Provider) who supplies the package and guide the farmers during the cultivation (See the case of how even a resource rich farmer learns about SRI through SHGs below). They provide immediate guidance and logistic support to farmers. They also look after the SHG matters. Since the SHGs mostly work on agriculture, there is an opportunity to spread SRI in the operational area and nearby areas as well.

Box 6.1: How a progressive farmer learnt about SRI through SHGs

Mr. Deepak Mahanta is an educated progressive farmer of Kerkera village. Agriculture Department, Government of Orissa had selected him to take part in a 'Farmers to Farmers Training Programme' organised at Central Rice Research Institute, Cuttack. Now he is a trainer on advance farming in that locality. He was also included in a team of 50 farmers, selected for an exposure visit to Tamil Nadu and Puducherry, which was arranged by Government of Orissa in 2003. He has 27 acres of land. Out of that 20 acres he cultivates and rest 7 acres are wasteland. Since 1991 he is actively involved with agriculture. In the year 1998 he introduced government seeds, chemical fertilisers and transplanting method. Next year he transplanted 5.0 acres of land. He had got 90 quintals of paddy from 5 acres (4.5t/ha), which was the highest ever yield in his life by using conventional method. But he never heard of SRI from government officials. When his wife Kamala Mahanta became a member of Maa Saraswati SHG, Kerkera last year, he became close to PRADAN and to know about SRI. In the year 2006 he had done SRI in an area of one acre.

The SRI demonstration in the year 2003 (Kharif) was done in four different locations with different varieties. Bhringarajpashi, Kadadiha, Tala Kainisari and Gouda Champei were the villages where SRI demonstration was done. Non-HYV varieties like *Konark, Surendra, Khandagir, Nabin, Swarnai* and *Lalat* were then taken up. For SRI paddy only medium land is chosen, as up land and low lands seem to be not suitable for SRI paddy.

SRI as an Opportunity to Double Productivity

PRADAN sees SRI as an opportunity to double productivity and seems to be providing farmers' food security for 8-12 months. The yields of SRI are an impressive 6-8 t/ha (Table 6.4).

The highest number of tillers was 80 per hill and the rate of conversion to effective tillers 40%- 70%. As tillering goes up, the percentage of effective tillers comes down. Application of chemical fertilizer increases the effective tillers. The number of bold grains per panicle was 150 – 220 as opposed to 100-140 in the conventional method is. SRI plants are healthier than conventional and withstand longer dry spells. The fodder is almost three times more than the conventional paddy. The average yield recorded is shown in the Table 6.4. Though it fluctuates it is seen in a majority fields the yield is 6.5 t/ha (2003-2006).

The results shown in Figure 6.1 were recorded in Ekghari village under Kerkera gram panchayat of Karanjia block.

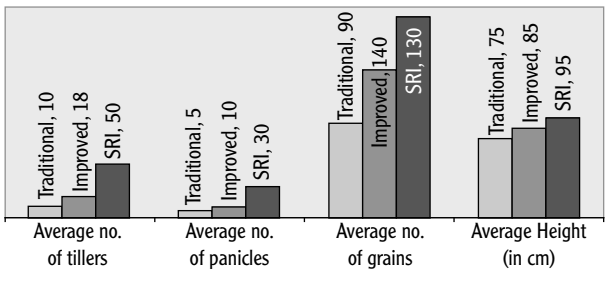
Table 6.3: Spread of SRI through PRADAN in Orissa

Year	Season	Families	Area (ha)
2003-04	Kharif	4	0.2
2004-05	Kharif	5	0.5
	Rabi	3	0.3
2005-06	Kharif	130	13.0
	Rabi	25	2.1
2006-07	Kharif	1050	105.0
	Rabi	25	0.36

Table 6.4: Year-wise SRI outreach in Orissa and average yield

Year	No. of Districts	No. of Families	Area (ha)	Average Yield (t/ha)
2003	2	4	0.2	6.5
2004	2	8	0.8	6.0
2005	3	155	15.1	8.0
2006	4	1075	105.36	6.5

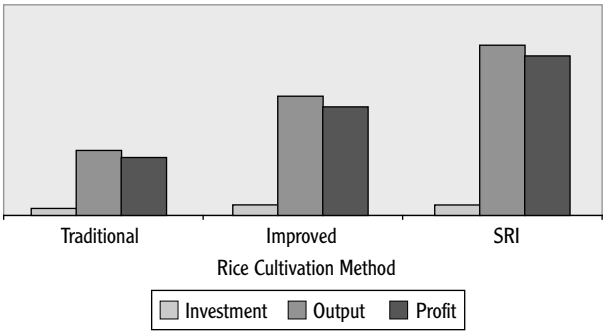
Fig. 6.1: SRI results growth status on 31st May 2007 at Ekghari (variety-Nabin)



For wide dissemination and popularization of SRI methods of cultivation, PRADAN is taking up many approaches like conducting agricultural training programs, organizing exposure visits, and proper follow up and guidance in the field. Hands on training and support to SHG families through VLE (Village Level Expert) or SP (Service Provider) are being provided. The experts of PRADAN also supervise the SRI fields. Weeders have been provided by PRADAN to the farmers. PRADAN is also demonstrating and sensitizing women SHG members through guided exposure. Farmers were

given training on SRI; a film on Purulia SRI Practices was shown to the farmers. Selected farmers participated in exposure visit to various places in Orissa and Purulia. In 2004 an exposure visit to Purulia was organized to witness SRI fields and practices.

Fig. 6.2: Costs and benefits of SRI



Irregular rainfall has hampered SRI intervention processes but not as much as conventional methods. As a result the mobilization of farmers in 2007 (600) has not been as high as last year.

Table 6.5: Spread of SRI by PRADAN in India

Year	No. of Districts	Families	Area (ha)
2003	2	8	0.4
2004	2	280	40
2005	7	1750	210
2006	11	6200	632

The farmers who have practiced SRI in previous years have been quite satisfied with the efforts. Intercultural operation at early stage is restricted (in case of transplanted paddy) in certain tribal pockets of this area as there is a custom to start operation after their *Nuakhai* festival (first harvesting of upland paddy in Sept – Oct). As the entire Karanjia area is a rain-fed area and rice is dependent on monsoon. There is little control over water, which is a major concern for SRI paddy. So to increase the yield potential, promoting large scale in-situ water conservation measures are required. Training on machines and equipment is also needed to popularize SRI among farmers. SRI adopters are becoming proponents of SRI. For some details of the experiences of SRI farmers see Box 6.1.

Nurturing Participatory Development of SRI: Experiences of SVA[22]

Sahabhagi Vikas Abhiyan (SVA), literally meaning 'campaign for participatory development' is a collective of several individuals and community based organisations, mostly working in Western Orissa. Founded by Ashoka-fellow Jagadish Pradhan it started in 1993 in reaction to the negative consequences of the Green Revolution on non-irrigated and rain fed areas. Though the Green Revolution had brought a lot of benefits to India, it favoured irrigated areas and the non-irrigated or rain fed areas became more vulnerable. SVA found that traditional community water management systems that provided economically viable and environmentally sustainable alternatives to farmers declined due to continued neglect. By demonstrating the benefits of traditional methods of irrigation and organising the shift to organic farming, SVA aims to undertake participatory development[23].

SVA undertakes various activities to empower the poor both economically and socially and is one of the few organisations with a strong focus on agriculture. SVA operates in the districts of Kalahandi, Nuapada, Bargarh and Bolangir - some of the poorest in Orissa. Their grassroots level work involves capacity building around agriculture, forestry and fishery. This work goes hand in hand with policy advocacy at the state and national levels. SVA publishes an Oriya newsletter titled *Gram Swarajya Abhiyan* that reports on their activities and perspectives. The newsletter reaches 700 villages and has 2000 individual subscribers, including nearly 500 grassroots NGOs.

SVA and SRI

Jagadish Pradhan first heard about SRI two years back through a news item on SRI in South India. SVA followed this lead through interactions with several practitioners in South India through their networks. SVA staff attended a training programme organised by the Dutch funding agency HIVOS in Bangalore (that supports a paddy value chain initiative), and participated in a SRI workshop at the Acharya N. G. Ranga Agriculture University (ANGRAU) in Hyderabad. They also visited a few SRI fields in Andhra Pradesh and acquired a feel for SRI.

Enthused by the prospects of SRI for sustainable agriculture and organic farming, SVA decided to undertake trials immediately in Kharif 2005. Interestingly the initial trials were simultaneously carried out in their own and farmers' fields. The trials followed spacing but not single seedlings (2-3). The success of the very first trials propelled them to continue with SRI in Rabi as well. In the following year SRI was extended to more blocks in both Kharif and Rabi. Despite difficulties in water management in non-irrigated conditions (in Kharif) the crop yields were higher in almost all cases.

The Spread of SRI through Careful Experimentation

SVA's strategy in SRI was to try out the practices locally step by step with a view to locally root the system and, if necessary, modify and adapt the practice locally. SVA staff realised that SRI represented an unconventional way of cultivating rice for many farmers and thus would require gradual but important changes in farmers' practices. Initial trials were with 15 day old seedlings, with two instead of single seedlings and reduced water on the rice plots of 1.5 inches. SVA has tried to maintain the practice of SRI in a purely organic way, explicitly renouncing the use of

[22] Written by Koen Beumer based on interviews with Jagadish Pradhan and Sisir Parija and inputs from Debasis Mohanty and C. Shambu Prasad.

[23] For information on the philosophy of SVA's involvement see the brief on the founder in Ashoka http://www.ashoka.org/node/2548. The current activities of SVA can be accessed from http://www.svaindia.org.

chemicals. The SRI work has extended to about 200 farmers in the region all with organic methods.

While it was hard to keep record of the farmers' fields, in their own centres SVA kept close records. To the surprise of many, despite several constraining factors and a partial adoption of the practices, the results were promising. The results were published on the cover of their newsletter *Gram Swarajya Abhiyan* (see box 7.1). Following this publication, some of the NGOs that subscribed have taken up SRI, like Seva Bharati, the Lakan Naik Society for Rural Development that are working in Kashipur and Tikiri under Rayagada district.

Realising the importance of having good technical backup on the new methods SVA decided to enhance the dissemination of SRI through informed education to farmers on the principles of SRI. These included publicity posters, and several SRI success stories were highlighted on radio and television. They also informed the government of their activities, who sent leading farmers to SVA fields as part of exposure visits. Last year their plot demonstrating SRI was visited by 4-5000 farmers and several NGOs. The interactions through the visits led to lot of interest in SRI and a continuous demand for information on SRI.

Oriya Manual on SRI

Farmers and organisations across the state have always felt the need for a good manual on SRI. Organisations

Box 7.1: Wonderful success of SRI paddy[24]

SRI has been promoted by SVA and its member organisations in various parts of Orissa since last year. In this process last year's (Rabi) SRI crop cutting was done in the presence of few government officers of Bargarh and Nuapada districts, where it was proved that with less investment, 25-30 quintals of rice can be produced in one acre.

Sri Ghanashyam Bhitria from the village Birighat under Khariar block of Nuapada district had practiced SRI in last Rabi season in a patch of one acre of irrigated land with a variety called Lalat. He had participated in the National workshop on SRI held at Hyderabad, and was guided by SVA's agriculture consultant Mr. Sisir Parija during land preparation, seedbed preparation and transplanting. Though normally 10 day-old plants should be transplanted, he had transplanted them after 15 days. Similarly the weeding was done late instead of weeding 10 days after transplantation. He had applied eight carts of manure per acre and 100 kg. of vermin compost.

Initially Mr. Bhitria was desperate about the field. Even the farmers around Bhitria criticised him. But after one month, when a number of tillers spouted, all the farmers became hopeful. The farmers were surprised when they saw its long panicles during April. On 7th May 2007 the crop cutting was done with the supervision of Sri Prabasi Sethi, district Agriculture Officer, Nuapada and Mr. Sarat Behera, Project Director of the District Rural Development Agency in the presence of many leading farmers of the locality. To the surprise of the two officers, it was found that the yield rate was 62 qtl/ha i.e. 25 qtl/ac. It would have been more if transplantation, weeding and water management would have been done in time.

After this experiment the agriculture department is also advising farmers to take up SRI and it is hoped that hundreds of farmers will practice SRI in this Kharif.

Bilenjore Experience
The demonstration field at Bilenjore done by SVA has been visited by 1000 farmers from different districts of Orissa. Regular irrigation was not done due to shortage of water and there was a problem with weeding. Still the yield was calculated at 21 qtl/ac.

Village Bahabal, Nuapada
Sri Charan Bag, a farmer from Bahabal village which is situated at the bottom of the Pendraban irrigation project, had tried SRI in 0.5 acre of land. Earlier he had applied fertilisers and pesticide supplied by the government, but this year without applying any fertilisers and pesticide he got more rice. He expects it would be 25-30 qtl/ac, if all the principles he followed.

Bargarh experience
The crop cutting of the SRI field of Sri Bhima Barik, who is a leading farmer of the village called Govindpur, under Sohela block, was done under the supervision of agriculture consultants Sisir Kumar Parija and Sabhapati Khadenga and 2.1 t/ac of yield from Khandagiri variety was recorded.

Similarly in the field of Meher Chandra Pradhan of the village Mundela under Paikamal block, crop cutting was held on May 30th, 2007 and the recorded yield was 28 qtl/ac using a variety called Konark. If he would do weeding in time and proper water management, the production would be more.

These success stories on SRI have created confidence in the local farmers.

[24] Wonderful success of SRI paddy. Gram Swarajya Abhiyan, Vol. 44(6), June-2007 (translated from the Oriya original)

such as the Regional Centre for Development Cooperation (RCDC), Bhubaneswar had in the past produced a simple brochure on SRI that served the purpose of providing basic information. There was however a need for a manual that could enable farmers to practice SRI. An important lead taken by SVA was in bringing out the first Oriya manual with pictures and detailed description of the SRI processes in January 2007. The booklet in Oriya was published by the Centre for Sustainable Agriculture (CSA), HIVOS, and the Watershed Support Services and Activities Network (WASSAN) from Andhra Pradesh. The twenty page booklet, titled 'SRI method for sustainable agriculture', has become an important tool in the spread of SRI in the state and was used by the Department of Agriculture in its Kharif season plan this year and in later training programmes of its agricultural officers. It contains several pictures, the principles, benefits and practices of SRI are explained, for example providing guiding principles for weeders and markers. The booklet relied on existing information on SRI and is not a mere translation. There has been an adaptation of the practices with greater emphasis on how farmers can indeed go organic with SRI.

Some Constraints in SRI Adoption

SVA's experience has been that SRI uptake is greater among small and marginal farmers as many big farmers opt for mechanised farming. All farmers nevertheless encounter some problems. SVA for example continuously encountered some weed control problems in SRI fields and according to them practicing SRI without a weeder would be extremely hard. Initially SVA had brought a weeder to Orissa from their trip to Andhra Pradesh and they got some weeders from the government. However, more weeders were required and in order to meet the immediate needs SVA decided to manufacture several weeders itself. SVA manufactures the weeders in Padambur in Bargarh district, in Khariar in the Nuapada district, and in Bhwawanipatna in Kalahandi district, and they are selling the weeders at a rate of Rs. 500, thereby enabling more farmers to practice SRI.

The same pragmatism in adopting SRI also characterises SVA's attitude towards several other constraining factors. Availability of sufficient organic manure for example is often a problem. They suggest to farmers that they should just give what they get, and although this might not always be enough, it is the best they can do.

Some farmers perceive additional labour to be one of the constraints in SRI. Timely and careful transplantation and weeding in SRI requires more than family labour. This consequently leads to labour costs, which are often too large a burden for poor and marginal farmers who find themselves in a bad economic situation. The overall economics of rice farming in Orissa has become unfavourable over the years due to a variety of reasons. State procurement of rice is lower in the state compared to neighbouring Andhra Pradesh or West Bengal and the market price is quite low. Farmers are often exploited by mill owners, and many farmers are indebted. Given this burden on farmers they are unable to organise labour, leading to late transplantation.

Irrigation was another constraint that was noticed while practicing SRI. The requirement to continuously leave the fields moist but not flooded is often too much to be asked, and SVA encountered water control problems during Kharif. This is also dependent on the type of soil. Clay soil needs less irrigation than sandy soil, because its water holding capacity is lesser. Nevertheless water control matters for all soil types, and is an important factor in preventing abundance of water in Kharif and droughts in Rabi.

Future Prospects

SVA sees SRI as a means for economic empowerment. They regard the system of rice intensification mainly fit for those who can share their labour, and for irrigated lands.

In Kharif 2007 SVA is scaling up their practices, and around 200 farmers are practicing SRI. In 15 areas in Koraput and Bargarh SRI is being practiced by their organisation, in nearly 1000 acres of land. SVA is also implementing SRI through the Western Orissa Rural Livelihoods Project (WORLP) (see case of Bulu Gadtia below). An extra measure they have taken is that they are digging up deep channels in low lying areas to implement SRI during this Kharif season. Looking at their organisation's trials the overall development is that farmers are coming forward to practice SRI methodology. SRI holds much promise for small farmers in Orissa. Appendix 7.1 indicates the spread of SRI method in Kharif 2007 with details of the dates of transplantation and, weeding schedules of each farmer.

Box 7.2: SRI to the rescue of Bulu Gadtia

Bulu Gadtia is a farmer residing in Gigina village of Narla block of Kalahandi district. It is coming under Western Orissa Rural Livelihoods Project (WORLP) implemented by Sahabhagi Vikas Abhiyan, Kalahandi. He has three acres of land with four brothers and finds it difficult to provide food security for the large extended family. Gadtia is a well respected member in the community and plays important roles in various decision making processes in his village.

He has constructed a well in his land by which he is growing vegetables like brinjal, beans, ladies finger (*bhendi*), *parwal* (*potal*), cow pea (jhudang) and other vegetables. He has 0.5 acre of banana cultivation which is very well managed by him. He has also grown lemon and hybrid mango in this land. He grows paddy in a part of his land to meet requirement of rice for his family. It becomes difficult for him to meet the total rice requirement for his family from such a small piece of land. He used to apply excessive fertiliser to meet the requirement of rice for his family. Now he has got a technique like System of Rice Intensification (SRI) which can fetch him better production from his small piece of land.

He has received trainings in WORLP from time to time and is motivated regarding the techniques how to get better production from a small piece of land in a sustainable manner. Finally he chose to go for SRI. When he transplanted the 12 day old seedlings one in every hill at 10" spacing, his fellow farmers and even his family members scoffed at him and prophesied that the land would remain fallow for the year. Gadtia was however confident about the new technique. A month of transplanting, he has done weeding twice with a Mandava weeder which benefits him most in reducing the weeding cost which would have been done manually and aerating the soil. He has got profuse tillering that is much better than traditional practices and Gadtia expressed satisfaction over the improvement in crop. The weeder was provided to him by SVA on hire basis. Most of his fellow farmers have also realised that this technique will do better to enhance the production and will be helpful for the small farmers who were struggling to harvest their total requirement of paddy from the small piece of land to feed their family. The area coverage will definitely increase in the coming year which will give a boost to the food grain production in the area.

As reported by Amulya Kumar Sahoo, SVA

Appendix 7.1: SRI Method (Kharif) 2007 – Farmers' Details

Sl. No.	Name of the Farmer	Village	G.P.	SRI Area (in ac)	Variety of Paddy	Source of Irrigation	Date of Sowing	Date of Plantation	First Weeding	Second Weeding	Third Weeding	Fourth Weeding
1	Sri Debaraj Podh	Khaliamunda	Lanji	0.5	1010	Tank	24.06.07	11.07.07	21.07.07	02.08.07	12.08.07	23.08.07
2	Sri Ganapati Podh	Khaliamunda	Lanji	0.10	1010	Tank	24.06.07	12.07.07	22.07.07	03.08.07	13.08.07	24.08.07
3	Sri Pitambar Podh	Pakhanpada	Lanji	0.50	Khandagiri	Tank	06.07.07	18.07.07	28.07.07	10.08.07	20.08.7	
4	Sri Dingar Podh	Pakhanpada	Lanji	0.20	Lalat	Tank	28.06.07	14.07.07	24.07.07	04.08.07	14.08.07	24.08.07
5	Sri Tararam Podh	Pakhanpada	Lanji	0.40	Swarna	well	28.06.07	13.07.07	24.07.07	04.08.07	11.08.07	22.08.07
6	Sri Keshrilal Podh	Pakhanpada	Lanji	0.20	Swarna	Nala	04.07.07	18.07.07	28.07.07	08.08.07	18.08.07	26.08.07
7	Sri Neheru Podh	Pakhanpada	Lanji	0.30	Swarna	Nala	04.07.07	19.07.07	29.07.07	08.08.08	18.08.07	26.08.07
8	Sri Chandramani Nag	Kantapada	Lanji	0.10	Lalat	well	02.07.07	14.07.07	24.07.07	04.08.07	12.08.07	
9	Sri Bhubane Nag	Kantapada	Lanji	0.20	Lalat	well	02.07.07	14.07.07	25.07.07	05.08.07	13.08.07	
10	Sri Hiranya Majhi	Kenduguda	Lanji	0.20	Lalat/Swarna	WHS	10.07.07	22.07.07	03.08.07	13.08.07	23.08.07	
11	Sri Tankadhar Thela	Mahulpada	Lanji	0.10	Khandagiri	well	06.07.07	19.07.07	29.07.07	13.08.07	24.08.07	
12	Sri Bhuja Thela	Mahulpada	Lanji	0.10	Khandagiri	well	06.07.07	19.07.07	30.07.07	10.08.07	19.08.07	
13	Sri Nabin Thela	Mahulpada	Lanji	0.10	Khandagiri	well	06.07.07	19.07.07	30.07.07	11.08.07	21.08.07	
14	Sri Basanta Podh	Kendupati	Lanji	0.30	Lalat	MIP	17.07.07	03.08.07	13.08.07	24.08.07		
15	Sri Sabyasachi Danadsena	Lanji	Lanji	0.75	Lalat	WHS	14.07.07	21.07.07	30.07.07	10.08.07	20.08.07	28.08.07
16	Sri Dinabandhu Podh	Kendupati	Lanji	0.25	Kushma	Chahala	03.08.07	18.08.07	27.08.07			
17	Ghansyam Bhitria	Birighat	Birighat	2.00	Swarna	LIP	21.07.07	1.08.07	10.08.07	20.08.07		
18	Hemapati Tandi	Bhaludunguri	Dabri	2.00	BPT/ Swarna	Rain	18.07.07	01.08.07	12.08.07	21.08.07		
		Total		8.30								

Prepared by: Mr. Birendra Dharua & Mr. Ghansyam Bhitria, SVA

Prabhakar Adhikari

Meeting Food Security of Tribal and Marginal Farmers through SRI: The Experiences of Pragati, Koraput

Introduction

Pragati, Koraput is a voluntary organisation established in 1992 to work for the cause of the poor and marginalised communities, especially tribals and the underprivileged sections of the society living in Koraput district of Orissa. Pragati works in 168 villages of 16 gram panchayats reaching out to 6979 households in Nandapur and Koraput blocks of Koraput. The areas of intervention are formation and strengthening of Community Based Organisations (CBOs), gender issues, Natural Resource Management (NRM), promotion of sustainable agriculture, disaster preparedness and rehabilitation; processing and marketing of NTFPs (Non Timber Forest Produce) and agricultural produce.

Pragati is implementing a project on Sustainable Agriculture through organic practices since 2003 in 40 villages in Koraput district. Pragati is also involved in awareness programmes on organic practices through video shows, exposure visits, wall posters, demonstrations, farmers' training, publication and distribution of newsletters and leaflets. Pragati has also enabled the formation of two organic farmers' associations. To meet the requirements of small and marginal farmers who lack capital to invest for seed, fertiliser and irrigation, Pragati has provided revolving fund that supports 485 families. Through Pragati's efforts 106 farmers have established vermi compost units and 250 farmers have been trained in the preparation of organic manures and pesticides.

Agriculture in Koraput

Koraput is the place of origin of many traditional varieties of paddy and rice constitutes the staple diet of people. Farmers of Koraput grow nearly 150 varieties of paddy. Agriculture is largely subsistence based and is influenced by several factors like quirky monsoon cycles, differential intensity of rainfall from place to place, soil erosion etc, which affect both the quality and quantity of paddy yield. Most of the lands are up lands constantly losing their fertility because of undulating topography of the area and large scale deforestation. Moreover, leeching of soil nutrients has made soil highly acidic. Further, with a view to maximise yield, farmers have started switching over to chemical fertilisers but yields have either stagnated or declined over last two decades after an initial spurt. The increased use of chemical fertilisers has increased the cost of cultivation and adversely affected sustainable fertility management of land. All these factors have made agriculture-based livelihoods unviable and led to deterioration of living standards of the farmers.

Koraput is located between 17° 40' - 20° 7' North latitude and 81° 24' - 84° 2' East longitude at an altitude of 900ft above mean sea level. According to 2001 census, 50.66% of the total population is scheduled tribes. Some of the major tribes are Paraja, Gadaba, Dora, Kondha etc. The total cultivable land of the district is 3,01,000 ha with an irrigated area of 78,000 ha in Kharif and 46,000 ha in Rabi. Area under paddy cultivation is 1, 13,000 ha which shows paddy is the primary crop grown in the district.

Agriculture is rain fed due to lack of assured means of irrigation. The climate is warm with mean minimum temperature of 5.8°C in Dec-Jan and mean maximum of temperature of 35°C during May. The monsoon starts from the second week of June and continues till the end of September. The average annual rainfall in the last 11 years is 1445.72 mm. The quantum of rainfall is enough for two crops if not more. However, frequent drought occurs due to the irregular and erratic rainfall pattern with short-term dry spells in between, which coincides with flowering or other critical crop growth stages causing crop failure. At the same time, heavy and torrential rains (150 to 250 mm intensity per hour) cause heavy run off resulting in sheet, rill and gully erosion.

The relative humidity is high during rainy season affected by South West monsoon, however, it is very low during winter and dry summer. The soil in the Koraput district is mostly red and lateritic in nature. The textures of the soil are sandy loam, clay loam, slightly to moderately acidic and have relatively low Cation Exchange Capacity (CEC)[25]. The soil is deficient in nitrogen, potash and some micro nutrients such as zinc and boron causing nutrient imbalances. The low lands and medium lands are suitable for growing paddy. Even in uplands, people grow short duration paddy. Hill, slopes, upland, pastureland are more erosion prone.

Our Experience of SRI

In March 2006, our staff members participated in a TOT (Training of Trainers) on SRI paddy technology organised by CWS (Centre for World Solidarity) at Sambhav, Nayagarh. Following the training workshop Pragati introduced demonstration of SRI in Koraput block action areas during the Kharif season. At first the trained staff imparted field based training cum demonstration in two phases for 25 farmers (three days duration each) which included preparation of land, seed testing, preparation of the seed bed, raising seedlings, transplantation, weeding, manuring and water management. Out of this, 11 farmers have experimented with the technology in their respective fields in Kharif 2006 for the first time in Koraput district in 2.5 acres of land.

Sri Dibakar Jani of Dayanidhiguda village in Kendar GP is a marginal farmer who was the first to adopt SRI technology in 0.60 acre of land (Kiari Beda). (See Box for the Case study). Previously he used to grow paddy in a patch of government land (half acre) i.e. only during rainy season and the yield he got could support the food requirement of his family for two months. For the rest of the year, he had to depend on wage labour since he had no alternate means of livelihood. After learning about SRI methodology from Pragati, Dibakar has experimented in 0.60 acre of land. Pragati has also documented the entire process of demonstration from land preparation to harvesting.

Similarly, other farmers adopting SRI technology are utilising 1 kg of seeds in total without using any chemical fertiliser or pesticides (See Table 8.2). Six other farmers of Mahadeiput panchayat have used 2 kg. of paddy seeds and harvested 6.9 quintals of paddy from 1.30 acre of land.

Table 8.1: Comparison from the experiences of demonstration

Ingredients	Traditional Method	SRI Paddy
1. Land area	0.60 acre	0.60 acre
2. Land type	Kiari Beda(plain step on a hill)	Kiari Beda(plain step on a hill)
3. Seed variety	Local (name unknown)	Local scented (Umuria chudi)
4. Seed quantity	40-45 kg.	2 kg. before treatment
5. Expenses for raising seedlings	Direct sowing.	Rs.50/- Date 8/7/06
6. Land Preparation	Only Ploughing. Rs.250/-	Ploughing Rs 250/- Dhanicha 5kg@ Rs.20=Rs.100/-
7.Manure	Rs.300/-urea and Gromore	1 Qtl Vermi compost, cow dung and farm yard manure Rs 450/-
8.Pesticides	Nil	Nil
9.Transplantation cost	Direct sowing	Rs.400/- Date 24/7/06 (16 days old seedling) Single transplantation.
10. Distance between plants	Unknown	Row to row 25 cm. and Plant to plant 25 cm. Not 100% uniform, due to lack of practice.
11.Weeding	Once (manually) cost Rs. 200/-	Thrice costing Rs.300/-
12.Fertiliser after weeding	Rs.300/- to 500/-	Nil
13. Pest and disease	'Chita'	No pest
14.Tillers	Not counted, less than 10.	Minimum 40 maximum 120.
15.Yield	75-80 kg.	4 Quintals. (400 kg.)

Table 8.2: Production in SRI with 1 kg. of seed

Sl.	Village	Name of the Farmer	Land	Production in Tonnes/ Hectares
1	Phulpadar	Ratan Gouda	20 cents	2.5
2	Kendar	Nila Gollari	10 cents	2.5
3	Kendar	Brundaban Gouda	20 cents	1.875
4	Kendar	Padlam Majhi	10 cents	2.5

These first trials are a learning experience for the farmers as well as for Pragati. Pragati has shared this experiment

[25] CEC refers to the quantity of negative charges in soil existing on the surfaces of clay and organic matter. The primary factor determining CEC is the clay and organic matter content of the soil. Higher quantities of clay and organic matter beget higher CEC. CEC is important because it provides a reservoir of nutrients to replenish those removed from the soil water by plant uptake.

in *Krushak Samparka Mela* (Farmers Contact Meet) which was organised on the occasion of the district level programme "PARAB" 2006 for cross learning and information dissemination among farmers. 300 farmers of Koraput and Nandapur block participated in the event at their own cost. The farmers who have practiced SRI method shared their experiences in the presence of a large group of farmers and officials from different government line departments. Pragati also developed a clay demonstration model reflecting different techniques of SRI like land preparation, raising seed bed, seedling transplantation, water management system, use of weeder etc. The demonstration stall drew attention of local farmers, agriculture as well as horticulture department officials, and we have received letters expressing interest and queries of farmers on SRI. We have printed and distributed leaflets on practices of SRI and case study of Sri Dibakar Jani to spread the success story of SRI.

Since in our action areas most of the farmers have small land holdings i.e. 1 to 2 acres, the yield most often is not adequate to feed them for even two to three months. Besides there is trend of increased use of chemical fertilisers which affects yield and cause damage to lands in the long run. Hence, we have planned to multiply the practice among more farmers, which can help address food insecurity and protect land fertility.

Pragati is taking initiatives for replication of SRI technology in its action areas. During the Rabi 06-07, nine farmers had taken up SRI. Professor Ashok Mohanty from OUAT, Bhubaneswar has documented the process in collaboration with OXFAM. Farmers have observed an increase in yield in an average of more than double from the same plot of land with lesser amounts of seeds and used only organic manures. During the current Kharif until to date 28 farmers have taken up SRI in different parts of our action areas. We have trained staffs who impart field-based trainings cum demonstrations for skill development of farmers, which is needed because it is different from the traditional system of paddy cultivation. Once the farmers learn about the technology and observe the differences for themselves, they will increasingly adopt the practice.

Our Observations and Learning

Based on our experiences we have the following observations and learning to share:

1. **SRI requires skill:** SRI requires some skills that are very different from the traditional practices of paddy cultivation. The farmer will have to learn about seed treatment, raised seedbed, land preparation and drainage, use of weeder, transplanting 8 to 12 days old seedlings, planting single seedling with wider space, which are very much in contrast to conventional practices. Unless the farmer is able to adopt all these techniques as a package they may not be able observe the differences. To change the age-old methodology of traditional paddy cultivation there is necessity of skill up-gradation of staff as well as farmers.
2. **Social mobilisation and demonstrations:** Social mobilisation and demonstrations are necessary and need to go hand in hand to motivate farmers to adopt SRI.
3. **Water management:** Proper water management and drainage is an important aspect of SRI methodology.
4. **Need to find varieties that can adapt better locally:** In our area we found that since the farmers have taken up long duration paddy there was problem in water management during the time of fruiting. Hence short duration paddy seems more preferred for SRI method of cultivation.
5. **Skill development to reduce labour costs:** Lack of practice resulted in labour intensiveness. Hence, there is a need for skill development of farmers. Lack of proper care at the time of transplantation damages plant growth and growth of tillers.
6. **Green manure is effective:** Use of green manure produced better results.

Dibakar Jani, a tribal farmer's story is one of the more successful stories on SRI in the state and has been recounted in some detail below. Pragati has been enthused by the progress of SRI and has decided to expand the area under SRI. More farmers have expressed interest in taking SRI forward. (see Appendix 8.1)

Case Study 8.1: Dibakar Jani

"Laying the foundation for a new practice"

Today agriculture is passing through a crucial phase. Over the past 50 to 60 years, the focus of all agricultural development has mainly been on maximising yields coupled with increasing specialisation in production and ever larger farm sizes. Yields have increased substantially contributing to increase in the ratio of total production but the small and marginal farmers and the environment have become victims at the alter of sacrifice. The ever increasing costs of cultivation due to dependency on external inputs, fluctuations in market prices coupled with vagaries of monsoon have made agriculture based livelihoods unviable.

This is the story of Dibakar Jani, a marginal farmer who has successfully experimented with a new technology to increase production. Dibakar Jani is a resident of Dayanidhiguda village, 8 km. away from the district headquarters at Koraput. He has a wife and four children, and his oldest son and daughter help in agricultural activities. Dibakar has no land of his own. He grows paddy in a piece of government land (half acre) i.e. only during rainy season. If the nature is merciful and there is no disaster, the yield he gets supports the food requirement of his family for only two months. For the rest of the year, he has to depend on wage labour since he has no alternate means of livelihood.

In June 2006 Dibakar had the opportunity to be a part of 32 member team of farmers who received field based training cum demonstration on SRI (System of Rice Intensification) technology of paddy cultivation and the preparation of organic manures and pesticides. It was organised by Pragati, Koraput. Back home, Dibakar decided to experiment with the new technology in half acre of land which is mortgaged with him by Sri Mugudi Santa of his village. Dibakar has paid a sum of Rs 2000/- for a period of three years. "I was so much excited that I at once made up my mind to experiment with it (SRI) whatever may be the output", says Dibakar.

At first he prepared the land and sowed Dhanicha seeds and after one month he ploughed the field for green manuring. He arranged the seed bed measuring 10ft. long, 2ft. wide and 6 inch height and sowed 2 kg. of Umuria chudi variety of seeds after proper processing. According to the existing practice of SRI technology the seedlings are transplanted within 8 to 12 days, but he was a bit late by 4 days due to sudden cessation of rains. He planted the seedlings one by one according to the spacing made before. Since he was doing it for the first time, he couldn't maintain the distance of 25 cm. from plant to plant and line to line. It was a little bit closer, so he couldn't use the weeder for weeding and he had to engage wage labour.

The difference was quite visible and it was a new experience for Dibakar. He was so delighted that he used to count the tillers**.** "There were minimum 50 and maximum plants had 100 to 120 tillers**"**. The panicles were also quite healthy. He has applied only organic manures i.e. four quintals of compost and one quintal vermin compost in total. For water management he was totally dependent on rain water. However in the fruiting stage he had to lift water through a motor pump since rains had stopped all of a sudden.

In last week of September the crop was ready for harvest. He got 4 quintals of paddy and another quintal was husk because there was delay in watering and the rain had stopped during the fruiting stage. However compared to traditional method of cultivation Mugudi Santa (real owner of the land) sowed 45 kg. of seeds and harvested 80 kg. to one quintal of paddy from the same land and also had to invest in chemical fertilisers. Dibakar on the other hand has harvested almost 4 times from 2 kg of seeds by improvement in skill. Though there are some gaps and it was a bit labour intensive since both the farmer and Pragati were experimenting for the first time, it has increased the confidence of Dibakar and his faith in organic practices. Now he is giving extra care to his vermin compost pit and motivating other farmers to adopt organic practices. The Agriculture department has also recognised Dibakar as a progressive farmer.

The extra yield will ensure food security for his family for a period of another four months. Now he won't be searching for wage labour and has invested in summer vegetable crop. In another three months time he will start earning from sale of vegetables. Henceforth he has decided to use SRI method rather than traditional one. The success of Dibakar has inspired other farmers in the locality and 28 farmers are practicing the technology in this Kharif.

The story of Dibakar can set example for small and marginal farmers.

Appendix 8.1: SRI Farmer Database in Koraput by Pragati

SRI farmer database in Kharif 2007

Sl. No.	Name of the Farmer	Address (Village, P.O & Pin code)	Block	Gram Panchayat	Land-holding (acres.)	Total Paddy Area (acres)	Paddy in Kharif (acres)	Paddy in Rabi (acre)	SRI Paddy (acre)	SRI History
1	Krutibas Gouda	Ghodadhara, Kendar, 764020	Koraput	Kendar	5.00	2.00	2.00	2.00	0.40	2nd time
2	Dibakar Jani*	Dayanidhiguda, Kendar, 764020	Koraput	Kendar	1.00	0.50	0.90	0.50	0.90	2nd time
3	Ratan Gouda	Phulpadar, Kendar, 764020	Koraput	Kendar	4.00	2.00	2.00		0.40	2nd time
4	Tankadhar Mukhi*	Bilaput, Mahadeiput, 764021	Koraput	Mahadeiput	5.00	5.00	5.00		0.70	2nd time
5	Dambarudhar Machha	Bilaput, Mahadeiput, 764021	Koraput	Mahadeiput	Landless				0.40	1st time
6	Mohan Guntha	Bilaput, Mahadeiput, 764021	Koraput	Mahadeiput	12.00	4.00	4.00		0.50	1st time
7	Trilochan Guntha	Bilaput, Mahadeiput, 764021	Koraput	Mahadeiput	5.00	2.00	2.00		0.50	1st time
8	Adhu Nayak	Gunthaguda, Mahadeiput, 764021	Koraput	Mahadeiput	8.00	3.00	3.00		0.50	1st time
9	Trilochan Pujari	Mastiguda, Mahadeiput, 764021	Koraput	Mahadeiput	Landless				0.30	1st time
10	Pradeep Natkhia	Daleiput, Mahadeiput, 764021	Koraput	Mahadeiput	2.00	1.00	1.00		0.90	1st time
11	Dhanurjaya Patro	Daleiput, Mahadeiput, 764021	Koraput	Mahadeiput	5.00	1.00	1.00		0.50	1st time
12	Damodar Patro	Daleiput, Mahadeiput, 764021	Koraput	Mahadeiput	8.00	2.00	2.00		0.30	1st time
13	Chandra Sekhar Patra	Daleiput, Mahadeiput, 764021	Koraput	Mahadeiput	8.00	2.00	2.00		0.30	1st time
14	Rabi Routa	Daleiput, Mahadeiput, 764021	Koraput	Mahadeiput	12.00	3.00	3.00		0.50	1st time
15	Purnima Routa	Daleiput, Mahadeiput, 764021	Koraput	Mahadeiput	Landless				0.50	1st time
16	Bhagabati Guntha	Daleiput, Mahadeiput, 764021	Koraput	Mahadeiput	Landless				0.50	1st time
17	Surendra Masti	Mahadeiput, 764021	Koraput	Mahadeiput	7.00	2.00	2.00		0.50	1st time
18	Suryanarayan Patro	Mahadeiput, 764021	Koraput	Mahadeiput	7.00	2.00	2.00		0.40	1st time
19	Debsan Guntha	Litiguda, Mahadeiput, 764021	Koraput	Mahadeiput	2.00	0.50	0.50		0.15	1st time
20	Guru Khillo	Panasput, Mahadeiput, 764021	Koraput	Mahadeiput	3.00	1.00	1.00		0.10	1st time
21	Ghanashyama Paika	Belguda, Mahadeiput, 764021	Koraput	Mahadeiput	5.00	1.00	1.00		0.15	1st time
22	Balabhadra Gadba	Karanjiguda, Mahadeiput, 764021	Koraput	Mahadeiput	2.00	1.00	1.00		1.00	2nd time
23	Subarna Pangi	Toding, PO: Chatwa Pin: 764038	Nandapur	Chatwa	3.00	2.00	2.00	1.00	0.20	2nd time
24	Bhaktaram Guntha	Sariaput, PO: Chatwa Pin: 764038	Nandapur	Chatwa	2.20	1.20	1.20	1.20	0.10	2nd time
25	Krushna Khora	Kanti, Badel Pin: 764038	Nandapur	Badel	3.00	2.00	2.00	1.00	0.10	1st time
26	Siddheswar Badnaik	Hanjarpentha, Bheja, 764038	Nandapur	Bheja	5.00	4.00	4.00	2.00	0.50	1st time
		Total			**114.20**	**44.20**	**44.60**	**7.70**	**11.30**	

NB: All the 26 farmers are motivated by 'Pragati', Koraput and trained at Sambhav, Nayagarh

Appendix 8.2: SRI Adoption in Rabi 2006- 2007

Sl. No	Name of the Farmer	Address (Village, P.O & Pin code)	Block	Gram Panchayat	Land-holding (acres)	Total Paddy Area (acres)	Paddy Kharif (acres)	Paddy in Rabi (acres)	SRI Paddy Area (acres)	SRI History
1	Subarna Pangi*	Toding, PO: Chatwa Pin: 764038	Nandapur	Chatwa	3.00	2.00	2.00	1.00	0.20	1st time
2	Bhaktaram Guntha	Sariaput, PO: Chatwa Pin: 764038	Nandapur	Chatwa	2.20	1.20	1.20	1.20	0.10	1st time
3	Nukana Gemel	Pogra ,PO:Chatwa Pin:764038	Nandapur	Chatwa	2.00	1.50	1.50	0.50	0.10	1st time
4	Bandhu Khillo	Vill: Padalput, PO: Golluru, Pin: 764038	Nandapur	Golluru	2.50	1.50	1.50	0.50	0.10	1st time
5	Ramdas Khillo*	Kathua, Panthlung, Pin:764038	Nandapur	Panthlung	3.00	2.00	2.00	2.00	0.10	1st time
6	Krupasindu Kurkuria	Mali Ambel, Balda, Pin:764038	Nandapur	Balda	4.00	2.00	2.00	2.00	0.10	1st time
7	Jalakrai Khora	Saput, Balda, Pin: 764038	Nandapur	Balda	3.00	2.00	2.00	2.00	0.10	1st time
8	Biswanath Muduli	Raising, Pin: 764038	Nandapur	Raising	3.00	3.00	3.00	3.00	0.50	1st time
9	Krutibas Gouda	Ghodadhara, Kendar, 764020	Koraput	Kendar	5.00	2.00	2.00	2.00	0.40	1st time
		Total			**27.70**	**17.20**	**17.20**	**14.20**	**1.70**	

NB: All the 9 farmers are motivated by 'Pragati', Koraput and trained at Sambhav, Nayagarh

Pravash Chandra Satpathy[26]

Innovating into SRI

Pravash Satpathy is an organic farmer with an inquisitive mind. He has been a full-time farmer since 1978 after retiring as a laboratory assistant at the Maharaj Purna Chanda College at Baripada. He gathers information on agriculture from various sources such as the quarterly 'CRRI Newsletter', and the journal *'Indian Farming'* brought out by ICAR. Ever since he started farming he has continuously been experimenting, leading to several innovations.

In total he has 14 acres of land of which one acre is a fish pond. It is situated in Belam in Mayurbhanj district, an area where temperatures can reach up to 45°C in summer and drop to 10°C in winter. His land receives 1200 to 1400 mm of rainfall every year. His farm is known as Matiala farm because the soil is mostly Matala – heavy clay. Most of the area is medium land, and it is situated at the bank of river Budhabalanga, a large river that meanders through north-east Orissa.

Previously it was a drought prone area, but when in 1979 an electric line passed through the village and they installed five LI (Lift Irrigation) points on the river bed, the situation changed over night. This greatly improved the potential of his land, and now he experiences a severe labour shortage at peak times. The fact that most labourers are marginal to medium-level cultivators complicates the matter, since they complete their own work first. Satpathy uses an electric pump to lift water to his land that is 45 feet higher than the river bed.

Innovations in Ratoon Cultivation

Satpathy is a rare farmer innovator who is constantly on the lookout for something different and willing to experiment and learn. Starting out with rice cultivation because he did not succeed in vegetable crop cultivation due to the heavy clay soil which cracked under dry condition and waterlogged when irrigated, he later changed to ratoon rice cultivation. This cultivation technique is only sporadically used in India and does not receive much scientific guidance and backing. As Mr. Satpathy says, when there was published anything at all then they often reported poor yields. But the high quality, high density and variability of the seeds is also mentioned, and Mr. Satpathy also observed this himself. Realising that selection of variety, stage and time of harvesting is important for ratoon cultivation, he examined many different varieties and practices. To satisfy his curiosity he has spent a lot of energy, time and resources, and he thinks that sometimes he went in the wrong direction. However, he is convinced that ratoon rice cultivation can actually lead to high yields.

In the meanwhile he was also experimenting with a rice-fish system of cultivation, finding out all the particularities that play a role in maximizing the yields of both rice and fish. He experienced problems ranging from water control and preparation of the fields, to the control of rats, parakeets and crabs, which all gave him incentives to find solutions and modify his practices.[27] Whenever he was uncertain about his capabilities after some bad experiences he courageously persisted, believing that a person with a thirst for learning can add a little to the body of knowledge and method of doing it.

About 22 years back he found a solitary plant of a long duration photosensitive desi variety called Haldigundi (see box 9.1 for what Satpathy wrote about his special fancy for photo sensitive varieties). The plant had grown along with some weed plants in a shallow portion of a pond which they call Bagachara – the grazing ground of cranes. This solitary plant only had five panicles but to his surprise these were extraordinarily long. The longest contained 850 grains,

[26] Written by Koen Beumer based on interview with Satpathy and inputs from and Debasis Mohanty and C. Shambu Prasad

[27] Information retrieved from two articles written by Mr. Satpathy in the CRRI bulletin:

- Pravash Chandra Satpathy (2001). Integrated rice-fish-ratoon rice cultivation for higher economic return. Odisame Atyadhik Dhan Utpadan- Saphal Kisano Ki Jubani [Rice production in Orissa – Farmers success story]. November: 26-27.
- Pravash Chandra Satpathy (2001). Ratoon rice cropping. Odisame Atyadhik Dhan Utpadan- Saphal Kisano Ki Jubani. November: 26-27.

the four others contained 700-750 each. Year after year Mr. Satpathy kept counting the number of tillers, mature panicles, viable grains and the weight of the grains of rice plants grown in a solitary place in the midst of a shallow channel, or a shallow bottom of a pond. The most vigorous plant had 92 panicles weighing 135 grams.

Box 9.1: My love affair with photo-period-sensitive varieties of rice

When I had just begun farming a friend invited me to visit his farm. There he presented me a rice panicle from the variety called Haldigundi, a long duration photo-sensitive indigenous variety with a good quality and yield potential. It impressed me greatly. The outstanding feature was its extra long panicles. My love for Haldigundi began then and there. Its panicles were 35 cm. long, having 400-350 seeds per panicle, yellow-brown in colour, bolls of about 38.5 grams per 1000 seeds at 26,000 seeds per kg.

In August 1979 I got another variety called OR-117-1, on which I had no information whatsoever. He sowed seeds in the seedbed quite late on the 9th of August and transplanted 25 days after sowing. It took 117 days to mature. Next year I sowed the seeds in the seed-bed in time, i.e. in the second week of June. However, it matured at the same period of the previous year in December, taking 160 days instead of 117 days. In both years the yield was good and almost equal. I was intrigued, puzzled. This variety could be sown late and its duration period could be shortened up to 40 days by manipulating the sowing dates without much less yield! So why then are they classified as 150-160-180 days varieties? Indian farmers were familiar with such phenomena and knew the answer through ages of observation. The important physiological stages were marked by rituals and celebrations. Ignorant of the phenomena, I took it as a revelation.

Not only was this intriguing, in my particular circumstances this could also be very useful. Because most labourers are marginal to medium-level cultivators and first complete their own works. So I get them mostly from mid August to November and again from mid December onwards. I had to schedule my work accordingly. 75% of my land is now planted late – from mid-August to mid-September – and harvested late in the month of December. This urgency has forced me to learn and to find out why photo-sensitive varieties could be planted late, why they still can be harvested at a fixed time of a month, how they could be manipulated to be used as a short to mid-duration variety, how they could be used as dalua crop, as ratoon crop, and be simultaneously suitable for rice-fish systems.

Next year I chose the Haldigundi variety to verify these mechanisms myself. He sowed seeds from the first week of June to the 9th of August, and transplanted on different dates, transplanting 30 to 70 day old seedlings. All plants matured between the 25th and 30th of November. I continued working on this, and as late as 1983 I had prepared a list of indigenous photo-period sensitive rice varieties which flowered and matured on different dates of the months. There were certain desi varieties which matured on almost every week of the month, starting from September to January. Before the advent of HYV photo-insensitive varieties, farmers just choose a variety out of a number of prevalent varieties, keeping an eye on its time of harvesting. I regret it that now all these excellent varieties are almost extinct.

Meanwhile I have learnt from Dr. A. Mishra who I consulted on this matter that photo-period-sensitivity means that the plant requires a specific day-length and some agro-climatic conditions for the completion of its cycle. It may need to wait for the proper time to come, called the lag-vegetative phase, and at this time it does not grow. This may last from 0 to about 60 days. So by reducing the duration the yield is not reduced, but only the lag-vegetative period is omitted. This discovery has been of great value to me. [28]

System of Mustard Intensification (SMI)

One of the most interesting instances illustrating his inquisitive mind was an experiment with mustard plants, which he conducted since 1985. By chance he had found out that when a desi variety of an Indian mustard plant would be planted singly and with adequate space in a fertile field, it could yield as much as 250 gm/plant. This is an enormous yield when compared to yields of normal mustard cultivation practices. He experimented with this over the years, and developed a system of cultivation which he presented at several meetings. This remarkable innovation even became the feature of a documentary made by the ETV Oriya. By using 200-400 gm of the seed per hectare, raising them in a nursery and transplanting the young seedlings in the wet field in lines, the yield can increase about 150 to 200%.

At another time he found a single plant of another variety that had grown in a non-competitive place, and had grown to maturity without intervention. It was huge plant, and Mr. Satpathy was so thrilled that he uprooted the whole plant and sent it to an agriculture exhibition held at the district Agriculture Office campus. Still, he did not think of applying the same technique in rice cultivation that he had applied in mustard cultivation, because, according

[28] Pravash Chandra Satpathy (2001). My love affair with photo-period-sensitive varieties of rice. Odisame Atyadhik Dhan Utpadan- Saphal Kisano Ki Jubani [Rice production in Orissa – Farmers success story]. November: 26-27.

to himself, he was taught differently, he was caught in a mindset.

SRI a Natural Progression of Experimentation

Mr. Pravash Satpathy first heard about SRI in 2004, while reading the November issue of Indian farming.[29] As he mentions, at the time he was already mentally quite prepared to accept the philosophy and technology of SRI because he had been experimenting along a similar line with mustard plants since 1985. At the time he read the article on SRI everything fell in the right place and unlike other farmers and research scientists he recognised the possibility. Given his experience with mushroom and his love for innovation, Satpathy immediately chose to try it out.

He did not receive training on SRI from anybody; he read a few articles and followed his intuition. SRI, according to Mr. Satpathy, is a low density plant system which depends on the individual capacity of the plant. Mr. Satpathy has been practicing SRI in the last four to five years and has tried out SRI in various ways. He tried out different spacings varying from 25x12.5 cm. to 40x40 cm. Normally he uses a spacing of 25x20 cm. for long duration varieties, while using 20x20 cm. for short duration varieties. He transplanted 10 day old saplings as well as 45 day old saplings, used both single and double seedlings, and practiced both organic and inorganic cultivation.

Results

Mr. Satpathy tried out a great variety of practices, differing in single or double seedlings, the date of transplantation ranging from 10 to 45 days, differences in spacing ranging from 23x23 cm. to 40x40 cm, practicing organic as well as inorganic cultivation, and trying out many different varieties. Starting with Rabi 2004, continuing in Kharif 2005 and vastly increasing the experiment during Kharif 2006 and Rabi 2006, the results clearly show that the yields improved after being more acquainted to the system. Appendix 9.1 gives a good indication of the meticulous experimentation that Satpathy undertook and what characteristics he was comparing the various trials for. Both in organic and inorganic practices the highest yields were gained during Kharif 2006.

With organic farming the highest yields (0.78 kg/m^2) were attained by placing one seedling per hill of the variety called IET – 5656, and by transplanting 16 day old saplings – the youngest he tried. He tried out transplanting up to 30 days, but the later the transplantation was done the lower were the resulting yields. Also, in organic farming, he experienced a remarkable difference between single and double seedlings, with yields from placing one seed at a time being considerably higher. Whereas the highest yield with single seedlings was 0.78 kg/m^2, the highest yield with double seedlings was only 0.485 kg/m^2.

In inorganic farming his highest yield was 0.93 kg/m^2, transplanting two 23-day old seedlings per hill and using a fertiliser at a rate of 57 – 25 – 30. This yield was quite higher than organic farming, although it must be said that the results of inorganic farming varied a lot throughout the seasons, with the lowest yield being 0.45 kg/m^2. In general the plants that were transplanted late, 40-45 days did not yield well.

Constraints

In spite of his best efforts, Mr. Satpathy has not yet been able to get a yield of 205 grams from a single rice plant. One of his main concerns is whether the soil is depleting nutrients after high production. At a certain point Mr. Satpathy was applying five to six t/ha green manure, but even with this amount of manure the yield did not increase. In other words, he found the nutrients were reducing, no matter how much green manure he added.

One of the major problems he encountered was the control of grasses and weeds, which flourish in SRI fields. Also labour can be a problem. First of all, Mr. Satpathy thinks that practicing SRI will require relatively much labour, which will increase costs. Second, labour can be a problem because it might not be available at all. In addition to the earlier mentioned problems in his region with most labourers giving first priority to their own fields, in Rabi Mr. Satpathy encounters this labour problem again because during the month of January a local festival called 'Makar Sankranti' is celebrated in his region. During this time, people do not work for 15-20 days. This leads to a late start in Rabi, which in turn affects the production. In his particular context, this makes Kharif the preferred season to practice SRI.

[29] Kumar, D. & Shivay, Y.S. (2004). System of rice intensification. *Indian Farming*. November: 18-21.

Dissemination and Future

During the last four to five years, several farmers came to see his fields, even travelling all the way from other districts. Usually the farmers were interested in both the drum seed method and SRI, but they didn't dare to practice it. Only one farmer was interested to such an extent that he has taken up Mr. Satpathy's ideas. Mr. Satpathy keeps in touch with him, and this farmer also is promoting it to other farmers. According to Mr. Satpathy, unless the government will push farmers or provides incentives, they may not practice SRI. Fortunately this year another four to five farmers became excited about SRI following a trial on SRI in 1-2 acres of land by the Krishi Vigyan Kendra at Samakhunta, the agriculture science centre of the government.

The constraining factors and the lack of initiatives from nearby farmers did not stop the enthusiasm of Mr. Satpathy. He thinks the road is still long. Though well over 70, he continues to experiment and is always on the lookout for improving practices. Initially he has been using the four-row manual rice transplanter, Mr. Satpathy has now switched to the drum seedlings method. This new innovation arouses his enthusiasm, for it reduces the burden of high costs. Using the drum seeder is cheaper than transplanting. The drum seeder, which requires two labourers to pull, takes away costs for uprooting, transport and transplantation, thereby also saving the scarce labour that is available. Currently Mr. Satpathy is trying to combine SRI with his drum seedlings method of rice cultivation. He is also not averse to trying out direct seedlings and is keen to know more about the results of such experiments in SRI.

Appendix 9.1: Experimental Results of Pravash Chandra Satpathy

Sl. No.	Year Season	Variety	Ferti Rate	Spacing in cm	Transplanting D.A.S	Seedling /hill	Panicles /hill	Panicles /m2	Average wt. of Each Panicle (in gm)	Yield/m² in Kg.
1	2	3	4	5	6	7	8	9	10	11
1	2004 Rabi	PNR 162	80-30-50	25X25	28	2	14	226	2.27	0.515
2	2004 Rabi	Kharabela	80-30-50	25X25	28	2	19	304	1.91	0.581
3	2005 Kharif	Pusa - 44	45-28-30	30X30	21	1	20	218	2.75	0.7
4	2005 Kharif	Pusa - 44	40-25-25	30X30	25	1	18	200	3.25	0.6
5	2005 Kharif	Pooja	39-22-20	25X25	40-45	2	18.87	302	1.49	0.45
6	2005 Kharif	F1 Sahyadri	93-50-50	30X30	27	1	18	200	3.25	0.6
7	2005 Kharif	Pratiksha	39-22-20	25X25	40-45	2	13.25	212	2.36	0.5
8	2005 Kharif	Salibahan	39-22-20	25X25	40-45	2	13.06	231	2.49	0.575
9	2006 Kharif	P – 44	45-25-25	30X30	29	2	15	181	2.9	0.525
10	2006 Kharif	F1 –Suruchi	90-50-60	30X30	10	1				0.87
11	2006 Kharif	F1 –Suruchi	95-50-60	30X30	13	1				0.65
12	2006 Kharif	F1 –Suruchi	95-50-60	25X25	13	1				0.65
13	2006 Kharif	CR – 1018	55-30-30	25X25	35	2	15.8	421	1.52	0.64
14	2006 Kharif	CR – 1018	55-30-30	25X25	35	2	17	272	2.61	0.712
15	2006 Kharif	CR – 1018	55-30-30	30X30	35	2	24.5	270	3.148	0.85
16	2006 Kharif	CR – 1018	48-27-30	25X25	24	2	16.3	261	2.77	0.725
17	2006 Kharif	CR – 2033-1	48-27-30	25X25	24	2	10.56	169	4.64	0.785
18	2006 Kharif	Pratiksha	57-25-30	25X25	22	2	17	272	2.9	0.791
19	2006 Kharif	Pratiksha	57-25-30	25X2.5	23	2	9.8	314	2.96	0.93
20	2006 Kharif	OR 1898-8-21	45-25-30	25X25	19	1	11.56	185	3.6	0.667
21	2006 Kharif	OR 1898-32-69	45-25-30	25X25	19	1	12.62	202	3.61	0.73
22	2006 Kharif	OR 1898-32-69	45-25-30	25X25	19	2	12.68	203	3.817	0.775
23	2006 Kharif	IET-5656	45-25-30	25X25		1	11.9	191	3.61	0.69
24	2006 Kharif	Nabin	55-30-35	23X23	21-22	2	18.55	352.5	2.0	0.705
25	2006 Kharif	Udayagiri	55-30-35	23X23	19	2	19.26	364	1.80	0.658
26	2006 Kharif	Udayagiri	55-30-35	25X25	19	2	16.46	263.5	2.94	0.775
27	2006 Rabi	Nabin	85-30-35	25X25	13	2	15.46	247	2.65	0.62
28	2006 Rabi	CR 898	95-30-45	25X25	18	1	14.7	235	2.937	0.69
29	2004 Rabi	PNR 162	No fertilizers applied. Only FYM 10 t/ha GM 20t/ha in a field of 0.1 ha	25X25	30	2	13.6	217	1.65	0.36
30	2004 Rabi	Gajapati		25X25	30	2	13.3	213	1.948	0.415
31	2005 Kharif	IET 5656		40X40	18	1	18.4	115	4.13	0.475
32	2005 Kharif	IET 5656		40X40	18	2	31.76	198	2.5	0.495
33	2005 Kharif	F1RH 404		40X40	19	1	35.7	223	3.14	0.7
34	2005 Kharif	OR 1885-16-32		40X40	19	1	28.9	180.8	2.76	0.5
35	2006 Kharif	IET 5656		40X40	16	1	27.2	170	4.1	0.7
36	2006 Kharif	IET 5656		30X30	16	1	19.55	213	3.7	0.78
37	2006 Kharif	IET 5656		30X30	17	2	16.39	182	2.747	0.5

Natabar Sarangi[30]

My Experiments with SRI

Beating My own Drum

I was a Government School Teacher and retired in the year 1992. Now I am completely devoted to agriculture - an organic farmer and indigenous seed conservator. My father was a sincere and successful farmer. He was violently opposed to Green Revolution (GR) technology i.e., chemical farming. I insisted on GR practices and rather forced him to adopt the method on his own field. We need chemical fertiliser, pesticides, HYV seed and more and more water. By the time I retired yield from our own land had declined substantially. Organic manure had been forgotten. Bullock plough was replaced by tractors. Pesticides ruled even though pest and diseases multiplied. Soil health deteriorated. Earthworms, micro-organisms, frogs, snails, oysters were decimated. It is the situation in the whole of India, all the Asian countries and hence in our village Nariso too. The miracle seed of GR had failed.

Sir Albert Howard (1940 – An Agricultural Testament) and Musanobu Fukuoka (1994 – One Straw Revolution) challenged the legacy of Von Liebig, the proponent of chemistry in agriculture.[31] Chemical farming is unsustainable. Organic farming is a viable alternative to GR practices. It can assure good production and food security to hungry millions of Asia and Africa. Howard experimented on India and Fukuoka in Japan.

In my two hectares of farmland I am growing rice and vegetables completely organically since 1996. Today I have been able to conserve, multiply and distribute 231 varieties of indigenous rice seeds to the farmers. It is a very difficult endeavour. However my secretary Jubaraj Swain, who is more than a Block Level Agriculture Officer, helps me in all the field work. We produce 3 metric tons of rice/ha on average, higher than the Indian average of 2.3 MT/ha and the Orissa average 1.5 MT. Organic farming is eco-friendly, less expensive and assures healthy food to man, animal and birds. More than 30 farmers of Nariso and its adjoining villages of Khurda district are now growing organic rice on their field with indigenous seed from our organisation – SPARD (Society for People's Awareness and Rural Development).

Advent of SRI in Nariso

The System of Rice Intensification came to my notice from an article in LEISA India sometime during 2002. It appealed to me. The whole methodology of SRI as illustrated by Prof. Norman Uphoff of Cornell University is based on organic farming – use of traditional rice seed variety and compost. The rationale of SRI – transplanting young seedlings, weeding and use of less water as compared to conventional rice cultivation appeared very much scientific. Dr. R. H. Richharia of CRRI, Cuttack practiced clonal propagation of rice with 10-12 day-old seedling to meet the seed requirement of rare land races. My father has also ploughed young seedlings (12-15 days old) and was getting excellent tillerings. The principles of alternate drying and watering in SRI fields, weeding at regular intervals was quite convincing as I think this is good for aeration of soil that would hasten rapid root growth.

I adopted SRI in 10 cents of rice field in Kharif-2003. We belong to the coastal area of Orissa. Besides annual rainfall of 2300 ml water table is very high and canal irrigation is secured. I followed all the methods of SRI, but could not save the SRI patch from flooding. The result was disappointing. Average tillers per hill was 27 and yield was 3.8 MT/ha.

Again I did SRI in the Rabi – 2003 (Summer Rice) and since then I am continuing the practice and 23 farmers of our organisation (SPARD) are also growing SRI rice in small plots. I would like to give a brief description of SRI in Nariso that may give some impression of our failure/achievement till now.

[30] I thank Shambu Prasad, Debasis Mohanty and Koen Beumer of Xavier Institute of Management, Bhubaneswar for enabling the networking of SRI farmers, Government and other Agencies in Orissa. SRI has a bright future for Rainfed Districts in Orissa.

[31] I am thankful to Norman Uphoff for pointing out to me that Von Leibig had become a strong proponent of biological factors in soil fertility towards the end of his career.

SRI Practices at Nariso

Seed Variety

Our SRI farmers use traditional rice seed varieties such as Jeera Dhan, Solari, Govindbhog, Pimpudibas, Prachi, Bidulata and many such varieties that are appropriate for medium land with duration of 125-135 days. Though SRI recommends seed 2 kg/acre in practice we use 3 kg/acre to meet germination hazards.

Seed Bed

Seed beds are raised close to the SRI field. Farmers spread banana leaves on the ground, and put thoroughly mixed earth and FYM (1:1) on the leaves (4" height). They soak rice seed for 24 hours in water. They remove water completely and smear the wet seed with cow urine (200ml/3 kg. seed) to enhance germination and save the future crop from pest or diseases. Wet seed is kept on a jute sack for 15-20 hours. The seed just begins to sprout by this time. The seed is then thinly spread on the seed bed and FYM covers the seed (half inch height). The method gives vigorous growth of seedlings and they gain a height of 12-15 cm. on the eight day spreading thus quite ready for transplantation.

Field Preparation

Dry soil ploughing is conducted twice. This helps to expose earth to sunlight and air and the field is made immune to pest and diseases. Puddling and levelling operation is completed just before transplantation, leaving 0.5 cm. water standing over the soil after levelling. This helps transplantation and saving roots and foliage of young seedlings.

Manuring

Whole of FYM (farm yard manure) or compost, neem or Karanj oil cake and a few baskets of earth soaked with cow urine (5 baskets/acre) are put on the field at least a week before puddling operation. Bio-fertiliser is rarely available at our place. I bring it from Agriculture Department and besides using in my field I provide it to other farmers. As medium land is very much suitable for SRI, we use Azoto bactor and Soluble Phosphorous Bactor (SPB) 2 kg. and 1 kg. respectively. Bio-fertiliser is thoroughly mixed with old FYM 24 hours before incorporation in the field and is kept in a shady place covered with a wet jute sack. This helps multiplying available micro-organisms in the stock.

Transplanting

Young seedlings of 8-12 days are carried to the nearby field in baskets. They are not uprooted. They are removed from the seed bed along with base material and are individually separated in the rice field with at most care not to damage baby roots. We use rope and stick for marking. Coil rope is marked at every 25 cm. length and two sticks of 25 cm. length each are used to keep the width of rows uniformly.

Initially the process was found very much labour intensive. Farmers and field workers did not feel comfortable to follow the method. However with experience from 2 - 3 seasons they are now skilled. Now transplantation needs 12-15 labour days/acre. Seed separation is managed by the workers during plantation. We dip the seedling straight about one inch in the soil.

Water Management

Canal irrigation is available in our locality. 15-20 mm water stands on the SRI field for a week after transplantation. Water is drained out and filled in the field alternatively at 8-10 days interval. In no case the height of the standing water will be more than 25 mm. In such case emergence of tillerings shall be arrested and root rotting may spoil the plant. Only wet fields help multiplying tillering number. Such practice continues till the inception of panicles that can be visible on the plant. Standing water to the height of 30-35mm is essential for emergence of healthy panicles and ripening of grains. Water is drained out of SRI field when 60% of grain is ripe.

Weeding

We conduct weeding at 15 days interval for the first 45 days of transplanting after 12-15 days from the date of transplanting. Initially we used an improvised bamboo weeder. It did not work effectively. Now SPARD has purchased a metallic weeder (rotating) from CRRI, Cuttack. Farmers use the weeder as and when they need mutually. Field is completely drained out before weeding. It helps good aeration and rapid and luxuriant root growth. Fundamental concept and science of SRI is root growth and so we name the practice as the 'Root Revolution'.

Management of Pest & Diseases

Traditional variety of rice and organic method of farming does not allow pest or disease in the field. Use of neem/ Karanj oil cake and cow urine is enough to make the field free from pest or disease.

Field Experience and Result

Till now we have been able to grow 57 tillerings/hill. Ninety percent of the tillerings are seen effective tillers and hold

panicles. Panicles are 25-30 cm. long carrying 200 plus bold grains. We are still in research to grow 95% effective tillerings and 75 tillers/hill is our target for Rabi 2008.

Constraints and Suggestions

1. **Seed:** SPARD is the only source for indigenous rice seed varieties. We do not get any support from Government/ OUAT/CRRI to maintain continuity of seed production which is very much cost intensive. However, our present effort can meet the seed requirement of 500 farmers. The programme needs attention of Government and other stakeholders.
2. **Weeder:** SRI is for resource poor farmers. They cannot afford to buy weeders that cost Rs 700/800 each. Farmers' SRI cooperatives under 2002 self reliant Cooperative Act needs to be formed. Such innovation would help popularising SRI. SRI target group should be small & consist of marginal farmers, share croppers and women.
3. **Organic Manure:** Every farmer should have at least one cow and a calf of heifer. Annual composting of cow dung urine and farmyard waste would be enough to feed one acre of SRI Field. Such expectation can be materialized through co-operative loan, otherwise SRI won't be meaningful. Co-operatives can effectively provide neem oil cake, biofertilisers through a common pool.
4. **Training & exposure visits:** Training of farmers and field visit is the most important component for SRI implementation. Government Agency even with a large number of Agri-scientist and professionals can hardly be able to meet training requirement. Well experienced SRI farmers and V.Os working on SRI (organic way) can prove better trainers.

SRI is a system that could be taken in different directions. It is quite possible that in their attempt to create a second green revolution SRI is promoted to enhance GM rice as well. However I think an important point to consider is whether such directions would help in enabling greater control for farmers or not. A more fruitful direction in SRI is to enhance productivity of long neglected indigenous varieties of rice as this could have greater impact on the livelihoods of several small and marginal farmers even as it is beneficial to the soil in the long run. We perhaps need to focus on this much more. Seed sovereignty of farmers can be guaranteed through SRI.

"Long Live SRI Long Live Organic Farming"!

D. Narayan[32]

Discovering SRI: Lonely Searches and Running Ahead

I am a 50 year old commerce graduate from Makarjhola village of Hinjilikut block in Ganjam district, and for the last 37 years I have been a progressive farmer. My prime occupation is cultivation, but I also spare time for social work. In 1984 I was the Sarpanch of Makarjhola gram panchayat and Panchayat Samiti member. Also I participate in activities of the NGO called United Artists Association working in the interest of farmers, although I am not an active member.

Being an inquisitive farmer I try to acquire all the information I can find on farming. I try to attend any agriculture fair, seminar, workshop and training programme within my reach. For example I often attend programmes in Sambhav, an NGO focused on organic farming, and I also attend programmes of the Horticulture Department. A couple of times I went to Vijayawarda, Andhra Pradesh, and I regularly watch agriculture-based television programmes. Basically I just try to gain knowledge on agriculture and its practice. I think every farmer is a good source of information because he needs and collects information on weather, markets, government policy and emerging technologies related to agriculture.

My Land

I have eight acres of agriculture land, which is my parental property. The entire area is irrigated by water from a canal that comes from the river Rushikulya, and the soil is sandy and black cotton in nature. I have one pair of bullocks, one cart, and one 2HP diesel motor. In the last six years I have adopted organic farming practices for all my crops in order to save my soils from the ill effects of chemical fertiliser-based farming. Apart from rice that is the staple crop in Orissa, I grow a variety of crops, with paddy, groundnut, ragi, til, and green gram as regular crops. Also I have replanted a mango orchard in an area of 0.8 acres after this was destroyed by the super-cyclone that hit Orissan shores in 1999.

Since 1986 I have a biogas plant operating that meets the fuel needs for my family of 6/7. Since the cow dung from my two bullocks is not sufficient for the biogas plant, I offer the use of my large cattle shed to others for their cattle, in exchange for which I get the dung instead of rent. Last year I also started a vermi compost unit. It is 350 square feet in size and has a capacity of 20 tons. I had to invest in this myself, as I found little cooperation of commercial banks in financing such units for farmers. Despite a plethora of schemes the support mechanisms from lead banks such as NABARD for organic farming are poor.

My Introduction to SRI

The first time I heard about SRI was while watching an ETV programme in Oriya called Annadata. This was in May 2005, just before Kharif season. The high yield potential and the new method of cropping of SRI sounded very interesting, and I became curious to know more about the new technique. I called Mr. R. Madhav Rao, a relative of mine from the Sikakulum district of Andhra Pradesh, but because SRI was just recently introduced in Andhra Pradesh, Mr. Rao could not tell me much about it. He did give me a phone number of an agricultural scientist at Sikakulam from whom I got some tips.

His specific advice was to replicate SRI in a small area, which I did straight away. I tried to get some more information and guidance from the local agriculture departments, but I did not succeed. At the same time I heard that the Krishi Vigyan Kendra (KVK) in Bhanjanagar in the Ganjam district had experimented with SRI in a small patch in its campus, but I was not in a position to visit. Despite the disappointing lack of guidance and help I felt I should persist with trying out SRI.

Nevertheless, despite these difficulties in gaining information on SRI and the risk of low or no return, I enthusiastically

[32] As told to Debasis Mohanty and Koen Beumer

decided to go ahead with it. I had not eye-witnessed any SRI-based cultivation, nor had any formal training, but its high yield potential and its new method was very interesting. I just applied my own ideas and understanding for the experiment. After 35 years of farming experience I took up SRI as a challenge. I chose a small field of 0.27 acres and started implementing SRI in Kharif 2005.

Kharif 2005

I followed the main SRI principles in my land. They included transplanting young seedlings, single seedling per hill, gap between plant to plant at 25 x25, and alternate wetting and drying instead of flooding the field. Because the seeds and roots of the seedlings should not be submerged in water I did not prepare a specific seedbed. I just used a part of the seedbed that I also used for conventional rice cultivation. As a practicing organic farmer I usually prepare the seedbed very carefully with bountiful of manure and paying close attention to the water management. Also with the main field preparation I just went ahead as I did usually, paying more attention to proper levelling. I did not canalise the fields as they are only small in size, and made sure the bed remained un-flooded.

The variety I used for the first SRI experiment was Seshadri from Maharastra. I only used this because other fine varieties were not available during that time. I transplanted the seedlings after 11 days. At the time I was not yet aware of more technical components, so I neither marked nor measured the root length. With proper guidance to the labourers the transplanting happened very carefully. Every 10 to 15 days I wetted the field, keeping it wet and moist. Nearly 50% of the water requirement for traditional farming was saved.

I used oil cake as fertiliser as I normally do, and I applied manure in a regular interval of 10 days to get the nitrogen properly. I did not feel it was necessary to apply any pesticide, for which I usually take arecanut leaves. I did notice some pests in the field, but the disease did not affect other plants because of the distance between the plants. Moreover, since I practice organic farming, the chances of pests are very much less as the plants usually are healthy. The biggest problem at the time was weeding. I could not arrange a weeder and carried out manual weeding only once after 30 days. Doing it again would have been too expensive, so I let it be. This was a mistake, as the weeds were comparatively higher than in traditional crops.

At the harvesting stage Mr. Niranjan Nayak, an Agriculture Scientist from KVK, Bhanjanagar, Ganjam, came with his team to note the yield rate of the SRI paddy. Mr. Nayak and his team estimated the yield to be 6.5 t/ha. They took a sample of 30 plants, 10 plants each from among the lowest, medium and highest grain-carrying plants, as I remember. The average number of tillers for the 30 plants counted was 37, and the maximum was 65. The growth of the plants was the same as in traditional paddy, as was their size. The panicles per hill were 19 (average of 30 plants), and the grains per panicle were 270 (average of 30 plants). The instance of unfilled grains was equal as in traditional paddy, and the quality of hay was good. I did not find any notable differences between SRI rice and general rice. The colour and taste were the same, and no problems during milling were reported. The rice output from SRI paddy was about 65% of the paddy milled, the same as in the case of traditional paddy.

I do not know the exact investment in my 0.27 acres of land – it must have been around Rs. 600 – but clearly the costs differed in comparison with traditional methods in each and every item, i.e. seeds, watering, fertiliser and harvesting. As I already indicated that the costs of the manual weeding scared me, I stopped. If I could use a rotary weeder I could be able to reduce the expenses on weeding, and also the soil could get more oxygen which would probably have led to higher yields. In traditional systems, expenditures per acre come to about Rs. 3500 and the income from the paddy is normally Rs. 10,000 under a market price of Rs. 400 per bag and a yield of 25 bags. My SRI yield would be 35 bags per acre as I got 9.5 bags from 0.27 acre, and since the costs would be about Rs. 1800 per acre, my income would increase almost twofold. This could be higher, if more technically correct cultivation was done with a fine seed variety. And I did not even include the income from the straw, which was doubled with SRI.

Rabi 2005-2006

As in Kharif, I applied SRI in Rabi as well but this time with a larger area, i.e. 0.5 acres of land. Although there were no real problems of water scarcity due to the canal, I had problems controlling weeds that grew plentiful due to the dryness of the field. Again I tried hard to arrange a cono weeder. I heard that Rangeilunda, Ganjam had a weeder so I went there, but coming there I was harassed due to the absence of a salesman. Meanwhile the weeds in the field were so high and the manual weeding became so expensive

that it compelled me to leave the field of 0.50 acre, leaving me with no yield whatsoever.

This was very disappointing, but fortunately a little later I was informed by UAA, Ganjam that CWS, Bhubaneswar was organising a workshop on 'sustainable agriculture and SRI paddy' at Sambhav. Over there I talked at length with a fellow farmer from Andhra Pradesh called Mr. G Nagarathnam Naidu, who informed me a lot on SRI. Mr. Naidu made a beautiful demonstration, and I think he is very much a role model. His success inspired me a lot to continue with my work on SRI. I asked Mr. Naidu if he could arrange a weeder for me, but unfortunately he had to go to New Delhi to participate in EXPO-2006.

I have tried to motivate local farmers to adopt SRI. However, I noticed that other farmers were quite suspicious about my success with SRI as the Rabi season had failed, saying that I am a rich man that can bear the loss. Consequently, as far as I know, no other farmers in my village have tried SRI. Nevertheless I persisted, inspired by the work of Mr. Naidu. I decided that I needed to keep better record of expenses on SRI paddy so I can convince farmers better.

Kharif 2006 and Rabi 2006-2007

In Kharif I decided to replicate SRI entirely organic in my entire eight acres of land. Luckily I had obtained a cono weeder and this worked properly, so I started the season with a lot of confidence. Weeding was done thrice with an interval of 15 days, and I did not find any pest in the fields. I did run into some different problems. In most of the fields I found 20% mortality of the plants. I replanted them but that did not recover. I am still unsure about the cause. Another difficulty I encountered was with the water logging, caused by repeated low pressure rain.

Eventually the plants were about 3 feet high and I found 24-30 tillers per hill. I tried out three different varieties of different duration. In 0.5 acres of land I tried the Basmati variety of 115 days. It yielded 15 qtl/ac. In 3.0 acres of land I cultivated a 145 day variety called Pratiksha which yielded 26 qtl/ac and in 4.5 acres of land I planted the 165 day variety called MTU 1071. The yield of this HYV was 18 qtl/ac. During this season all the staff of the agriculture department visited my SRI fields on the advice of Mr. Nayak, and the fields were praised a lot.

In Rabi 2006, discouraged by my experiences of the previous year, I only tried out SRI in a small patch. Once again the yield failed. Rice plants from last year's fallen seeds sprouted, which I could not differentiate from transplanted plants. Finally I left it.

Current Situation and the Future

The yields of the long during variety MTU 1071 were lower in case of SRI, so in Kharif 2007 I made some changes. I have taken Basumati in 3.0 acres, Pratiksha in 3.5 acres and Navin in 0.5 acre. Currently the plants are 20 to 35 days old and I found only seven to eight tillers. I am maintaining the 25 cm. gap and I am using a rope marker, but once again I had problems with weeding. Although the cono weeder is working properly, I have labour problems and because of this I am not able to do weeding.

In the future I hope that the potential of SRI may even be expanded to other crops. I believe it will work not only in paddy but also with other crops. Also multi-cropping and intercropping in SRI paddy field may be possible, which would improve the potential of SRI even more. I tried to grow sugarcane in pit method, where the concept is similar to SRI, growing sugarcane between the small mango plants. Unfortunately the sugarcane field was destroyed by the village cattle, so personally I do not have any experience yet on the success or failure of applying SRI methods to other crops, but I think that this will be possible.

Overall I think SRI is an exciting and very profitable system of cropping, and I believe it can be implemented in both dry and wetlands. I therefore hope that the government will organise training programmes on SRI and will take initiatives to popularise SRI among farmers. I hope that farmers will accept this technology, but they should be aware properly of what it requires and it is of great importance that they have access to the appropriate implements, notably the weeder.

Ranjan K. Panda, Bimal Pandia and Adikanda Biswal [33]

Profuse Possibilities in Bargarh: Growing Confidence in SRI

Drought and Distress: A Potential Remedy in SRI

Paikmal block is a drought and migration prone region. Crop loss in rain-fed lands is a regular feature. Most of the lands are uplands. Top soil erosion is a major threat. Water retention capacity is very less. Productivity is relatively low. Majority of people are agriculture and NTFP (Non Timber Forest Produce) dependent with marginal or small holdings. But in last few decades, NTFP availability has reduced or become unstable as forest has degraded and climate has changed. Scarcity, unequal and erratic distribution of rainfall results in crop loss. There are few water harvesting structures in the region. Most of the fields do not have supplementary irrigation sources.

Farmers prefer high water requiring paddy crops to other crops. Many are often lured into adopting new high yielding varieties in anticipation of higher yields. While larger farmers have been able to offset increasing expenditure on fertiliser and pesticide, small and marginal farmers' vulnerability in the absence of supplemental irrigation to input intensive agriculture is high especially when the drought tolerance capacities of the improved varieties are relatively low in comparison to traditional crop varieties and practices.

MASS (the Manav Adhikar Seva Samiti) is working in this region since 1988 and in recent years has adopted an integrated approach to Natural Resource Management (NRM) and ecological agriculture. The interventions are primarily aimed at making agriculture ecologically sustainable through proper use of natural resources.

It was thus natural for MASS to evince interest in SRI that was not input intensive. Initial information on SRI came from various agriculture publication and journals that MASS's library subscribes to. But the thrust to generate more attention towards SRI came from a workshop conducted in June' 07 at the Institute on Management of Agricultural Extension (IMAGE), Bhubaneswar on that subject. From that workshop we decided that we should start experiments with SRI from this Kharif itself. MASS saw a potential to answer drought problems and promote eco-agriculture at the same time along with the added bonus of enhancing crop production with lesser external and physical inputs.

The Initial Struggle in Convincing Farmers

Though MASS – with its grassroots presence in four districts – is an active and known proponent of traditional and non-chemical agricultural practices, this is the first year that it has experimented with SRI. MASS is working in 28 villages of Paikmal block in Bargarh district and is quite familiar and friendly with the communities. Every village has a dedicated farmer's club. It was decided to proceed steadily and cautiously in this matter as it involves an entirely new technique which the farmer may find very hard to believe and adopt. To start with a farmer's training was called in May this year. Twenty-seven farmers - from the operational area in Paikmal block – participated in that meeting. They listened to the briefings keenly but it was very hard for them to believe that rice can be cultivated without sufficient water.

But at the end of the training session 16 of the 27 farmers showed interest in the technique and expressed their intention to go for trial cultivation. But uncertain rainfall and last minute doubt caused 10 of the 16 farmers to back out. Only six farmers went for paddy cultivation in SRI technique.

All the six farmers are from different villages. Land for trial cultivation was also judiciously selected – with farmer's close involvement – to represent diverse conditions. The trial fields were 15 to 20 decimals each. Various varieties – both traditional and high yielding – of paddy, namely, Purnima, Kamalshankar and MTU 1010 are being tried.

[33] The authors are from MASS, an NGO based at Sambalpur. E-mail: ranjanpanda@gmail.com

Seed beds were prepared with soil and manure in equal proportions. Impure and unhealthy seeds were discarded with the help of salt and egg culture. Then those were treated with a mixture of fresh cow dung, moulded soil (locally known as Uie hunka mati), pond silt and neem oil. The treated seed were then sown half inch below the seed bed surface. The farmers were advised to sow at the rate of two kilograms of seed per acre. After that the nursery bed were covered with paddy straw. Two farmers transplanted the seedling in 10 days of sowing, two in 12 days and the other two farmers transplanted seedlings in 13 days.

Seed transplantation too was very different from normal practice as the farmers were advised not to wash off soil from root and transplant just one seedling per hill at 10 inches apart. No fertiliser or chemical was applied in the main land. The main land was puddled four times after one cart load of dung manure, one cart load of green manure, one cart load of paddy straw and five kilograms of neem cake was applied. Drainage/irrigation lines (channels) were drawn at eight feet intervals. Transplantation was done in straight lines to ease weeding. Farmers were advised not to keep standing water in the fields. No other special implements were used. Weeding was manually done as no farmers had mechanical or hands driven weed outers.

Many doubts still crept into the mind of the adopting farmers. They could not believe that only two kilograms of seed will be sufficient for a one acre main field. One farmer sowed more than the recommended dose. Nobody could believe that seed nursery can be raised without puddling with once a day of showering of water only. Farmers' morale received continuous beatings as onlookers laughed off the technique and taunted the farmers for adopting such an 'impracticable and laughable' advice. As a result one farmer sowed more than the prescribed seeds and two other farmers flood irrigated their main field twice each. One farmer did not cover his seed bed with paddy straw.

No Laughing Stuff: One Month Later, All Sceptics were Proved Wrong

All through this period volunteers and agriculture expert from MASS continuously kept persuading and following up with the farmers. Ten days after seed sowing, many a 'laugher' stopped laughing as not only the seedlings were ready for transplantation by then but also half kilograms of

Box 12.1: Scaling doubts: The case of Madan Bariha

The last one and half month for Madan Bariha – a poor tribal - was very hard and chaotic. Not because he tirelessly worked in his fields for hours but because people had shown negative perceptions and comments to his style of paddy cultivation procedure. He is a marginal farmer and the 20 decimals of land in which he has gone for the new type of cultivation practice means a lot to him and his family. Any crop loss will give his family a substantial economic blow and food in-security. Yet, Madan took up the challenge, triumphantly weathered the past few weeks and is now a proud farmer.

Madan has gone for a new method of rice cultivation which is better known as System of Rice Intensification (SRI). He had attended a farmers training organised by MASS, where they were oriented about the possibilities of the new system of rice cultivation. He saw tremendous scope in the system as most of his lands are drought prone rain-fed land.

Like many others he did not believe that rice can be grown without keeping standing water in the fields. He also was not too convinced that only two to three kilograms of seeds will be adequate for transplanting an acre. He had doubts if only one seedling per hill will be optimum.

But he saw no harm in going for experimentation with the new system as even if it fails the loss will be still bearable and a new crop can be taken soon. He was told that transplantation should be done in 10-12 days and growth can be noticed within a month of transplantation. He trusted that and went for the challenge.
Now after about a month of transplantation his farmland has a distinct greenery and growth than the neighbouring fields. The single seedlings that he so reluctantly transplanted a month ago have grown into bushes of tillers, more than 30 on an average per hill.

"Look at my field. Never ever this field had so much growth," exuberates Madan. His neighbouring farmers agree with him. "The way the crop is growing yield should be more than normal. There is definite merit in this system. We too will go for this kind of cultivation next year," they say.

Madan is very happy and confident now. He is patiently explaining the technique to amazed farmers and passers-by, whose numbers are swelling with each passing day. The persons who so unkindly booed his methods of practice now thank Madan for his courage and success.

Madan is one of six farmers, in Paikmal block of Bargarh district, who are experimenting with SRI this year. The initiative and follow-ups have come from MASS, a Sambalpur based NGO. MASS has also initiated people to go for SRI demonstration and experiments in its other field areas this year that is completely organic.

seed was sufficient to transplant a 20 decimal main land. There were more surprises in store for onlookers as each hill now had as many as 30 to 36 vigorously growing tillers after mere 30 days of transplantation. And all these were achieved with total low cost organic management.

In the meantime, the package of practice has got further boost as those farmers who doubted the technique and slightly diverted from total adoption have been proved wrong. It was seen that after four days of sowing, seedlings were about one and half inch taller if covered with straw. But in one case, where it was not covered with straw, it was just germinating. Then two trial fields had less tillers because farmers disbelieved dry field theory and kept standing water there.

Serious interest in the system is developing in place of severe disbelief. Now, there is considerable interest among farmers in the new system of farming. Abdul Usman's demonstration field is drawing onlookers and interested farmers each day. Plants in his neighbouring plots are thinner and shorter than his fields in spite of two doses of chemical fertiliser applications. One big farmer from Padampur, the nearest town, is coming once every week to see the progress of the crop. Usman is a very proud farmer now. The 20 decimals of land in which he has gone for SRI, is the only farm land that he has. Hence, he had quite a lot of stake in that. He was also persuaded by many to use fertiliser and chemicals. But Usman stuck to the theory and is very happy now. People have started believing that SRI is an answer to drought and crop loss. But they are little sceptical about its large scale adoption and possibilities.

Drawing Future Plans

With the initial success, MASS has done a potential assessment to scale up SRI in its operational fields. It has been identified that 14 villages in MASS's area of operation in Paikmal block have tremendous SRI potential. In six villages SRI can be done in both Kharif and Rabi season.

Only six farmers cultivated paddy in only about an acre of land this year. But the growing interest and confidence of farmers will help in large scale scaling up and adaptation of the technique. MASS intends to involve as many farmers, local NGOs and government institutions in this process. This year was just the beginning of SRI initiative.

Prasant Mohanty

SRI in Ranpur Block of Nayagarh District: An Experiment by Vasundhara

Vasundhara is a research and policy advocacy group that has been involved in conservation and management of forest resources in the state of Orissa since 1991. Apart from these areas it has also been focusing on bio-diversity conservation and livelihood improvement of resource dependent poor, and also on land right issues in tribal dominated areas of the state. It has been closely working in Ranpur since 1997. After seeing the hazardous effects of modern farming, Vasundhara has stepped in ecological farming practices in Ranpur areas. In the process SRI was selected as one of the options of intervention.

Ranpur is a block of Nayagarh district with agriculture as the prime occupation of people followed by collection of Non Timber Forest Produce. Rice, mung, biri and vegetables are cultivated in this area. Prior to this, ragi and horse gram were cultivated in the upland of the areas, but the government efforts for plantation of acacia and eucalyptus have wiped out traditional crops. As far as irrigation is concerned the facilities are very limited to certain pockets and one crop only. Stream water fulfils the irrigation needs of farmers along with improving the soil nutrients. Irrigation facilities available in villages go for Kharif and dalua paddy cultivation and in some places it goes for mung and biri as second crop.

Chemical inputs such as fertilisers and pesticides are used in Ranpur, and farmers are yet to realise that farming is possible without these chemical inputs. Against this backdrop it is difficult to bring farmers back to traditional farming practices. However, Vasundhara has been working towards reviving the ecological farming practices since 2004.

SRI Activities

In the last quarter of 2005, a programme on Organic Farming and SRI was organised at Sambhav in collaboration with CWS, which has helped us to experiment on SRI in Ranpur.

There are many reasons for the community to be interested in the SRI experiment:

- Farmers feel comfortable with SRI as it is adoptable
- Local seeds are used in SRI
- Farmers are not dependent on external market for inputs like fertilisers and seeds
- Lesser quantities of seeds and water are required in comparison to traditional methods
- It has a higher yield potential, which is one of the major motivations for farmers
- Increase in soil fertility
- The organic process produces high quality of foods
- Significant role in conservation of local environment and local biodiversity.

The above positive reasons have a lot of bearing in making SRI popular amongst the farmers. There is more scope in future as well.

Subsequently we organised training programme on SRI for farmers in Ranpur. In the Kharif season of 2006, we experimented with six villages on a trial basis. The villages selected for SRI were Nathapur, Sikharpur, Basantpur, Kotapokhari, Ranpur, Gambharikhol, Jadapada. There was delay in the process of SRI experiment because farmers were feeling it was very new. Eventually work started with seed treatment and land preparation. Seedlings were then transplanted with care between 10-12 days duration. There was a lot of anxiety among neighbouring farmers to see this transplantation which was undertaken with a spacing of 10 inches distance and single seedling. Within 15 days the difference was visible in the growth of the plants.

Farmers' Experiences

The experience of Ms. Buli Nayak of Nathapur village was very encouraging. In her farm it was found that there were 58 to 60 tillers and 40-45 panicles in each plant. She got a yield of around two quintal from 12 decimal of lands where

the earlier yield rate of the same land never exceeded one quintal of paddy.

The experience of Mr. Gopal Khuntia of Kotapokhari village was also equally encouraging to note, although the yield rate was not very high like that of Buli Nayak. It was a different experience for him. Mr. Gopal Khuntia had cultivated 10 decimal of land for SRI experiment. He followed all the principles of SRI in the small plot and he continued his chemical farming method in rest of his lands. One of the interesting things found was that the plants were getting a pest attack at the time of flowering and were also getting a yellow colour. However, the impact of the pest attack in his SRI fields was limited, as in comparison with his remaining lands. Despite the attack the production was around 1.5 quintals. Gopal Khuntia felt that probably this was due to the use of organic manures and compost in the SRI field.

In the current year, the rice cultivated by Mr. Prasanna Kumar Nayak is an encouraging experience to note. The highest number of tillers is 30 and the average number of tillers is 20-25 during 31 days of the rice plant which is normally higher. It was also interesting to note why Prasanna decided to go for SRI. Last year he learnt about SRI from Vasundhara, but instead of going to experiment SRI he transplanted a few seedlings in 10 inch spacing and found that the growth of the plant was extraordinarily well and that they had a good number of panicles. Therefore he decided to go for SRI in the current year.

Current Practices and Future Prospects

This year the SRI practices have expanded three times as far as areas are concerned. In addition to villages selected in 2006, there are two more villages (Sinduria and Kodalpalli) where farmers have cultivated rice in the process of SRI. One of the major factors that had direct implication for the SRI experiment was the poor rainfall and long dry spells in the current year in Ranpur, due to which the replication of SRI is not very encouraging. Even the soil moisture was not there to transplant the seedling within 8-12 days.

Green Revolution that aims at providing food security in the country has also created a devastating impact on soil, water and the agriculture. Nevertheless there is at present a discussion on the second Green Revolution to take place. In this context SRI is a badly needed alternative. SRI has the potential of providing both food security and environment conservation. The state and other supporting agencies have a definite role in the extensive expansion of SRI across the country.

Ronali Pradhan and Rekha Panigrahi

SRI: Scope and Opportunities for Upscaling in Orissa

The Centre for World Solidarity (CWS) is a voluntary organisation established as a Public Trust in 1992 to contribute its modest bit towards creating a more just society. It envisions a 'society of resilient, inter-dependent small communities vibrant with the consciousness of their rights and duties and sensitive to the rights of dalits, indigenous people and minorities, to rights of the women generally and gender equality, rights of the children and eco friendly development processes that cohere with the rights of these sections of the society'.

CWS works through a network of partnerships with grassroots NGOs, networks and individual fellows, to promote people centred participatory development in five states of India, namely Andhra Pradesh, Tamil Nadu, Orissa, Jharkhand and Bihar. The Orissa chapter of CWS is called the Centre for World Solidarity – Orissa Resource Centre (CWS-ORC) and is focusing on issues pertaining to NRM, gender, child rights, tribal tights and human rights in general. Under the NRM programme ORC is promoting community forest management and sustainable agriculture in seven districts of the state.

Initiatives by CWS in Orissa

CWS first came to know about SRI in August 2005 when Prof. Radhamohan, former Advisor of CWS-ORC, met Mr. Narayana Reddy in Bangalore. Mr. Narayana Reddy informed Prof. Radhamohan about SRI, and to him the practice sounded very much useful for small and marginal tribal farmers of the state. Rice is the main crop of Orissa, a state that is known for its biodiversity in rice varieties, and Orissa does have a lot of promise with SRI given the large extent of rice and its close link to livelihoods. In the Orissa situation, mostly tribal people remain in vulnerable condition as they harvest very small amounts due to subsistence farming. Food security for them is only limited to six to eight months in a year and for rest of the year they migrate to far off places where they are subjected to various kinds of hazardous situations. In this context there is need to promote a practice like SRI which can provide food for the whole year with less input cost when practiced organically.

As ORC is promoting sustainable agriculture in Orissa since 2002 and is mainly targeting small and marginal farmers, SRI as a practice is very much suitable to be adopted by these farmers. Realising the fact that SRI as an innovation comes at an opportune time and its importance in agriculture scenario in Orissa, CWS strategically took up the challenge of promoting SRI through its partners. More specifically we promoted it through partners operating in Southern parts of the state, mostly in the Ganjam, Gajapati, Phulbani, Nawrangpur and Koraput districts and also in Nayagarh districts in Eastern part of the state. To initiate the process CWS organised two workshops for the partners in two phases.

Phase I – First Workshop on 'System for Rice Intensification'

This workshop was only an in-house orientation session conducted for two days in the month of September 2005 specifically for the purpose of generating awareness among the partners about the concept behind SRI. The workshop was jointly organised by CWS and one of its partners in South Orissa called UAA (United Artists' Association). As resource persons we had invited professionals from the Centre for Sustainable Agriculture in Secunderabad, field level staff representatives of CWS partners participated.

The workshop included a theory session that discussed the chronology of SRI, the rationale behind adopting SRI, its suitability, the principles and the methodologies that are to be followed. The idea was to give the partners knowledge of SRI as a cultivation method that can be

practiced with lesser investments while enhancing the yield.

The workshop went well, however, several shortcomings were experienced. The theory session could not clarify many doubts that came up in the mind of the participants. As SRI is a practice contradicting the age old practice of traditional paddy cultivation, many participants could not visualise what can be the method of cultivation and what can be the result. Moreover, as the lecture was delivered in English and Hindi because of a lack of knowledge in Oriya, it was difficult for many participants to comprehend the concept of SRI. Though everything was being translated in the local language, the gap was very well felt by the participants. Hence, a need was felt for organising a workshop which involved a practicing farmer combined with field demonstration to understand the concept of SRI so that the participants can ultimately train farmers in their respective operational areas.

Phase II – Second Workshop on 'System for Rice Intensification'

This was held in March 2006 and was a more comprehensive training-cum-demonstration programme where participants got hands on experiences with SRI. The emphasis was on practicing SRI in organic method using local variety of seeds. As a resource person we had invited Mr. G. Nagaratnam Naidu, an innovative farmer from Andhra Pradesh whose field was visited by the Chief Minister of Andhra Pradesh and who got record yields in his farm. The workshop was attended by 25 representatives of CWS partners promoting sustainable agriculture.

The workshop consisted of two parts, namely an in house training detailing the process and a field demonstration. The theory session included information given on the history of SRI, the concept, benefits and principles of SRI, attention was given to critical aspects that have to be considered during cultivation, and to the suitability according to the soil type, irrigation facilities and other local specificities.

The field demonstration session gave the partners some practical experience on SRI, and consisted of land preparation including land levelling and field channels, drawing lines at regular spacing, manuring with FYM and Magic Compost, the removal of seedlings from the seed bed which were sown 10 days in advance, the transplanting of seedlings in the main field, and a brief exposure during a later period to see the yield – which was made by the partners individually. The outcome of the workshop was that the partners had increased their knowledge and awareness regarding the practice of SRI, and they had gained an enhanced understanding of the principles and practices of SRI.

These two events proved to be landmark events for most of the partners and the workshops were able to change the earlier perception that rice can only be grown under input intensive condition. It was an eye opener for the participants, and many partners included promotion of SRI in their respective operational areas in their annual work plans.

In Kharif 2006 only seven acres of land covering around 25 farmers could be brought successfully under SRI method of rice cultivation, as there were not enough resources after continuous follow up. The yield was varying from two to six times than the earlier practice. So it had a great impact on the local people in the area and has great potentiality to be replicated and spread to nearby places as well. The impact of the above mentioned initiative was so great that more than 200 farmers have taken up SRI in organic way during this Kharif (for example see Table 14.1). All of them also use only indigenous seeds. All of the partners are working in areas where farmers are mostly small and marginal. These farmers can not produce enough food from their own land due to inadequate knowledge or skill, low quality of land and water resources, lack of access to capital or their inability to plan systematically as they have to migrate for a major period. Given this condition, the first year experience in SRI has proved to be quite instrumental in giving a positive impression among the farming community.

A good example of the energetic spread of SRI is the spread of SRI by the NGO called Briksha O'Jeevar Bandhu Parishad (BOJBP), meaning "Friends of Trees and Living Beings". BOJBP is located in Nayagarh district, and originally focused on forest conservation. They kept track of all the farmers who started practicing SRI after they were informed on this by BOJBP, and table 14.1 shows the details of SRI paddy cultivation in Kharif 2007.

Table 14.1: The farmers' list of BOJBP

Sl. No.	Name of the Farmers	Village	Gram Panchayat	Block	Area in Dec.	SRI History
1	Ananda Mahapatra	Gamharidihi	Gotisahi	Odagaon	7	1st year
2	Jagdish Pattanaik	Gamharidihi	Gotisahi	Odagaon	6	1st year
3	Kishore Pattanaik	Gamharidihi	Gotisahi	Odagaon	6	1st year
4	Baikuntha Nath Pattanaik	Gamharidihi	Gotisahi	Odagaon	15	1st year
5	Pitabash Sahoo	Gamein	Kalikaprasad	Nayagarh	6	1st year
6	Suresh Swain	Gamein	Kalikaprasad	Nayagarh	80	2nd year
7	Andha Sahoo	Gamein	Kalikaprasad	Nayagarh	6	1st year
8	Gangadhar Sahoo	Gamein	Kalikaprasad	Nayagarh	12	1st year
9	Sankarsan Jena	Gamein	Kalikaprasad	Nayagarh	4	1st year
10	Raghunath Bhatta	Gamein	Kalikaprasad	Nayagarh	4	1st year
11	Bhajaman Sahoo	Gamein	Kalikaprasad	Nayagarh	8	1st year
12	Gada Nayak	Gamein	Kalikaprasad	Nayagarh	6	1st year
13	Surendra Behera	Binjhagiri	Kalikaprasad	Nayagarh	15	2nd year
14	Muralidhar Majhi	Binjhagiri	Kalikaprasad	Nayagarh	12	1st year
15	Laxmi Pradhan	Binjhagiri	Kalikaprasad	Nayagarh	22	1st year
16	Bhima Pradhan	Binjhagiri	Kalikaprasad	Nayagarh	8	1st year
17	Kuni Barik	Binjhagiri	Kalikaprasad	Nayagarh	8	1st year
18	Somanath Barik	Binjhagiri	Kalikaprasad	Nayagarh	6	1st year
19	Yudhistira Nanda	Nagmundali	Kalikaprasad	Nayagarh	14	1st year
20	Basant Pradhan	Nagmundali	Kalikaprasad	Nayagarh	4	1st year
21	Somanath Pradhan	Nagmundali	Kalikaprasad	Nayagarh	4	1st year
22	Chakradhar Khatei	Kesharpur	Kalikaprasad	Nayagarh	4	1st year
23	Banamali Dora	Kesharpur	Kalikaprasad	Nayagarh	6	2nd year
24	Chaitanya Pradhan	Kesharpur	Kalikaprasad	Nayagarh	12	2nd year
25	Brundaban Barada	Kesharpur	Kalikaprasad	Nayagarh	8	2nd year
26	Rabindra Sethi	Kesharpur	Kalikaprasad	Nayagarh	2	1st year
27	Chhatia Nayak	Kesharpur	Kalikaprasad	Nayagarh	14	1st year
28	Krushna Chandra Dora	Kesharpur	Kalikaprasad	Nayagarh	20	2nd year
29	Subash Chandra Dora	Kesharpur	Kalikaprasad	Nayagarh	15	2nd year
30	Ganga Dhar Bhatta	Badagorada	Badagorada	Odagaon	12	1st year
31	Basant Dora	Badagorada	Badagorada	Odagaon	7	1st year
32	Madhu Pradhan	Gopinathprasad	Badagorada	Odagaon	8	1st year
33	Satyabadi Swain	Angisinghi	Dhusuma	Odagaon	6	1st year
34	Kanak Lata Dalei	Kalikaprasad	Kalikaprasad	Nayagarh	4	1st year
35	Jayakrishna Pradhan	Nodiali	Nodiali	Nayagarh	12	1st year
36	Suresh Pradhan	Nodiali	Nodiali	Nayagarh	20	1st year
37	Biswanath Dalabehera	Kesharpur	Kalikaprasad	Nayagarh	4	1st year
38	Haluri Biswal	Gamein	Kalikaprasad	Nayagarh	8	2nd year
39	Subhagya M Maharana	Gamein	Kalikaprasad	Nayagarh	4	2nd year

Mr. Ramesh Chandra Naik, Secretary, BOJBP

The State Level Dialogue and Beyond

There is a general feeling that Orissa as a state is very much new to SRI and that the rate of adoption is quite less compared to other states. In fact there is no convergence among key players and the extent of adoption is not properly documented and focused in a larger forum. For this, CWS organised one state level dialogue on SRI in Orissa in collaboration with the Department of Agriculture, Government of Orissa; the Xavier Institute of Management, Bhubaneswar; Oxfam GB East India Office, Kolkata and the WWF Dialogue Project in the month of June 2007. Various stakeholders such as farmers, civil society representatives, government staff, bureaucrats, scientists, researchers, policy makers and other interest groups came together to throw light upon the progress of SRI in Orissa, and the various critical issues related to technical, social and policy implications. The goal was to ensure synergy in the work of the key players and to ensure that mostly small and marginal farmers are benefited. During the workshop it was also felt that such kind of events should be organised at a periodic interval in order to bring refinement in the approach and also to provide a platform to initiate debate on policy level matters relating to SRI in Orissa.

ORC has taken a proactive role for up scaling SRI in Orissa. It is perceived that there is a great need to have a visible replicable impact. For this a contiguous patch in south-eastern Orissa comprising of six districts (Rayagada, Koraput, Ganjam, Nayagarh, Navrangpur and Malkangiri) has been selected for up scaling in the initial phase. In these districts, CWS partners will be working with a consortium approach in collaborative mode and each one has involved up to five grass root organisations /farmers group /CBOs /federation. This way the outreach will be more and the consortium as a whole will be able to address the issue at a larger level. In these districts mostly small and marginal tribal farmers have been targeted.

For carrying forward this initiative, steps have already been taken by ORC to collaborate with Sir Dorabji Tata Trust, Mumbai as far as raising resources is concerned. Given the tremendous potential of SRI to maximise production from small land holdings using less water and other inputs like seeds, fertilisers etc. and thereby minimising the cost of production to a great extent, ORC is motivated to put it further on the agriculture map of Orissa. ORC is also planning to promote SRI in the rest of the districts of the state within its capacity in the days to come.

Debasis Mohapatra[34]

Rooting SRI in Orissa: My SRI Journey

The Long and Recurring SRI Trail

System of Rice Intensification (SRI) is not a variety of rice, but a different method to enhance its production. In this method, less water, less seeds & inputs are required while more production or yield is assured. This sounds very illogical, as a common man or an ignorant farmer's only belief is that only if you apply more fertiliser, more water, more pesticide will you get more yield.

I first time came to know about SRI method through a mail, while I was working in CARE India (during May 2000) for the super cyclone rehabilitation project. I could not get a scope to debate or know further as we were busy with our own project. To add to this, there was no demonstration plot available to believe it or challenge it as an agriculture professional.

For nearly four years, I did not hear about SRI and if indeed it was working and viable. I later moved from CARE to DFID's livelihood project at Nuapada, a remote district of Orissa and then to Delhi to work with a consulting firm called "MART" where hardcore agriculture discussion on crops and farmers plight was very rare. But with an assignment to conduct a study for Tamil Nadu Empowerment Project on "resource mapping and opportunity assessment", I had to shift to Chennai. I had to visit 15 districts and map resource agencies and their work across the state. This time, I came to know about SRI again and could relate to the past "SRI e-mail". I saw the SRI fields and the possibility of productivity enhancement came alive following discussions with few researchers of the Tamil Nadu Agriculture University (TNAU) and extension workers. This gave me the hope and confidence that it was possible to experiment this in Orissa as well.

I switched from MART to OXFAM GB and this time I moved from Chennai to Kolkata and started working more closely with NGOs of Orissa. During my CARE days, I had got an opportunity to visit Sambhav, the treasure of sustainable farming with a group of NGO friends to get exposure on bio-dynamic farming methods. In the meantime I met Shambu Prasad of Xavier Institute of Management, Bhubaneswar at a workshop and subsequently received the soft copy of his book "System of Rice Intensification in India: Innovation History and Institutional Challenges". Encouraged by the rapid spread of SRI in other states I decided to experiment SRI with help of few farmers and NGOs in coastal and Southern Orissa. PRAGATI, a partner NGO of Oxfam GB was already aware of SRI as a partner of CWS, Hyderabad. So when I discussed with Prabhakar Adhikari, he was very happy and agreed to cooperate fully in this initiative to popularise SRI in the southern underdeveloped district of Koraput. Two other NGO partners of Oxfam GB based at Coastal Orissa, Pallishree, Jajpur and SOLAR, Konark, who were supporting flood victims and farmers to restore their livelihood through seed and tool support also agreed to experiment and learn SRI. With the support of Sambhav we participated in two training programmes in Dec 2006 and January 2007. Fifty farmers and six staff of three NGOs participated in these training programmes.

From Awareness to Practice

After the programme, in Rabi 2007, 39 farmers were interested and experimented SRI at three different locations: Nandapur block of Koraput, Kanas block of Puri district and Bari block of Jajpur promoted and guided by Pragati, Solar and Pallishree respectively. The plot sizes of the trials were between 0.1 acre to 2 acres.

I got good support of Asis James, an Agriculture Consultant, who work for spreading SRI and organic practice in coastal Orissa and documented with help of village volunteers the various growth stage of rice crop. I had invited few other agriculture friends to visit, document and spread SRI from OUAT and local district agriculture department. We also decided to support a 'Lessons sharing workshop' organised at Sambhav on 1st & 2nd April 2007 where 42 SRI practitioners

[34] Debasis Mohapatra is an ex-agriculture graduate from Orissa university of Agriculture technology, Bhubaneswar and Alumni of Xavier Institute of Management, Bhubaneswar. Currently working with Oxfam GB, Kolkata as Project officer in Market Access Project.

from eight districts participated. The workshop perhaps the first of its kind in Orissa gave a platform for SRI farmers' till then isolated, to learn from each others' experiences and hear from farmers of other districts as well.

Some Field Experiences of SRI

I was present during transplantation at Bari, Jajpur with a farmer and his labourers. They were asking many questions on tender age of seedling, distance we maintain and the approach of carrying seedling like your baby to the main field etc. Few of them were saying this would not survive and die in a day or two. The next month when I revisited the farmers they very happy at the sight of luxuriant tillers on the field. There were still lots of questions on weeds and what needed to be done about them. I had very little knowledge and confidence to address these questions. I however requested them to be patient and wait and watch and follow the process and soon they would be in a position to tell the difference.

Another farmer of Kanas of Puri district was motivated so much that he decided to go for two acre of SRI, in spite of my warning. He was quite low in the first week as the growth was very limited and the entire field was looking barren. In spite of our repeated advice for organic farming practices, he could not stop himself from urea application.

The results nevertheless were encouraging. The farmers had 33-40 tillers within 32 –36 days with one weeding at Bari, Jajpur. Similarly 40-82 tillers were observed within 90 –95 days with one weeding done only, 140-180 number of panicles observed at Kanas, Puri. Almost every farmer got 25-75% higher yield in comparison to their previous year yield from the same plot.

We later realised the importance of weeding. Rotary weeders should be used for weed control, to reduce the cost and improve soil fertility. A marker is required to maintain the space of 25 cm. Cost of cultivation can be reduced significantly i.e. 50% at least. Organic method of cultivation gives more economic return. SRI is suitable for both Kharif and summer rice in inland and coastal belt respectively. It is a method not a variety, hence any variety provides better yield.

Attempts to Scale Up: Working Towards a State Level Workshop

Oxfam GB started grounding its global agriculture scale up programme from 2006 in India and Orissa has been considered as a pilot state for this project. I got an opportunity to share with my seniors Nand Kishore and Lalchand at Kolkata Office about SRI experience and its potentiality to enhance rice productivity of poor farmers. They were having few questions as well as supporting my budding idea; meanwhile Shambu Prasad and I got an opportunity to meet Dr. Aribind Padhee, Director of Agriculture, Government of Orissa to explore the possibility of involving the department of agriculture. All SRI in the state was being done with no state support or enabling policy in place. He was very interested and immediately invited us to share with his 150 department officials at a pre-season workshop held during May'07.

At the workshop Shambu Prasad mooted the idea of a full length discussion on SRI and felt that resource persons from Andhra Pradesh and Tripura could be invited to provide a good learning opportunity for the participants. Oxfam GB, CWS, WWF & XIMB along with Government of Orissa agreed to support this noble initiative of SRI expansion in Orissa and a state level dialogue on SRI was organised on 23rd June 2007 where Officials of Agriculture Departments, Agriculture Researchers, NGOs and farmers participated. Thus in some sense SRI has now found roots in Orissa and my dream of experimenting and learning has been fulfilled to some extent. It is now time to scale up the small initiative and I hope many organisations, farmers, government agencies, international NGOs and bilateral bodies would come forward to further spread SRI in Orissa and outside.

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WWF-International - ICRISAT Dialogue Project
ICRISAT, Patancheru - 500 324
Andhra Pradesh, India
Tel: 040-30713762
E-mail: v.goud@cgiar.org

Xavier Institute of Management
Xavier Square
Bhubaneswar - 751 013
Orissa
Website: http://www.ximb.ac.in