Proceedings of

3rd National Symposium on the

SYSTEM OF RICE INTENSIFICATION (SRI) IN INDIA

Policies, Institutions and Strategies for Scaling Up:
Mainstreaming SRI for Achieving Food Security
While Reducing Water Conflicts

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"THE WAY AHEAD"

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Sraban Dalai

Contact:

Ms. Padma Reddy,
ICRISAT - WWF Project
ICRISAT, Patancheru – 502 324
Andhra Pradesh, India
Tel: +91 40 3071 3762
Email: p.reddy@cgiar.org
Visit www.sri-india.net for the soft copy of the proceedings report

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1. Background

The world is facing water crisis. It is estimated that more than 1.3 billion people face drinking water problems every day, and by 2025, about two-thirds of the world's population -- about 5.5 billion people -- will live in areas facing moderate to severe water stress (UN, 1997: 19).

Agriculture is by far the biggest user of water. Of the 1% of total freshwater water resources on earth available for human use, 80% is taken away by agriculture; irrigation and dryland farming thereby affect the overall availability and cycle of water in most river basins. The largest water using crops are: rice, sugarcane, and wheat.

Rice, the most widely grown and consumed cereal crop, is the lifeline for more than half of the world's population. Traditionally-cultivated paddy crop takes about 3,000-5,000 liters of water to produce 1 kg of rice. With the burgeoning population escalating consumer demand for more rice while the looming water crisis and climate-induced changes play havoc with the periodicity and intensity of rainfall, rice cultivation is under serious threat.

Rice being the largest single consumer of water, climate change is going to have profound implications on its cultivation. Lack of proper rainfall, depleting ground water levels, and low, even stagnant yields of rice are forcing rice-growing farmers to switch to other crops.

By 2050, it is estimated that per-capita availability of water is going to be even further reduced, and if the current level of water-intensive agriculture continues to be practiced, then by 2025 there may not be sufficient water in many countries to meet human needs. Indians in particular will have to face much tougher situations to maintain lifestyles and even lives.

In India, the productivity of rice is already very low, and the area for growing rice cannot be increased further. Out of 560 rice-growing districts in the country, about 90 districts are now producing less than 1.5 t/ha of rough rice, which is half of the national average and much lower than the global average. If efforts are directed to increasing yield by just one ton per hectare on the rice-cultivating area, then our country can easily increase its production to 40 million tonnes, enough to meet the projected food security requirements by 2030.

Therefore any efforts that successfully reduce the water allocation for rice even by 20-30% will help in averting both the food and water crises as farmers can continue to grow more rice with less water.

While addressing issues concerning the food crisis, Prof. M.S. Swaminathan has suggested 'Bridging the Yield Gap Movement'. SRI, a novel approach to rice production, which originated in Madagascar as part of civil society efforts to increase yields, constructively reduces the capital, fertiliser, labour and water inputs while increasing crop yields and promoting more abundance, diversity and activity of soil biota in and around the plants' rhizosphere. These changed practices with reduced inputs, supported by good aeration and organic matter for the soil, lead to generally improved productivity, with average paddy yields of 7-8 tonnes/hectare, about double the present world average of 3.8 t/ha.

It is reported that the benefits of SRI practices have been successfully demonstrated in 36 countries across the globe. In India too, farmers and research institutions in several states – Tamil Nadu, Andhra Pradesh, Orissa, Tripura, Punjab, West Bengal, Chhattisgarh, Karnataka, Assam, Bihar, Himachal Pradesh, Uttaranchal, Jammu and Kashmir, Madhya Pradesh and others – have begun to increasingly adopt and promote SRI in paddy cultivation.

1.1 The System of Rice Intensification (SRI)

SRI is a combination of several practices which include changes in nursery management, time of transplanting, size of plant population, water and weed management, and organic nutrient provision. Its different way of cultivating rice crops remains more or less same as in the conventional method; it just alters certain agronomic practices now used in standard rice cultivation.

SRI is not a fixed package of technical specifications, but a system of production with four main components, *viz.*, soil fertility management, planting methods, weed control, and water (irrigation) management. Increasingly, SRI concepts and practices are being adapted to rainfed (unirrigated) rice production, and to other crops besides rice. Several field practices have been developed around these components. Of them, the key cultural practices followed in most cases are: soil nutrient management through adequate application of farmyard manure or compost made from any vegetation or other biomass, transplanting young seedlings (8 to 12 days old) carefully, quickly and with shallow, at wider spacing (usually 25 x 25 cm to begin), regular weeding with a mechanical weeder which aerates the soil as it removes weeds, and limited but regular irrigation to keep soil wet without continuous flooding, i.e., mostly aerobic so that roots and beneficial soil organisms can survive. Otherwise they suffer from lack of oxygen.

Rice grown under SRI management has larger root systems, profuse and strong tillers with bigger panicles and well-filled spikelets having higher grain weight. SRI rice plants can develop about 30 – 80 tillers, and the yields are usually higher than before. The 'secret' (now public knowledge) behind this is that rice plants do best when young seedlings are transplanted singly and carefully at wider spacing; their roots grow larger in soil that is kept well-aerated with abundant and diverse soil micro-organisms.

1.2 SRI National Symposium – An Overview

To influence policy decisions for up-scaling SRI at a national level, ICRISAT-WWF Dialog Project's low-profile initiatives through its field interventions (at strategic locations in India), research, and policy advocacy have paved the way for large-scale adoption of SRI methodology at different levels in several states by various stakeholders. With SRI being started in almost all the states of India under different agro-climatic zones, a continuous effort to share, synthesize and document the experiences while articulating opportunities and constraints to up-scale SRI was felt important. Envisioning the importance of a farm-based approach like SRI for combating the food and water crises while taking into consideration the health and sustainability of both agroecosystems and natural ecosystems, the ICRISAT-WWF project initiated a series of national-level symposia on SRI in India. Appreciable efforts have gone into paving the way for annual SRI events to become an important national platform to strengthen SRI movement in the country.

The First National Symposium on SRI was organised in November 2006 at Hyderabad, Andhra Pradesh, hosted at Acharya N.G. Ranga Agricultural University (ANGRAU). This brought farmers, scientists, and civil society organizations together on a broad scale for the first time in India.

Built on the success of the first one, a Second National Symposium was held at Agartala in Tripura state during October 2007. This further expanded to include more policy makers, and it was instrumental in generating interest among governments, banks and private trusts to invest in SRI by directly supporting the farmers in many states.

These events brought together a diverse group of concerned individuals and agencies to share the experiences, concerns, constraints, farmers' innovations, research priorities and policy directions that can enhance adoption and up-scaling of SRI methods to attain food security and improve the livelihoods of rural households, especially the poor and the marginal, while avoiding placing further stress on the water resources that are critical for the future of ecosystems.

The events motivated many researchers and research institutes to initiate experimental trials on SRI across the country and facilitated networking of like-minded individuals and agencies for cross-sharing of experiences and training support to propagate SRI in new areas. The most significant outcome was the inclusion of SRI methods in the National Food Security Mission (NFSM) program as one of the options to improve productivity of rice in food-deficit parts of the country. Representatives of Government agencies and departments clearly emphasized how they 'want SRI to be placed centre-stage'. They also dearly laid out plans for the National Food Security Mission to incorporate SRI practices, and noted that SRI has to be encouraged with relevance to local conditions, simultaneously engaging the local bodies in its promotion.

1.3 The 3rd National Symposium

The most successful state in India in terms of SRI implementation and adoption -- Tamil Nadu -- played host to the 3rd National Symposium on SRI. The venue was the magnificent Tamil Nadu Agricultural University (TNAU) at Coimbatore from 1st to 3rd December 2008. The theme of the Symposium was: **Policies, Institutions and Strategies for Scaling Up - Mainstreaming SRI for achieving food security while reducing water conflicts.**

Rice in Tamil Nadu is widely cultivated on over 21 lakh ha in 28 districts with an annual production of 80-85 lakh tonnes (rough rice) and an average yield of 4 t/ha. During 2007-2008, SRI methods have been applied on 4.2 lakh ha -- about 20% of the total rice-growing area.

The energetic commitment of scientists and field staff at TNAU and strong political support from the state government has facilitated the fast spread of SRI in the state to the extent that it is included as a key technological intervention in the World Bank-funded IAMWARM project which is currently underway.

Main objectives of the 3rd National Symposium as organized were:

i) **Sharing of Experiences:** which involved farmers, promoters, researchers, and state government officials in focusing on:

- the diversity of extension approaches;
- the difficulties and constraints encountered by them;
- new or improved tools;
- innovations in crop establishment and management; and
- organic farming.

ii) **Understanding Constraints and Opportunities:** this was intended to familiarize participants with respect to current research findings regarding:
- theoretical and conceptual issues in SRI (such as the roles of soil biology and micro-biology);
- possible modifications to water, soil, nutrient, and weed management;
- the quality of grain and straw as affected by SRI;
- varietal responses to different soils and field conditions, etc,
- innovations in farm implements and mechanization, and
- economic impact assessments.

iii) **Options for the Scaling up of SRI:** this was explored through a high-level panel discussion, targeting key issues of policy, development strategies, institutional mechanisms, financial resources and incentives, etc.

The third symposium facilitated the convergence of ideas based on field experiences of farmers, civil society and scientists from across the country to look critically at the results and to assess the performance of SRI methods.

2. DAY 1: The 3rd National Symposium on SRI

Venue: Tamil Nadu Agricultural University, Coimbatore

Monday morning, December 1: The pleasant morning weather of Coimbatore added to the festive atmosphere on the first day where participants from across different states in India and other countries gathered at the Tamil Nadu Agricultural University (TNAU) campus for registration to the 3rd National Symposium on SRI. The scope of participation, 350 people from 23 states (including union territories) reflected the growth of interest and involvement with SRI in India; the first National SRI Symposium had attracted 150 participants from most parts of India, while the second symposium attracted 250 participants from almost all states and territories.

There was also a diverse group of international participants. SRI colleagues came from five neighboring countries: Ali Mohammed Ramzi from the Aga Khan Foundation program in **Afghanistan**; Karma Lhendup, a lecturer at the College of Natural Resources of the Royal University of **Bhutan**; Iswandi Anas from the Institute Pertanian Bogor (IPB) represented the **Indonesia** Association for SRI (Ina-SRI); Anizan Isahak from the National University of **Malaysia**; and Rajendra Uprety from the District Agricultural Development Office in Biratnagar, **Nepal**. Other international participants included four researchers who will be conducting a joint evaluation of SRI: Janice Thies from **Cornell University**; Haaro Maat from **Wageningen University**; and Tanguy Lafarge and Sarah Beebout from **IRRI**. Caryl Levine and Ken Lee attended from **Lotus Foods**, a San Francisco-based company importing specialty rices for sale in U.S. markets; Philip Riddell, a consultant on assignment as an irrigation specialist with **WWF** and Dr. Norman Uphoff from Cornell University accompanied by his wife Marguerite and her sister Carolyn McKay who have become the volunteers of SRI promotion.

The symposia, spearheaded by Biksham Gujja and Vinod Goud, were initiated and supported by the **World wide Fund for Nature** (WWF) through its project for `Improving productivity in agriculture' based on farm-based approach to agriculture with ICRISAT, the International Crop Research Institute for the Semi-Arid Tropics. Sir Dorabji Tata Trust (SDTT), Mumbai, the National Bank for Agriculture and Rural Development (NABARD), Mumbai, and the National Food Security Mission (NFSM), Delhi, deserve special appreciation for supporting the 3rd National Symposium. This diversity reflects the growth and involvement of different stakeholders in the SRI movement in India.

Partners in SRI promotion and scaling up include the Indian Council for Agricultural Research's **Directorate of Rice Research** (DRR) in Hyderabad, and the **Central Rice Research Institute** in Cuttack; the Ministry of Agriculture's **Directorate of Rice Development** (DRD) in Patna; the Government of India's **National Food Security Mission** (NFSM) in addition to NABARD and SDTT, listed above. The **Watershed Support Services and Activities Network** (WASSAN), an NGO based in Hyderabad, has been

instrumental in scaling-up activities; as are the three hosts of this and previous symposiums -- TNAU, Acharya N.G Ranga Agricultural University (ANGRAU) in Hyderabad and the **Tripura State Department of Agriculture** –who continued as co-sponsors.

2.1 Inaugural Session

The Symposium started with the lighting of the lamp in the main auditorium. One variation from usual protocol was to include among the dignitaries on stage a woman farmer from Tamil Nadu, **Smt. (Ms.) Manonmani**, who represented farmers' interest and involvement with SRI. **Dr. Biksham Gujja**, senior policy advisor for WWF and the prime mover behind the Symposium, led off the presentations, giving the welcome and stating the purpose and objectives of the event. Dr. Gujja focused particularly on the urgency of reducing the water requirements for rice production given the growing water crisis in India.

In the Presidential Address given by the Vice-Chancellor of TNAU, **Dr. C. Ramasamy** talked about his university's role in the World Bank-funded **IAMWARM** project (Irrigated Agriculture Modernization and Water Resources Management). He commented about farmers' general enthusiasm for SRI, but also noted continuing complaints about 'drudgery' involved in weed control and difficulties of practicing SRI on a large scale. He said that SRI was reducing farmers' need for seed and for nursery area, as well as for water and labor.

Once better mechanical weeders are more widely available, the VC observed, the labor time required for SRI should be further reduced along with difficulty of weed control. Farmers have not only gotten 24% higher yield on average, but the price they receive for their SRI paddy is 28% higher because of the grain quality. The Minister and Department of Agriculture in Tamil Nadu are now 'fully convinced' about SRI, he said. There was no need to achieve super-yields with the new methods because simply adding 1 ton/ha to yield in Tamil Nadu will suffice to meet consumption needs and produce some surplus for the rest of the country.

The presentation by Smt. Manonmani was different in style but not message. She recounted her first introduction to SRI, when 100 people were trained but only she was willing to try out the new methods. The others were "totally frightened." However, she added, "Now all 100 are appreciating me. SRI has given a new lease on life for the farming community." After her training on SRI at the Killikulam campus of TNAU, she went back to her village in the Tirunelveli district of TN, and tried the methods on half an acre. Now she uses

them on 50 acres (20 ha), she said. "What we must do is change the mindset of the people. That is most important."

"Because of my results, I have confidence now," she said proudly. "I can stand in front of you [over 300 people, most of them university-educated] and tell you about my experience. … I tell other farmers, unless you work hard, you cannot succeed." She said that her SRI yields have been as high as 11 tons/ha, and that she received an award for this. "I am ready to train anybody in SRI, from any part of the world." She concluded by saying: "Every farmer is saying that agricultural work does not pay, that it only results in economic losses. But I don't agree. With SRI, it can become profitable. Also, we must remember that if agriculture dies, everyone dies; all life forms will perish." This was quite an admonition for participants to think about as the Symposium began.

After a ceremony of felicitating the SRI proponents and 'releasing' several newly-published books; SRI Experiences of Farmers in India, SRI Fact Sheets for several states, a Symposium special edition of the SRI Newsletter, and manuals on SRI, the Program Leader for Sustainable Rice Systems in the Cornell International Institute for Food, Agriculture and Development (CIIFAD), Dr. Norman Uphoff, the Chief Guest of the event, addressed the participants of the symposium. Since the thoughts which he had shared in his paper for the Symposium on 'What Is SRI?' were too many to be covered in 10 minutes, he suggested that they be read and reflected on. He stressed that *SRI is a work in progress:* "We are not assembled to celebrate SRI, but rather to learn from each other's experiences, good and bad."

While SRI is usually discussed in terms of specific **practices** that change age-old common methods, he said, "It is better to understand SRI in terms of the multiple, scientifically-sound **reasons** why these practices raise the productivity of land, labor, water and capital used in rice production. These, in turn, can be summarized in terms of a number of basic **principles** that make SRI a coherent system of resource management, and ultimately constitute a **paradigm** for improving our agricultural systems in the 21st century".

He commented on three ways of characterizing SRI: (a) SRI is an **opportunity**, rather than a technology; it is something continually evolving, particularly driven by farmer innovation, (b) SRI is a kind of **'infection'** that is benign and beneficial, spreading and activating people to try to make SRI productivity enhancements more widely available, and (c) SRI has become a **movement** which is now worldwide, with thousands of people dedicated to benefiting producers, consumers and the environment all at the same time. SRI as been validated in 36 countries and continues to spread.

Dr. G.S.G. Ayyangar, formerly Commissioner and Secretary of Agriculture in Tripura, now reassigned to central government service, commented from his experience overseeing the expansion of SRI in that state, that SRI is not necessarily connected to either big or small farms, but is scale-neutral. He was

particularly pleased that SRI is being taken up by tribal farmers in his state, who are doubling their yield with one-third less labor per hectare. He commented that Green Revolution technologies, despite being promoted for 40 years, have not reached into the "nooks and crannies" of Tripura, where higher food production is most needed. While it is true that SRI methods cannot be used "in each and every plot," they can be used practically anywhere, he said, "only not everywhere with the best results." The most important thing, he added, is to have, get or create water control, so that soils can be kept well-drained.

When a usual question was asked: "what varieties are best with SRI?" Dr. Ayyangar answered: "any and all." Some are better than others, of course, but yield increases are attainable from practically all varieties. Dr. Gujja added the idea that SRI "liberates farmers from the constraints of seed," because they can use any kind of variety, modern or traditional, hybrid or landrace. "SRI is seed-neutral," although we should help farmers find what varieties perform best with SRI practices under their own local climatic and soil conditions. SRI has the disadvantage of having no commercial interests, like seed companies, promoting it. However, hybrid seed producers should welcome SRI because by reducing the amount of seed needed by as much as 90%, this makes hybrid seed more affordable for farmers who want to use it.

Dr. L.G. Giri Rao of ANGRAU said that 1,500 trials had been conducted, confirming that SRI is variety-neutral, "so variety is not a constraint." However, as observed already, some varieties perform better than others with SRI practices. In ANGRAU experience, it is important not just to train farmers in SRI, but to give training also to agricultural laborers, whose skill and cooperation are needed for best results. The challenge faced in Andhra Pradesh is how to help larger farmers adapt SRI methods for their operations.

The symposium adjourned for a tea/coffee break. During the break, some of the dignitaries and experts attended to the queries of journalists from media at a press conference organized for the event.

2.2: Technical Session I: Experience Sharing by Farmers

In the first session of day 1, a panel of farmers from different parts of India reported on their experience with SRI methods. This session was chaired by Ravindra Babu, the Director of WASSAN.

PUNJAB: The first report was from **Kapil Behal**, who farms in Gurdaspur district and has been guided by Dr. Amrik Singh from the Ministry of Agriculture's **ATMA** program. SRI use in Punjab started in that district, at Dr. Singh's initiative, when 10 farmers cultivated SRI on 3 acres in 2005-06. Use expanded to 25 farmers on 30 acres the next year, and to 150 farmers on 175 acres the next. This year, 150 farmers are using SRI on 225 acres just in Gurdaspur, and SRI use is now spreading within the state.

Behal reported a 20% yield increase from already high levels, going from 7.7 tons/ha with standard methods to 9.8 tons/ha using SRI practices. He has been able to reduce his water use by about 50%, doing alternate

wetting and drying during the season with 13 irrigations, having a maximum depth of 2.5 cm. Standard practices is to maintain standing water of 5 cm, requiring 25 irrigations. Summarizing the experience of Gurdaspur farmers, Behal reported that yield increases of 20-25% are attained with 75% less seed, 45-50% less water, and 25-40% less fertilizer. Also, the rice crop matures 8-10 days sooner than with usual cultivation methods.

Behal reported also that SRI practices were giving better grain quality, more resistance to pests and diseases, and improvement in soil health. The constraints identified from farmer experience were: psychology and attitudes; water management problems; shortages of labor for certain operations; inappropriate design of available cono weeders; limited organic matter for making compost; labor-intensity; and unreliable electricity for pumping water.

ANDHRA PRADESH: Nagaratnam Naidu reported his introduction to SRI methods of rice cultivation in the year 2003 after formal training from DRR and ANGRAU. The maximum yields recorded from his fields are 15 t/ha. He reported 60% savings in water, and compared with 28 kg of seeds/acre sown before he uses only 2 kg of seeds per acre under SRI method. A champion and campaigner of SRI, Nagaratnam Naidu is being awarded the *Jagjivan Ram Kisan Puruskar 2008* by the Indian Council of Agriculture Research (ICAR).

KARNATAKA: Revanna from Bellary district in this state reported next on his use of SRI methods. He has been assisted by the **AME Foundation,** based in Bangalore. He used just 2 kg of seed/acre (5 kg/ha), did seed selection and treated his seeds with Azospirillum bacteria (200 g/acre), transplanting 10 day-old seedlings, 1-2 seedlings/hill, with irrigation just once a week up to panicle initiation and twice a week thereafter. He started weeding at 20 days after transplanting and did 4 weedings in all. He reported higher root growth though also more weeds to deal with. His yield increase was only 5%, going from 4.875 t/ha to 5.125 t/ha, but his costs of production were cut by 30%. This led to a 60% increase in Revanna's net income, raising it from Rs. 9,286 to Rs. 14,872.

HARYANA: Anurag Tewari from **Tilda Riceland Pvt. Ltd.** reported on the SRI experience of two farmers in this state, **Nirmal Singh and Sukhjinder Singh**, both successful producers of Basmati rice. Tilda is the largest exporter of Basmati rice from India, and it has been promoting SRI because of the many advantages it offers. Tewari listed these, as he did at the 2nd Symposium, as including higher tillering, more grains per panicle, and better grain weight. Tilda is particularly attracted by SRI's improved grain quality: a higher head rice recovery rate when SRI paddy is milled; reduced chalkiness; less green grains and immature grains; and fewer damaged and discolored grains. These improvements result in the production of higher-quality Basmati rice for export.

When the two Haryana farmers used SRI methods, they averaged 12.03 tons/ha vs. 11.32 tons/ha with the ***best management practices*** currently recommended by Haryana Agricultural University (HAU). Problems that farmers in Haryana reported are: SRI is "a bit complicated"; SRI is not cheap to utilize and is more labor-intensive (a statement at variance with many farmer reports); SRI requires continuous attention; and SRI requires a strong extension effort to support farmers in their innovation. The Tilda presentation's conclusion was: "SRI has tremendous potential for small farmers."

UTTARAKHAND: Rikeshwar Prasad from Tehri Garhwal district, who has been assisted in the use of SRI by the **People's Science Institute** (PSI) in Dehradun, has only 0.1 ha of paddy land, not an uncommon situation this hill state. With conventional methods, his previous paddy yield was 3.75 tons/ha. This gave him only 375 kg per year to feed his family of four, so they could not meet their basic staple food needs. With SRI, instead of maintaining 6 inches of water on his paddy field, he aims for only 1 inch, and he needs to use only 1.25 kg of seed for his field, instead of 10 kg as he needed before.

Rikeshwar reported on three years of experience using SRI methods, with yields of 6.25 tons, 9.35 tons, and 7.81 tons/ha, i.e., more than double what he produced before. He has also gotten 2-2.5 times more straw fodder for his two buffaloes, an important consideration. He listed the following advantages: less water, less time required, i.e., needs less labour work, and less cost of production with much greater net income. With SRI, he was able to reduce his costs per hectare from Rs. 21,700 to Rs. 12,500. Given higher value of production, his net income from paddy has been increased almost ten-fold, from Rs. 2,750 previously to Rs. 27,600 per hectare now.

The constraints that Rikeshwar listed were: Difficulty in using marker and weeder for the first time, especially by women; difficulty in using weeder and marker in small and irregular terraces; difficulty in transportation of 10-day-old seedlings; and uncertain availability of water under rainfed conditions, especially after the milky stage of ripening. He suggested four lessons: Nursery raising and transplanting need to be done on time; more weeding results in higher yields; design modifications are needed in the Mandava weeder for small terraces; and proper water management is required in terraced fields.

With amusement, Rikeshwar reported that initially there was a lot of reluctance in his village to use SRI methods. "Neighbors said that I was spoiling my field." Now, however, most are willing to accept SRI. Before, Rikeshwar was able to produce only enough food grain to feed his family for 2-3 months, he said. Now, he is producing 6 months' supply for his family plus more fodder for his two buffaloes.

HIMACHAL PRADESH: A similar report was given by **Tilak Raj** from Kangra district, where **People's Science Institute** has also been introducing SRI through local NGOs like the Chinmaya Organisation for Rural Development (CORD). Tilak has only 0.24 ha of land, all paddy land. His paddy yield previously averaged 5.625 tons/ha, giving him 1.15 tons for his family of four.

With SRI, Tilak has modified his water management in the same way that Rikeshwar reported from Uttarakhand. He uses 12-day instead of 30-day seedlings. His yields with SRI methods have not gone up as much as Rikeshwar's – giving him 6.0, 6.25 and 7.5 tons/ha in the past three years. However, he is very pleased with SRI because he now needs less seed and uses less water, while also saving labor time. With SRI, he is producing 40% more fodder, which is important for feeding his livestock, and his costs of cultivation have been reduced by 30%, going from Rs. 20,100/ha to Rs. 14,400. This has raised his net income by 60%, from Rs. 52,150/ha to Rs. 83,000/ha.

The constraints that Tilak identified were: Due to excessive rainfall, the nursery can get spoiled; effort is required to operate the weeder; and marking of small and irregular fields is difficult. The lessons learned are: More filled seeds are obtained in the SRI crop; there are fewer weeds in the crop; the crop is less subject to lodging; and when there is delay in growth of the crops, the crops can be damaged by cattle. He said that in his village they are also experimenting with adapting SRI methods to their wheat crop, a kind of 'System of Wheat Intensification' (SWI).

GUJARAT: [This report was actually made on the second day in a parallel session, but it fits in here most appropriately.] S.M. Patwardhan and S.M. Patel from the **BAIF Development Research Foundation** reported on farmer experience in Dangs district in this state, which has thus far had very little SRI activity. BAIF is working with tribal populations in a remote area with irregular rainfall, where 70% of the households do not produce enough grain to feed themselves from their own land. Average paddy yields are 1 ton/ha.

During the monsoon season, 17 farmers in Dangs agreed to try out SRI methods on .05 to .10 ha, with control plots side-by-side. These farmers had a yield of 2.95 tons/ha on their control paddy plots, so they appear to be somewhat better situated than the average. Their SRI yields averaged 5.37 tons/ha, 80% more, and very high without irrigation. Of much interest was a slide showing how different rice varieties responded respectively to SRI practices under these rainfed conditions:

	Conventional methods (kg/ha)	SRI methods (kg/ha)	Increase (%)
Local varieties	1,853	3,816	106
Improved varieties	3,400	5,390	60
Hybrids	3,094	6,027	95

BAIF reported that the trials had been subject to a 10-day dry spell at 5 days after transplanting. This caused major losses in the control plots, while in the SRI plots increases in biomass were observed. Farmers' observations were: SRI reduces seed requirements; with SRI there is an absolute necessity of weeding; with SRI, proper leveling of fields is very important; and farmers lack practice in using organic manures. Also, farmers observed that the use of organic matter alleviated water-stress problems.

TAMIL NADU: The most enthusiastic farmer report was from **P. Baskaran**, president of the **SRI Farmers Association –Thumbal** in Salem district. He reported that paddy yields have been 2.9 to 5.8 tons/ha in his area, but labor constraints and high costs have made paddy production less and less attractive. In August 2007, TNAU staff with the IAMWARM project introduced farmers in Thumbal village to SRI. "At first, nobody would come forward to follow the methods of SRI." But more than 200 acres were planted with these new methods last year, and farmers found they could reduce their labor requirements by 30% while getting higher yields. This year, about 90% will plant SRI without subsidy, Baskaran said.

Because of their satisfaction with SRI, farmers in Thumbal formed an association to train other farmers and promote the spread of SRI in their area. One goal of the Association is: "Avoid wastage of seeds (we feel it's a crime)." The Association wants also to help farmers reduce their costs of production and to increase their incomes.

Of particular interest in Baskaran's presentation was a modification he reported in the use of the rotary weeder. With *'the Raji method,'* the farmer stands in one row and 'weeds' in the adjacent one. He holds the rotary weeder differently with his hands, pushing and pulling the cones back and forth in the other row. From a standing position, he can cover 3.5-4.5 meters with the Raji method, compared with 1-1.5 meters using the present weeding technique, where he just pushes the weeder up and down the rows across the field.

This innovation, Baskaran reported, saves time and energy, reducing the manpower needed for weeding and saving money. It reduces the number of steps/100 m^2 from 338 to 78, according to one accounting, and it reduces the time required to weed such an area from 48 to 28 minutes. The number of hours needed for weeding an acre is reduced by 43%, from 32.5 to 18.5.

With pride, Baskaran showed pictures of visits to the Thumbal SRI Farmers Association from the **Minister of Agriculture**, the **Vice-Chancellor** of TNAU, and **Dr. T. M. Thiyagarajan**, the TNAU faculty member who started SRI evaluation in 2000 and who has been the key person for getting SRI established in Tamil Nadu. Baskaran said that in the past year, 2,500 farmers have visited Thambal village to learn more about SRI methodology. He invited everyone at the symposium to visit his village and see their results in person.

A final report from Tamil Nadu was titled: ***How a Farmer Obtained Higher Productivity in Paddy by Adopting SRI Methods***. The farmer referred to was **K. Pitchai** in Dindigul District, who, as explained by his agricultural laborer, could not come to the symposium in Coimbatore "due to his old age." Ganesan said, "I have come to make a powerpoint presentation regarding the higher productivity obtained." He described how they had achieved a yield of 14.2 tons/ha the previous season using SRI methods on 2 of the landowner's 9 acres of rice land. They used younger seedlings, wider spacing, water control, etc. The number of hills/m^2 was 20. The average number of productive panicles/hill was 36. The number of grains/panicle averaged 119.

The cost/ha of SRI cultivation was calculated as declining 27%, from Rs. 31,750 to Rs. 23,325. Ganesan showed how with the higher yield and lower costs, Pitchai's net profit had gone up by 125% -- from Rs. 40,250 to Rs. 90.275. Even if these data might be overstated (and there was no evident reason to think that they were), the differences Ganesan reported were of such a magnitude that the agronomic and economic advantages of SRI methods could not be dismissed by suggesting they were just due to 'measurement errors.'

With this review of SRI experience in very diverse parts of India -- Punjab, Haryana, Himachal Pradesh and Uttarakhand in the north; Tamil Nadu and Karnataka in the south; and Gujarat in the west -- the Symposium adjourned for lunch, considerably later than scheduled, but with a lot to think about.

Once the group sessions had been completed, participants were encouraged to visit an exhibition of posters and machinery innovations that had been mounted in the antechamber to the plenary hall. Although the exhibition was in place throughout the entire duration of the symposium, this was the only time slot formally allocated to allow participants to enjoy the various exhibits on show.

2.3: Technical Session II: SRI in India

This session chaired by Dr. Norman Uphoff was led off by Dr. Biksham Gujja from **WWF** with a paper on '*Status of SRI in India and Challenges Ahead*,' showing a map of India with the 564 districts where rice is grown denoted in light green, and the 218 districts where SRI has been already introduced, almost

40%, indicated in dark green. This does not mean that SRI methods are used in the entire districts but that the value of these methods has been demonstrated.

This cartographic survey showed that SRI is now present in all rice-growing states of India, and in all agro-climatic zones. It has been utilized successfully in rainfed as well as irrigated areas, and by all types of farmers, ranging from less than 0.2 ha to over 50 ha. There are national and many state initiatives now underway to promote SRI's further spread. However, the uptake of SRI has been much less than could and should have happened by now, considering that the methods increase production and factor productivity, decrease the need for water, and facilitate using less inputs and having lower costs of production, plus other benefits.

Dr. Biksham proposed setting goals to move the SRI enterprise forward, suggesting that we call for 20% of the rice-sector area to be under SRI management by 2015, with a 30% reduction in current levels of water use for rice production. Given higher yields with SRI, this should enable the country to meet its projected needs for greater rice output. Currently over 8 million ha of rice-growing area produce less than 2 ton/ha. There is considerable potential for yield enhancement in such areas. [Thousands of households in eastern India assisted by PRADAN have averaged 7 tons/ha yields with rainfed SRI there.]

One of the constraints most often identified has been the greater need for weed control, and the implements currently available are not always, or for all soil conditions, considered effective and efficient by farmers. Achieving better design and quality of weeders, and if possible their motorization, would make a big contribution to both the acceleration of SRI adoption and accompanying water saving. To advance the national effort to utilize SRI, there needs to be: more systematic learning from field-level experience; better institutional mechanisms, communication and coordination; more collaboration with the private sector, particularly for implements and for improved market opportunities; and improved natural resource and ecosystem management to ensure sustainability.

Next, **Dr. B.C. Viraktamath**, head of the **Directorate for Rice Research (DRR)** of ICAR, spoke on '*Research on SRI in India and Priorities for the Future*.' Noting that the National Food Security Mission has set a target of 10 million additional tons of rice production by 2011-12, he listed these challenges for the rice sector: plateauing rice yields, declining resource base, deteriorating soil health, increasing environmental concerns, and increasing cost of cultivation, lowering profitability. Water in particular is becoming "a critical factor and [it] will become scarcer and scarcer." As rice crops currently consume about 40% of the country's fresh water, improving water-use efficiency in rice production is "the need of the hour." This can be approached through genetics, trying to breed more water-use efficient varieties and hybrids, or through changes in management, of which SRI is perhaps the most promising option.

Dr. Viraktamath reported that DRR trials showed SRI with a 16.6% yield advantage over 'integrated crop management' (best management practices), with a 46-48% advantage when using hybrids. The trials confirmed the benefits of using younger seedlings, and

SRI also had a measureable impact on soil biology, specifically microbial biomass carbon and microbial biomass nitrogen. Water requirements were reduced by 29% on average. Not much difference was measured in nutrient use efficiency y for N, P and K, but there was significantly higher chlorophyll (SPAD values were 40.08 in SRI rice leaves and 36.03 in conventionally-grown leaves), indicating greater nitrogen uptake. Multi-location trials over four seasons showed an average 12.6% yield advantage on average, though 20.5% advantage in kharif 2007. Also there was evidence of greater pest and disease resistance when plants were grown by SRI methods.

Dr. Viraktamath's conclusions, based on DRR research evaluations, were:

- Performance of SRI is location-specific, and varieties respond differentially to this method.
- SRI is a water-saving and seed-saving methodology.
- SRI can be a best option to promote hybrid rice, as hybrids perform considerably better under SRI management, and it can help farmers save significantly on hybrid seed costs.
- SRI has potential to improve soil health and give environmental protection.
- Further research is needed to understand the factors contributing to higher yield, soil health parameters, and various aspects of sustainability.

The presentation by **Dr. B. C. Barah** from ICAR's **National Centre for Agricultural Economics and Policy Research** (NCAEP) on '*SRI: A Pro-Poor Option for Household Food Security and Resource Conservation*,' started with a review of the origins and methods of SRI before focusing on economic issues. Barah addressed the context of SRI innovation by noting that the rate of rice yield increase in Tamil Nadu, which was 2.37% in 1965-79, accelerated to 4.69% during the 1980s when the Green Revolution was in full sway, and then back to 1.01% from 1990-2002. There has been a slow increase in productivity since then. **At the same time, the rice sector is increasingly dominated by small farmers.** Those who cultivate less than 1 ha comprise 84% of rice farmers in India and manage 54% of rice-growing area. Medium rice farmers, those with 1 to 4 ha, are 15% of the total number and operate 40% of the rice area. Large farmers, having more than 4 ha, are less than 1% of the total and control 6% of the rice area. Although there has been some expansion of the latter category in recent years, the rice sector is overwhelmingly constitute of small and medium farmers. Technological options need to take this into consideration.

Dr. Barah offered data from four districts of Tamil Nadu (Coimbatore, Kanchipuram, Ramananthapuram, and Tanjore) comparing SRI vs. conventional methods. The data can be summarized as follows. Average **yield increase** using SRI methods was only 10% in this data set (5.65 vs. 5.12 tons/ha). However, farmer **net income** (gross income minus total costs) was 31% higher (Rs. 16,363 vs. 12,466). Barah's data also showed a 29% reduction in **water requirements** (23.7 vs. 33.3 irrigations); **labor inputs** were 15% less (199 vs. 235 hours); and **costs of production** were 17% lower (Rs. 15,400 vs. 18,400). Another slide showed a 41% increase in **net returns**, a more inclusive comparison than net income (Rs. 12,984 vs. 9,263); and farmers' **cost of production per quintal** of rice produced was 29% (Rs. 303 vs. 428). Such figures help to explain why SRI methods have been so rapidly accepted by many farmers in Tamil Nadu. Dr. Barah also presented figures on net returns in the four Tamil Nadu districts broken down by ***economic status of farmers***. An analysis of these data shows, not surprisingly, that smaller units of production had **higher returns per hectare**. Such a pattern is common throughout the agriculture sector as smaller units of land are cultivated more intensively. However, the data also showed SRI as giving the highest returns to small and marginal farmers, supporting Dr. Barah's characterization of SRI as 'pro-poor.'

Size of farming operation	SRI (Rs.)	Conventional (Rs.)	SRI Advantage (%)
Marginal farmers	14,466	8,174*	76.9*
Small farmers	13,053	10,100	29.2
Medium farmers	12,345	9,371	31.7
Large farmers	11,030	7,813	41.2

* There were no data reported from Kanchipuram, and the low average yield (4,238) reported from Ramananthapuram suggests there were some failures of marginal farmers' conventional crops there.

The next presentation was on '*Civil Society Involvement in SRI*,' presented by **Dr. C. Shambu Prasad,** from the **Xavier Institute of Management** (XIMB) in Bhubaneswar. He started by emphasizing that non-government organizations (NGOs) are not a homogeneous lot, varying in size, effectiveness, origins, commitment, etc. They operate at all levels, from grassroots to international, and have many kinds of involvement in SRI: implementation, extension, training, resource centers, research, monitoring, policy advocacy, etc. The category also includes farmer associations, networks of many sorts, people's movements, etc.

This involvement is appropriate because SRI has civil-society origins, having been developed by a priest and initially promoted by an indigenous NGO in Madagascar, *Association Tefy Saina*. It has since been taken up most often by NGOs, universities, and community organizations, with government agencies coming into the SRI 'alliance' relatively recently. SRI is knowledge-intensive and entirely voluntary, so its promotion by civil society is more feasible than if large amounts of capital were involved.

An analysis of the membership of the SRI Google-group in India shows that 60% of its membership is from civil-society organizations (CSOs) broadly defined, and civil society has given leadership for SRI extension in West Bengal, Uttarakhand, Himachal Pradesh, Orissa, Bihar, Jharkhand, Karnataka, Assam, Madhya Pradesh and Andhra Pradesh. In Orissa, there are 23 organizations working in 46 blocks and 414 villages to promote SRI, with over 5,000 farmers already involved in the SRI movement there.

SRI expansion in India is now in what Dr. Shambu Prasad characterized as a Phase 2, where civil society is playing increasingly diversified and creative roles, improving implements for SRI, extending the concepts and methods to other crops, adapting them to rainfed rice production, applying SRI to traditional varieties, and promoting organic intensification of production, also supporting greater involvement of women, and integrating SRI into watershed management, natural resource management, and sustainable livelihoods. Various institutional models for promotion as being devised, even within a single NGO, e.g., PRADAN.

Dr. Shambu Prasad described the emergence of an SRI people's movement in Orissa, with rural people now using a new greeting ("*Jai SRI*") and developing songs, poems, dances, etc. to celebrate and publicize the practices of SRI. "*Jai SRI*" is a variation on the Indian Independence Movement salute: "*Jai Hind*," and is a contraction for "*Jaivik SRI*" meaning 'organic SRI.'

Now the SRI movement in India seems to be entering or will soon enter a Phase 3, according to Dr. Shambu. This in particular involves the challenges of scaling up. Civil-society organizations will have to become more adept at working with government agencies, research institutions, and private sector, learning how to influence public policy and operate, often more indirectly, on a larger scale.

Special contributions that CSOs can make in the future may be to give attention and weight to **cultural dimensions** of SRI practice, while maintaining a vocal concern for **equitable and sustainable outcomes**. They can also help to **document impacts**, negative as well as positive, holistically, and to keep **climate change** issues on everyone's agenda. A particular challenge will be for NGOs like IDE to work with the private sector to improve the **supply chain** for SRI implements.

In conclusion, SRI would not have gotten this far, and not so quickly, without the involvement of civil society actors, and SRI would be quite different qualitatively if its development and dissemination had been entirely in the hands of either the public or the private sector. The shape of SRI in the future will also be determined at least in part by civil society involvement.

This presentation was followed by an NGO contribution, by Mr. **A. Ravindra**, Director of **WASSAN**, discussing '*Promotion of SRI under the National Food Security Mission*.' NFSM is a large-scale Government of India initiative that includes SRI as one of its rice-sector components. The initial target was to extend SRI practices over 5 million hectares over a five-year period (2007-2012), to raise rice production by at least 10 million tons. But Ravindra noted that the Rs. 50 million ($1 million) allocated for SRI demonstrations is less than 2% of the NFSM funds allocated for the rice sector. While the NFSM documents say that farmer field schools (FFS) will be used to spread knowledge about SRI, relatively few resources are earmarked for such activities.

Most funding for SRI under NFSM thus far is allocated to subsidies for the distribution of implements. While weeders and markers are indeed important for saving labor time and for getting best yield results with SRI, this approach reflects the government's 'input-centric' fixation in agricultural extension. That SRI is a ***knowledge-based*** innovation does not seem to have been well comprehended. SRI should be promoted in different ways than those used in previous extension campaigns, e.g., SRI is more effectively spread through farmer-to-farmer visitation, and with trained SRI farmers in 'expert' roles.

A number of suggestions were made by Ravindra based on his analysis:

- Membership should be provided for CSOs on national and state-level committees that plan and oversee SRI campaigns, to incorporate their experience and perspectives.
- State or Regional Resource Centers for SRI should be established, following the precedent of the '**learning alliance**' established in Orissa, formally operating under the auspices of NFSM.
- There should be partnership of CSOs and farmer associations with state-level coordinating agencies.
- Partnerships were recommended with ATMA at the district level, involving appropriate financial support to CSOs.
- Create a research capacity to consolidate and advance SRI knowledge and practice involving KVKs and various agricultural research institutions and state agricultural universities with strong capacity.

As possible 'ways ahead,' Mr. Ravindra suggested: more financial outlays to support SRI extension activity; redesign of institutional mechanisms for SRI promotion such as under NFSM; geographically-focused programs; and a stronger soil-health program to combat decreasing soil fertility, which currently dooms conventional agricultural development efforts.

A presentation on '*Promoting SRI in India: The Experience of the **Sir Dorabji Tata Trust***' was made by Mr. **Biswanath Sinha**, SDTT program officer. After giving background on the Trust, Biswanath projected a

map of India, which showed Human Development Index (HDI) scores by district across the country. This showed clearly that the greatest poverty and underdevelopment in India was evident in the eastern and some northern states. The Trust accordingly is focusing its grants and support in these regions of the country. It has also identified SRI as one of the most potent and cost-effective ways to counter poverty and food insecurity, starting to fund the SRI work of five agencies promoting SRI in 2006.

In January 2008, the Sir Dorabji Tata Trust made an allocation of Rs. 10.94 crores ($2.28 million) for a three-year program supporting SRI work in eastern and northern India. The strategy has four components: (a) reaching out to small and marginal farmers, (b) human resource development for SRI, particularly training master-trainers, (c) awareness-building on SRI, (d) ensuring cross-learning among practitioners and SRI advocacy, and (e) promoting innovation within SRI, e.g., applications to other crops (Biswanath's slide showed large panicles of finger millet).

Currently, there are 107 partner organizations in Uttarakhand, Assam, Bihar, West Bengal, Jharkhand, Orissa, Chhattisgarh and Madhya Pradesh, which receive some SDTT assistance in their work with 30,198 small farmers, using SRI on 6,635 acres in kharif season 2008. Biswanath noted that the state governments of Orissa, Uttarakhand and Assam have begun 'mainstreaming' SRI into their official agricultural programs.

A table of results from Uttarakhand in the 2008 kharif season, with data from 6 taluks in Kumaon district and 7 taluks in Garhwal district, showed grain yields up 76% on average, and straw yields up 46% using SRI methods. Another table presenting data reported by five NGOs working in the state of Assam showed farmers whose conventional yields previously averaged 3.05 tons/ha getting average yields of 6.25 tons/ha when they used SRI.

Major concerns of SDTT and partners included: weeders and markers need to be made more available; non-availability of enough organic matter for fully organic production; in target areas, paddy cultivation is still dependent on rainfall, and many areas are vulnerable to floods (Assam, Orissa) or to drought (northern Jharkhand) or landslides (Uttarakhand); and limited labor supply during the peak period of demand for labor during transplantation time.

Future plans included: addressing the issue of marker and weeder supply; dealing with the issue of organic manure supply and soil nutrient supplementation; reaching out to another 50,000 small and marginal farmers by next *kharif* season; initiating SRI in 4 new states: Maharashtra, Manipur, Nagaland and Meghalaya; and conducting soil nutrient studies in fields where SRI has been practiced over 5 years. SDTT is also starting a complementary initiative on 'diversion-based irrigation' (DBI) to introduce or improve small-scale systems, fed by small streams or rivers or by surface run-off.

In his presentation on *'Farmer-Level Problems, Constraints and Innovations in SRI Cultivation'* **Dr. T. M. Thiyagarajan**, who is retired from the TNAU faculty, gave a review of *technical issues* with SRI. He has served as Head of TNAU's Rice Research Center at Tirur near Chennai; before that he was Dean of the TNAU campus at Killikulam, and before that Director of TNAU's Center for Crop and Soil Management Studies in Coimbatore. He has recently joined the WWF program as a consultant on SRI, having been the first Indian researcher to being working on this innovation as early as 2000.

Dr. TMT focused on the four basic areas where SRI departs from standard rice-growing practice: nursery management, transplanting, irrigation, and weeding. In particular, his presentation showed a number of nursery and weeder innovations, most of which have come from farmers and which are being documented and evaluated by the university and NGOs.

Dr. Aum Sarma spoke briefly about '*SRI Farm Implements and Machinery*' being developed at the Agricultural Research Institute of ANGRAU in Andhra Pradesh for use with SRI. He showed pictures of various markers and weeders, both manual and mechanical, which are being produced and sold by the Institute. He showed also a self-propelled (motorized) four-row weeder, which attracted considerable interest, although the present design is heavier and less 'agile' than desirable. Dr. Aum said that work is started on a paddy transplanter that can space 1-2 seedlings per hill, and work is continuing on a self-propelled weeder that can meet farmers' specifications. [A farmer in Costa Rica has recently sent CIIFAD a report on a version of SRI that he has developed with mechanized transplanting, and with yields of 8 tons/ha instead of 4.2 tons.]

Dr. L.G. Giri Rao, Director of Extension at ANGRAU, in a presentation on "Andhra Pradesh: Initiatives for SRI and Lessons," reviewed quickly his university's experience extending SRI over the past seven seasons, dating from the 2003 kharif season when his predecessor, Dr. A. Satyanarayana, started evaluating and dissemination SRI in Andhra Pradesh state. ANGRAU staffs have engaged in many farmer workshops and scientific meetings to promote understanding and use of SRI methods. Dr. Giri Rao provided data from 1,043 on-farm trials, which showed a yield advantage of 35% (7.538 tons/ha vs. 5.733 tons/ha). In addition to higher yield, crop maturity was advanced by 7-10 days, which is a real benefit to farmers.

Dr. Giri Rao reviewed reasons why some farmers are still finding adoption of SRI methods difficult. Some complain about the 'drudgery' involved in SRI nursery management and transplanting young seedlings (even though the number of seedlings is reduced by 80-90%), using a marker, and manual cono weeding. Weed management in SRI fields is also considered difficult (a common view). Lack of standardized protocol means that different actors practice SRI differently (although many see this as positive rather than negative). "Most of the farmers feel that SRI is a labor-intensive technology,"Dr. Giri Rao reported (although information given by farmers from other states and data from Tamil Nadu reported by Dr. Barah earlier in the day showed SRI to be labor-saving). Because of these constraints, many farmers discontinue SRI during their 2nd year, he said. There is also a lack of skilled force available for transplanting and cono weeding.

Dr. Giri Rao noted that SRI has the advantages of cost-effectiveness and increased yield per unit area over conventional paddy cultivation. He urged that extension, research and policy support for SRI be given immediate attention. For scaling up SRI, a stronger research data base on SRI is needed, he said, also large-scale demonstrations, multi-location trials, motorized cono weeders, and skill upgrading of SRI partners, including laborers. In conclusion, he noted that a seed rate of 5 kg/ha is quite sufficient and could save 400,000 tons of rice in Andhra Pradesh alone, worth about Rs. 300 crores. It was also now clear that young seedlings can give more yield, and that a single seeding per hill is enough to obtain good yields. Further, rice can be cultivated successfully with a lesser amount of water than is now used.

When Dr. Giri Rao finished, the floor was open for questions and comments. Unfortunately, there was no opportunity to discuss and reconcile the views that he had expressed which were at variance with what a number of other speakers had previously reported. Quite a diverse set of comments were elicited by the afternoon's presentations and the discussions went on until 7, at which time the Symposium adjourned for a cultural event of modern music and dance, followed by a dinner for all participants.

3. DAY 2: Parallel Sessions

Next morning, the Symposium reconvened at 8 am, with participants meeting in one of four Technical sessions:

(a) Technical session IIIa: ***Research Studies*** especially with respect to planting practice; agronomy and chemical usage;

(b) Technical session IIIb: ***Extension, Tools and Constraints*** in terms of on-farm practices and technology transfer (including the need or otherwise of subsidies); adoption by indigenous minorities; and the ongoing mechanization challenge;

(c) Technical session IIIc: *E**conomic Impact Assessment and Market*** including the differential economic efficiency of SRI compared with tradition production practices; commercial opportunities for SRI farmers; the role of banks in promoting the method; and potential benefits that could accrue to social networking and

(d) Technical session IIId: *I**nstitutional and Policy Issues*** including a review of local successes; the need for new arrangements that unite Government and other institutions; the challenges of taking SRI to scale in mountain areas; possible communal operations such as nurseries; the potential contribution of farmer field schools; the need for incentives; inadequate machinery (yet again!); and how to re-attract "dis-adopters".

The four parallel sessions was followed by a plenary session under Technical session III e.

This Plenary Session was chaired by Dr. G.S.G. Ayyangar, IAS, Joint Secretary and Advisor, Ministry of Home Affairs (Disaster Management), Govt. of India, New Delhi. Dr. Ayyangar in his introductory remarks shared with the delegates his views and experiences with SRI in Tripura where he worked and was involved in the promotion of SRI among the farmers of that State. He stated that although he is convinced of the advantages and benefits that would accrue to the farmers from the SRI method, SRI, he conduded, cannot be spread to every rice-growing area in the country within economically viable costs due to certain obvious reasons. In this session, the Rapporteurs summed the gist of the presentations, discussions and condusions of the previous four sessions which have been explained below:

3.1: Technical Session IIIa: Research Studies

This session chaired by Dr. T.M. Thiyagarajan, formerly Dean at the TNAU, had six paper presentations on: i) **Evaluation of Principles of SRI and their Influence on Growth Parameters and Grain Yield of Rice** by Principal Sscientist Dr. R. Mahender Kumar from DRR; ii) **Effect of Crop Geometry Levels under SRI on Tillering Behaviour and Yield of Rice** by Dr. N. Thavaprakash from Dept. of Agronomy, TNAU; iii) **Grain Quality Parameters of Cultivars as Influenced by SRI in Rice** by Principal Scientist Dr. N. Ravindra Babu from DRR; iv) **System of Rice Intensification in Quality Seed Production of Paddy Variety ADT 39** by Dr. Manonmani, Associate Prof, Dept. of Seed Science and Technology, TNAU; v) **Evaluation of SRI Practices for Sustainable Rice Farming within Cauvery Delta Zone** by Dr. R Rajendran, Prof. (Agronomy), TRRI; and vi) **Influence of SRI on Pesticide Usage in Rice** by Dr. Ch. Padmavathi, Scientist (Entomology), DRR.

The conclusions of IIIa session are:

i) Integrated Nutrient Management was found to be better and more appropriate for SRI rice production.

ii) Crop under SRI practice was found to be greener than under conventional system, indicative of greater photosynthesis.

iii) Tillering was found to initiate around 15th day after planting and peak tillering was observed around 30 DAP.

iv) Third-leaf stage seedlings were found to be better for transplanting.

v) Leaf folder incidence was found to be heavier in SRI rice.

vi) SRI rice in *kharif* season performed well and recorded higher grain and straw yields than under *rabi* season.

vii) There is need for conducting more detailed studies on profuse tillering, nutrient removal by the crop, appropriate water management, influence of wider spacing, and physiological aspects like shortening of crop duration for proper scaling up of SRI in the coming years.

viii) Difficulties in transplanting very young seedlings and intercultivation (weeding) operation was reported as most limiting factors of SRI.

3.2: Technical Session IIIb: Extension, Tools and Constraints

Dr. M. Mahadevappa, former Chairman with ASRB under ICAR, chaired this session in which four papers were presented on: i) **Farmer-Participatory Extension: A Case Study of SRI Technology Adoption in North-Western Agro-climatic Zone of Tamil Nadu** by Dr. M. N. Budhar of the Regional Research Station of TNAU; ii) **Promotion of SRI in Rain-fed Rice Cultivation among Farmers in Dangs District of Gujarat** by S.M. Batwardan from the BAIF Development Research Foundation, Pune in the state of Maharashtra; iii) **SRI Transplanter** by Dr. Rangasamy, Dean of the Agricultural Engineering College and Research Institue (AEC & RI) in Kumulur, Trichy district of Tamil Nadu; and iv) **Development of a Motorized Weeder for SRI** by Dr. D. Manohar Jesudas, Prof. and Head of Dept. of Farm Machinery of the AEC & RI of TNAU in Coimbatore.

The conclusions of the papers presented in this session were:

i) Increase in rice yield by 1 t / ha was recorded in SRI fields in Dharmapuri / Krishnagiri districts.

ii) Difficulties in raising mat nursery, using markers and cono weeders were some of the expressed constraints in adopting SRI.

iii) Local and improved varieties and hybrids were found to be suitable for SRI cultivation, and average grain yields of 53.7 q / ha (5.35 tons/ha) were recorded under SRI compared to 29.5 q / ha (2.95 tons/ha) under conventional cultivation in Maharashtra.

iv) A motorised weeder to cover 2 to 3 rows is under successful experimentation at the TNAU and would be released for use by farmers shortly. It would cost around Rs. 40,000 / unit and would be suitable for use under different soil conditions. It could be used to cover 1 ha / day with 2 labourers.

v) Development of modified transplanter with adjustments to transplant 1 to 2 seedlings / hill in several rows at a time must be developed as early as possible.

vi) It was suggested to organize SRI exhibitions at village stations and to give daily briefings on SRI through TV and CDs on SRI for reaching individual farmers.

vii) The cost of cultivation could be reduced by 20 - 30% by adopting SRI method of rice farming

viii) Sarah E.J. Beebout, soil chemist from IRRI, opined that farmer-to-farmer extension works, and NGOs could play key roles in extension activities of SRI promotion.

The Chairman of this session in his concluding remarks stated that in future, machinery would play greater roles for the success of SRI, and so cost-effective machineries must be developed to carry out the different operations at critical stages of crop growth.

3.3: Technical Session IIIc: Economic Impact Assessment and Markets

This session chaired by Dr. B.C. Barah, Principal Scientist of NCAEP of ICAR in New Delhi, had five papers on i) **Differential Efficiency Levels at SRI and Non-SRI situations** by Dr. K. Palanisami, Director of International Water Management Institute (IWMI) – TATA program at ICRISAT); ii) **Impact Assessment of SRI Cultivation** by Prof. K.N. Selvaraj of TNAU; iv) **Commercial Opportunities for Organic SRI Producers** by Ken Lee from Lotus Foods of U.S.A.; and v) **Role of Banks in Promotion of SRI** by V.K. Rao, General Manager of NABARD.

The following salient conclusions were drawn after discussion on the papers presented in this session:

i) It was stressed to develop some common methodology to measure the economic impact of SRI on the farming community at macro level, not just at on-farm level.

ii) Packages of SRI practices must be perfected to scale up SRI suitably.

iii) Water saving must be analyzed and quantified using economic tools.

iv) Indirect benefits like improvement in grain quality must be measured also.

v) Higher prices were demanded for organic SRI rice products.

3.4: Technical Session IIId: Institutional and Policy Issues

Dr. Shambu Prasad from XIMB, Bhubaneswar, chaired this session in which the six papers presented were: i) **Popularisation of SRI Cultivation through IAMWARM Project** by Dr. M.V. Rangaswamy, Director, WTC of TNAU; ii) **Scaling up SRI: TRIAD Initiatives Hold the Key to its Success** by Dr. Nabarunsen Gupta, Culcutta University; iii) **Scaling Up of SRI through Farmer Field Schools: AMEF's Experience in Tamil Nadu** by K. Gandhimathi, AMEF, Dharmapuri; iv) **Role of Government and Panchayat Raj Institutions in Large-Scale Adoption of SRI in Tripura** by Dr. Baharul Islam Majumdar, Dept. of Agriculture, Tripura; v) **Food Security and SRI : A Reflective Note based on PRADAN's Experience in Eastern India** by Dinabandhu Karmakar, PRADAN in the Purulia district of West Bengal; and vi) **PSI Experience in Northern India** by Debasish Sen from People's Science Institute in Dehradun.

Main points of the papers presented in this session have been summarized by Dr. Norman Uphoff as follows.

TAMIL NADU/TNAU-IAMWARM: The director of the **Water Technology Center** (WTC) of TNAU, **Dr. M. V. Rangaswamy**, reported on SRI experience under this World Bank-funded project for himself and B.J. Pandian, head of the IAMWARM cell within the WTC. This project to modernize irrigation on >600,000 ha within 63 sub-basins, has a budget of Rs. 25 billion and includes plans to introduce SRI management on 250,000 ha. TNAU is one of the implementing partners and is responsible for SRI extension. Rangaswamy said that maximum SRI yields of 14.2-15.4 tons/ha have been achieved already. Average yields in the area are 4.465 kg/ha. With SRI practices, not all being used or used as advised, nearly 25% of farmers have gotten a 20-30% increase (to 5,300-5,800 kg/ha), while 21% have gotten 30-40% increases (to 5,800-6,250 kg/ha). Ten percent have gotten even larger increases.

The conclusion to their written paper was: "The overall response to [SRI] from farmers in the sub-basins is exceptional and encouraging. Thus, SRI has rejuvenated the declining interest in rice cultivation to many rice growers. With the positive results coming from the various sub-basins, it is time for us to channelize our efforts to achieve greater water productivity as well as grain productivity and also to take part in a second Green Revolution."

EASTERN INDIA/TRIAD: A senior faculty member from **Calcutta University**, **Dr. Nabarun Sen Gupta**, reported on a private sector approach to SRI dissemination, through a company called **Triad Services**, which is affiliated with the consulting firm **BASIX**. The program started with 33 farmers at Berhampur in Orissa in 2006/07, and 48 farmers at Srikakulam in AP in 2007/08, but it has expanded greatly this year. The program started with a grant of Rs. 200,000 for this action research. All varieties were found to give higher yields with SRI methods, 75% on average in Berhampur, and 30% on average in Srikakulam. There was also an increase of 49-75% in straw yield. BASIX figured out that a self-sustaining program could be operated to spread SRI if participating small and marginal farmers paid a service fee of Rs. 300 (plus Rs. 40 tax) for technical training and support. Farmers with successful use of SRI methods could recover this amount (about US$7.50) several times over.

With 1,067 farmers enrolled in 2008/09 in the states of Andhra Pradesh and Orissa, this fee is generating Rs. 382,000, which can cover the program's costs of operation. Triad is not 'cherry-picking' by working with larger farmers. In fact, it is working in areas of poverty. This year's program also includes 970 small and marginal farmers in Bihar and 1,050 such farmers in Jharkhand. TRIAD provides one technician to service 400 farmers, being available at all critical periods of the crop cycle.

Transplanting very young seedlings has been difficult because of the unreliability of the monsoon rains. (TRIAD is working with rainfed farmers.) Mostly the seedlings used have been 18-20 days, with only a few able to plant 14-15 day seedlings, as recommended. Also, many find alternate wetting and drying difficult, being afraid of monsoon irregularity. But most are doing 2-3 weedings as recommended. Farmers have seen the value of 1 seedling per hill which gave 490 tillers/hill vs. 400 or fewer when 2, 3, 4 or 5 seedlings/hill were planted). Also it was seen that both grain and straw yield are higher with use of younger seedlings.

Farmers assisted by TRIAD find that their SRI paddy receives a better price because of higher grain quality, and they are starting to engage in collective marketing, as this gives them some bargaining power and cuts their costs of marketing. Getting participating farmers organized into collective-action groups has become part of the TRIAD strategy. This private-sector initiative for SRI was somewhat of a contrast to most of the other presentations in the parallel session, which came from NGOs or from a university or a state government.

WEST BENGAL/PRADAN: Dinabandhu Karmarkar reported on the SRI experience of PRADAN, the NGO that he works with in Purulia district of West Bengal. The communities with which PRADAN is engaged

there have very poor soil resources and unreliable rainfall. There is crop failure in one out of every three years. PRADAN began its own efforts at 'rice intensification' in 2001 with younger seedlings (25 days instead of much older), and 2-3 seedlings per hill (instead of 7-8). It encouraged greater use of chemical fertilizers as this was thought to be necessary given the soil quality, although it did try to get farmers to grow legume crops as green manures. There were, however, difficulties in getting improved-variety seeds into farmers' hands, and getting them the right doses of chemical fertilizers. Because of the unreliable monsoon, farmers often had to plant seedlings that were 'too old,' but the cost of seed to grow large additional nurseries was a deterrent.

In December 2002, Dinabandhu met with Prof. Uphoff in Delhi and learned the details of SRI practice. Only four farmers in Purulia would try the new methods in 2003, but the results were good, and next year, 150 households began using SRI, and PRADAN started trying out the methods in other poverty-constrained districts in other states of eastern India. There were about 2,000 farmers using SRI methods in 2005, and 6,200 (with 632 hectares of SRI) in 2006. Last year, there were 10,400 farmers practicing SRI on 1,080 hectares. This year, the number is about 20,000.

Primary reasons for spread were (1) Lower seed rate, which permitted farmers to plant additional nurseries, with little seed required, to have alternative nurseries to use for having young seedlings if the monsoon rains are delayed; (2) Shorter time for nurseries, so that farmer can start them even as late as the middle of August if the monsoon arrives very late; (3) Extra root growth, which enables plants to exploit soil moisture at low depths during dry spells; and (4) Higher yield, which can help marginal households, with an average holding of 1 acre (0.4 ha), to attain food security. Yields have average 7 tons/ha even without irrigation, and a few yields have reached 12 to 14 tons (one even 15 tons measured by an IWMI evaluation team in 2004). In Orissa, the SRI yields have averaged 3.75 tons/ha, not 7.5 t/ha as in Purulia, but even that represents about a doubling of current paddy yields

Constraints to expansion which Dinabandhu reported were: (1) No possibilities for recommended water management (alternate wetting and drying) for lack of irrigation facilities; SRI has had to be reformulated for rainfed production; (2) Prolonged deep water during the monsoon damages rice-plant roots, so farmers have to be persuaded not to horde rain water in their fields; (3) Some farmers adopting wider spacing (30 cm) have had low tillering due to soil or weather conditions; (4) Other farmers have gone for single-seedling transplantation, but with closer spacing than recommended (15 cm); (5) Many farmers failed to transplant at 12 days due to unavailability of rainfall and reverted to older seedlings; (6) Some farmers who have used the methods for several years have reported reduction in yields now, indicating a need to make greater efforts to collect and apply more organic matter for these plots.

This year in Purulia, the average SRI yield was lower because many farmers have modified SRI to such an extent that it does not meet SRI expectations and produce the expected yields. This can undermine farmers' interest in the new methods. There have been large drop-outs in one particular block (Barabazar), with only 87 SRI users this year compared to 600 last year. In Gaya district (Bihar), 25% of the 4,352 families practicing SRI this year lost most of their crop due to drought, while the other 75% had to make great efforts to pull their crop through the season. However, we noted that non-SRI farmers in the area suffered **even greater losses** due to the adverse weather. Further modifications of SRI methods to succeed in these climate- and soil-limited conditions will need to be made.

TAMIL NADU/AME: The **Agriculture-Man-Ecology Foundation** based in Bangalore, with branches in several South Indian state, made a report on '*Scaling Up of SRI through Farmer Field Schools: AMEF's Experience in Tamilnadu*,' reported by **Smt. K. Gandhimadhi**. She said farmer-volunteers for this effort

were recruited through the 450 self-help groups (SHGs) with which AME's local NGO partner known as BEST was already working.

Each NGO staff member worked with three 'farmer-volunteers,' who were given 15 days of training. Each farmer-volunteer then worked with 10 villages, so that there were 30 villages reached per staff member. Since the Farmer Field Schools established in each village each had 20 farmer participants, there were 600 farmers (53.5% of them women) connected indirectly to each BEST staff member. Attendance in the Schools was 85%, and field days at the end of the FFS were very popular.

In the Pudukkottai area where Ms. Gandhimadhi works, 105 farmers used SRI methods on 88 acres (35.2 ha) this past season, using single seedlings 11 to 22 days old (not all planted young seedlings), following the ecological principles of cultivation presented in LEISA magazine. Farmers found collective nurseries practical, given the small number of seedlings involved, and they put bird perches up in their fields to attract birds that would feed on insects.

The yield that Ms. Gandhimadhi reported, 12.25 t/ha, sounded too high for an average. However, some SRI plants had up to 95 tillers, she said, with 72 fertile tillers, numbers for which there are certainly precedents. Farmers' costs of production were reduced by 55%, she reported, contributing to higher farmer net income.

All farmers are persuaded now that they can get higher yields with younger seedlings, she concluded. It was interesting to see the contrasts between AME's approach and the earlier TRIAD report. Each had a different kind of institutional mode – NGO vs. private sector – but the same goal: to multiply SRI use rapidly and at low cost. AMEF's SRI project is supported by ICRISAT-WWF.

TRIPURA/DEPT. OF AGRICULTURE: Dr. Baharul Majumdar, a senior agronomist in the DOA in Tripura state, reported on '*The Role of Government and Panchayati Raj Institutions in Large-Scale Adoption of SRI*,' in which he has played an instrumental role. He noted that the state government had pledged in its 2001-2010 plans for Tripura development to achieve self-sufficiency in food grains and thereby improve farmers' economic condition by the end of the plan period. However, by 2005, halfway through the plan period, not much progress was made toward these goals.

Dr. Majumdar began experimenting personally with SRI methods in 2000, and by 2002/03 he began on-farm trials, with 44 farmers, on just 0.2 ha (0.5 acre) each, only 8.8 ha in total. From this small beginning, next year he got 88 farmers to try the methods, and in 2004/05, there were 440 farmers using SRI techniques on 0.4 ha (1 acre) each. This was again doubled to 880 farmers in 2005/06, for an area of 352 hectares.

At this point Dr. Majumdar was able to get the state government to give SRI its full backing, despite Dr. Majumdar described as "criticism, resistance, and opposition." He showed pictures of the Secretary of Agriculture in an SRI field, talking with farmers, and of Dr. M.S. Swaminathan.

One-third of the state's agriculture budget was allocated to SRI promotion; with a threat to stop the salaries of any officials who did not cooperate (this sanction was invoked for 10-15 personnel). The growth of SRI use is shown in the table below, from Dr. Majumdar's presentation:

	No. of farmers	Area under SRI (ha)	% of rice-growing area
2005/06	880	352	0.14
2006/07	73,300	14,678	6.23
2007/08	162,485	32,457	13.77
2008/09	250,000*	50,000*	21.23

* Expected

Dr. Majumdar provided data on the average paddy yields in Tripura state (total and SRI) compared to the all-India average. Tripura's average yields were already somewhat higher than those for India as a whole in 2003/04. In that year, SRI yields were more than double those in the rest of the state. This advantage has only 70% in 2007/08 as the program expanded rapidly. The average yield increase was 1.77 tons/ha, compared with almost 3 tons/ha greater production with SRI methods in 2003/04. Some tradeoff between expansion and effectiveness is usually to be expected, especially when any program expands rapidly, and when supervision and implementation are less thorough. Projections that Dr. Majumdar showed indicated that average yield in the state needs only to increase by 1 ton/ha to meet the government goal.

Yield (in tons/ha)				
Year	All-India	Tripura	SRI in Tripura	Increase over present practice
2003/04	2.077	2.396	5.360	2.964
2004/05	1.984	2.352	5.025	2.673
2005/06	2.102	2.383	4.690	2.307
2006/07	2.084	2.503	4.271	1.768
2007/08	N.A.	2.550	4.321	1.771

When Dr. Majumdar finished, Dr. Uphoff asked him whether there is any ***disadoption*** of SRI being observed in Tripura. This has been reported from Andhra Pradesh, and previously from Madagascar (in an article published in *Agricultural Systems*). This has been regarded by some as a vulnerability for SRI. Dr. Majumdar said that to his knowledge this has not been significant in Tripura; the benefits are so tangible, and the extension service provides a good backup to assist farmers if they encounter any problems. Having enough organic matter to replenish the soil is a constraint that they are working on in Tripura. Also, because most farmers depend on rainfall rather than on irrigation, appropriate adaptations in SRI practice are needed for rainfed conditions and are being further refined.

UTTARAKHAND AND HIMACHAL PRADESH/PSI: Debashish Sen from the **People's Science Institute** reported on PSI experience working with farmers to introduce SRI in these two northern mountain states. Work started in 2006 with orientation workshops for about 1,000 farmers and district-level meetings with officials, local NGOs and others. The first year, just 40 farmers tried out SRI methods in 25 villages. The second year, this number expanded 15-fold to 591 in 133 villages. Results were good: 5.3 tons/ha for SRI vs. 3.2 tons/ha with conventional methods in 2006, the first year, and 5.4 tons/ha vs. 2.9 tons/ha in 2007, even better the second year.

With this base of experience, and with support from the Sir Dorabji Tata Trust for work in Uttarakhand (UK) and from WWF for work in Himachal Pradesh (HP), the numbers of farmer-participants expanded 20-fold in 2008. Five hundred village clusters were selected; advertisements were put into popular daily newspapers and onto the ETV channel; a user-friendly manual was produced in Hindi; and a 20-minute film was made (also in Hindi). The number of farmers given training was 15,110, and 12,009 (80%) in fact followed up with SRI production on their farms, on a total area of 238.7 hectares.

The numbers of farmers (and villages) in UK and HP, respectively, were: 8,996 (358) and 3,013 (138). Crop-cutting results showed that in UK, where the control plots with conventional methods yielded 3.4 tons/ha, SRI methods gave 5.6 tons/ha; in HP, these averages were 3.8 tons/ha vs. 5.3 tons/ha, for an overall average yield increase of 50% with SRI methods.

Of much interest to everyone was Debashish's report on farmer experimentation with applications of SRI concepts and methods to other crops: wheat; *mandwa*, a small-grained millet native to the Himalayan region; and *rajma* (kidney beans). The average increase in yield across seven trials was 57%. Debashish presented benefit-cost analysis for different kinds of cultivation and crops, which showed very substantial net profits (Rs./ha) that could be gained from changes in cultivation methods because of a combination of both increased yield and reduced costs of production.

	Conventional practice	SRI/SWI practice
Transplanting – local paddy variety	8,450	32,245
Transplanting – Basmati paddy variety	35,125	71,375
Direct sowing - wheat	7,880	25,270

The most interesting data reported from PSI was the relationship between yield and both the age of seedlings and the number of weedings, something we have seen in factorial trials. This information came from a variety of on-farm experiences across the two states:

Age of seedlings	Yield (tons/ha)	Number of weedings	Yield (tons/ha)
>23 days	4.0-4.5	One	5.0-5.5
16-23 days	5.5-6.0	Two	6.0-6.5
10-15 days	7.0-7.5	Three	7.0-7.5

Because ambient temperatures in UK and HP are colder, given the higher elevations, the seedling age at which the fourth phyllochron begins is later by several days than for rice cultivation in the tropics and even most temperate areas. Even so, we see that the advice to transplant by the 15th day and to do more than two mechanical weedings, to aerate the soil as well as control weeds, holds up in northern India.

Debashish reported on the institutional networking that PSI has done to introduce SRI in these two states; cooperating institutions include Vivekananda Parvatiya Krishi Anushandhan Sansthan (VPKAS), Almora, UK; G.B. Pant University of Agriculture and Technology, Pantnagar, UK; the Rice and Wheat Research Centre, Malan, HP; and the CSKHP Agriculture University, Kangra, HP. Provision has been made for program monitoring, with state-level panels (Programme Monitoring Committees, PMCs) of experienced persons including experts, government officials, scientists, etc. The PMCs work through field visits as well as holding meetings with the programme staff. Programme feedback is provided to top government officials like the Chief Secretary, Agriculture Secretary, Rural Development Commissioner, and Agriculture Directorate.

Policy advocacy is pursued through linkages with the Agriculture Department, and coordination is sought with the national extension program (ATMA) which operates at district level, with development projects, state agricultural universities, KVKs (extension centers) and other institutions. These efforts are reinforced by media advocacy, popularizing SRI through newsletters, local newspapers, magazines, national journals, radio, TV, etc. and also by state-level workshops with officials, farmers, researchers and NGOs.

Farmers have drawn the following conclusions about SRI based on their experience in HP and UK, according to PSI: **Benefits:** Less seed requirement; Saving in water; Decreased workload; Less disease occurrence; Less lodging; Higher grain yields; Higher grain quality; Increased biomass for fodder; Improves soil fertility. **Constraints:** Time-bound operations; Labor-intensive (this seems at odds with 'decreased workload' as a benefit); Limited accessibility to weeders and markers; Limited accessibility to

manure; More effort required to operate the Mandava weeder for small terraces and clay soils; Frequent unavailability of water under rainfed conditions, especially after the milk-rice stage.

Concerns that Debashish listed were: Lack of adequate, trained, and committed master-trainers for capacity-building and field support activities; Inadequacy of one-time training (continued and timely field support is required); Selection of villages should be purposive as villages are scattered, and working with them is difficult; Rainfall irregularity (during transplanting and drainage periods) presents continuing problems; Timely availability of quality equipment is needed (weak supply chain) and inadequate composting material; Limited adoption, conditioned by the predominance of small plots, and poor quality land; Variability in adoption of practices (seedling age and spacing, water management, use of organic nutrients and weeders). These things can be addressed but require innovation and persistence.

Areas for improvement that he identified in conclusion were: Improvements in the recommended package of practices (water, nutrient, and labour, management, cost-effective equipment, etc.); Capacity-building strategy (e.g., village-level resource persons and regular quality training); Research on other crops, on disease-resistant and high-tillering varieties, better equipment, etc.; Networking among stakeholders (farmers, CSOs, government, research institutions, agriculture universities, media, etc.); Policy framework (incentives, assured irrigation, outlets for equipment, market opportunities, etc.).

Debashish's concluding statement was: **Farmers should be provided flexibility for adoption of different principles under SRI**. This was discussed and agreed, that SRI should never be pressed as a single package, but rather the reasons for the recommendations should be explained to farmers so that they can understand what are the likely benefits from making certain changes in their practices.

Summation points:

i) Networking among the stakeholders must be formed and/or strengthened.

ii) Farmers should be given flexibility in adopting the SRI practices.

iii) Reasons for drop-outs from SRI cultivation must be analyzed, and effective steps like counseling should be taken to prevent and/or bring back the drop-outs.

iv) Raising community nurseries as under TN IAMWARM Projects should be encouraged.

v) Monitoring teams as under TN IAMWARM project should be established.

vi) Participatory SRI movement is to be promoted.

vii) As many Master Trainers as possible must be trained

viii) In command areas where farmers do not have control over water release, suitable strategies must be worked out to manage SRI under such situations.

ix) Proper nutrient management has had little attention so far, simply recommending application of as much organic matter as possible; more evaluation and mobilization of organic matter should be provided for to ensure maximizing productivity and sustainability under SRI.

x) In water management, possibilities to adopt micro-irrigations should be pursued.

xi) Overall, soil health must be attended to, improved and sustained.

xii) Strict protocol need to be adopted for organic SRI wherever practiced if farmers are to get the benefit of a deserved price premium for higher quality products.

xiii) Governments should be encouraging SRI promotion and extension at all levels.

The chairman of the session in his concluding remarks said that the SRI method of rice cultivation must be practiced with scientific temper in conformity with logic.

3.5: Technical Session IIIe: Plenary

In initiating the plenum discussion of the issues raised, the Chairman reminded participants that in order to meet food production targets, rice production in India has to increase by 2 million tonnes annually for the next 17 years! In his view, achieving this target is more important than the method(s) by which it is reached. SRI practices should contribute as much as possible to this goal.

Given the pressing need to use water more sparingly and wisely, the issue was raised about big dams and canals not being well used, noting that large areas of land remain fallow even where groundwater is plentiful. A major challenge for reducing unnecessary and wasteful use of water for rice and other agricultural purposes is to make it more profitable for farmers to conserve water. One Department of Agriculture working mainly on community development approaches with farmers who enjoyed neither reliable water, nor water management facilities, and who hence "thoroughly misused and wasted" water, were being shown the benefits of SRI from a water-saving perspective; and these farmers in doing so achieved their highest yields on record.

This introduced the parallel issue of irrigation service delivery, which is generally poor in the country and making this more accountable and more effective is a precondition not only for the practice of SRI, but also for the reduction of perceived risk of inadequate water supply in the eyes of risk-averse farmers who are used to panic-filling of their fields every time water is available. Localised service delivery deriving from wells or traditional tanks was agreed to be a more reliable methods for irrigation.

The discussion addressed the matter of securing adequate input supplies, especially of organic material for soil fertilisation. The challenge of increasing paddy production by 2 million tons per year underscores the need for having more timely seed supply, appropriate fertilizer availability, irrigation facilities, and reliable, easy-to-use machinery. It was agreed that, with these in place, the current challenge would actually be modest, and India could even become a net exporter.

To this end, there was consideration of the extent to which comprehensive nutrient management studies can be superimposed onto other SRI trials. The potential benefits, it was felt, could be enormous with significant and positive implications for funding possibilities. There are, after all, much funding under rural development programs that could be tapped if SRI roll-outs could be combined with management schemes. One participant drew the plenum's attention to the potential multiple benefits of vermicomposting, an enterprise that whole rural communities can participate in and benefit from.

The discussion closed with several suggestions or conclusions.

i) It is necessary to initiate and sustain the SRI debate at both state and national policy levels.

ii) The dissemination strategy should target medium as well as small farmers.

iii) Research should be intensified with respect to soil nutrients and micro-biology.

iv) Given that few locations are fully unsuitable, most being amenable to some benefit from an adaptation of SRI principles and practices, SRI scaling-up objectives could be articulated broadly, to include climate change buffering and organic certification.

v) Accordingly, it may be helpful also to specify some basic or minimum package of practices for SRI that reflects the generalizable principles.

Presented in this way, SRI promotion could establish synergistic relationships between policy and institutions. But, it was agreed, this would be beyond the reach of NGOs and CBOs. Only Government could do this, perhaps using a vehicle such as the National Food Security Mission or something similar, or by incorporating the methods into existing initiatives, such as these addressing watershed management. The challenge, as suggested by one participant, would be to converge all such ideas into a single operational package, from which the principal synergistic benefits go first of all to the farmers.

3.6 Technical Session IV (a): Exposure Visits to SRI Rice Fields

On Tuesday afternoon, after the parallel presentations and plenum session, the participants were divided into four groups to visit different locations within the Coimbatore region to see SRI in practice and to interact with farmers using the alternative methods and with professionals working with them. The area mainly comprised of the SRI paddy crops raised under the TN IAMWARM project in the Aliyar sub basin region. Reports were made to the plenum on the following day.

TECHNICAL SESSION IV (a): Exposure Visits to SRI Rice Fields (13:30 to 18:30)

GROUP	CHAIRMAN	RAPPORTEUR	COODINATOR	LOCATION
I	Dr B.J. Pandian TNAU	Dr. C. Jayanthi WTC, TNAU	Dr. K. Sathyamurthy	Annamalai
II	Dr S. Ramasamy Dept. of Agronomy TNAU	Dr. R. Rajendran	Dr. R.Krshnan	Kaliapuram
III	Dr T.M. Thiyagarajan Former Dean, TNAU	Dr. N. Maragatham	Dr. J.R. Kannan Babu	Pongaliyur
IV	Dr M.V. Rangasamy Director, WTC, TNAU	Dr. S. Mahendran	Dr. Kumar	Thundu Kadavapthi

4. DAY 3

4.1: Technical Session IV (b): Reflections on Field Visits

This session was chaired by Dr. Iswandi Anas, the Director of Soil Biotechnology Laboratory at the Agricultural University of Bogor (IPB) Indonesia, and Coordinator of the Indonesian Association for SRI.

Group I: Field visit to Annamalai

Dr. B. J. Pandian shared reflections from the group of 56 delegates who visited the Annamalai area. In this area, most of the farmers had switched from paddy cultivation to coconut plantations for reasons of low returns and labour shortages. Here the farmers are being motivated and encouraged to return to rice cultivation by the introduction of SRI under the IAMWARM Project as SRI requires comparatively fewer number of labourers and the crop is yielding higher net income. As SRI cultivation is in transitional stage, the farmers could not adopt all the components of SRI yet because of certain practical difficulties.

After introduction of SRI, the farmers have reduced their seed rate to 10 kg/acre, although not yet 2 kg/acre as recommended under SRI; 65 kg/acre are normally used by farmers in the area. As this area is very near to the Parambikulam Dam, water is available throughout the year, and farmers have not felt a need to follow alternate wetting and drying (AWD) as recommended for SRI. Farmers are transplanting two seedlings/hill in rows rather than single seedlings/hill in square planting, mainly due to the resistance of labourers who work on a contract basis and do not like to adjust to new practices. The farmers are using rice seedlings of 10 to 18 days old, some young but some older than the SRI norm.

However, most are using the rotary weeder for weeding. The farmers expressed some difficulty and drudgery while using the rotary weeder and wanted motorised weeder implements to be available. Their productivity was, however, higher under this partial SRI cultivation than under conventional system. Field agents or supervisors (parawakars) who manage the gangs of labourers are the *links* between the farmers and the labourers in this area. They are not yet convinced of the efficacy of the new practices. The non-coconut plantation areas can be brought under SRI rice in due course through encouragement as offered under TN IAMWARM Project.

Group II: Field visit to Kaliapuram

Dr. R. Rajendran, Professor of Agronomy, TNAU, and rapporteur of the 2nd group of 50 delegates who visited Kaliapuram area, presented the reflections of that group. In this area, the farmers who have adopted SRI cultivation under TN IAMWARM Project, are transplanting rice seedlings generally of 19 days age in rows with 2 seedlings/hill, and not in square planting due to same local problems noted by the first group. The farmer who was visited had recorded about 500 kg/acre higher yield under his partial SRI than what he used to harvest under conventional system. The farmers expressed a willingness to try to adopt all the components of SRI during the next season of cultivation.

Group II: Field visit to Pongaliyur

Dr. J.R. Kannan Babu, Professor, TNAU, presented the reflections of the 3rd group of delegates who visited the SRI fields under TN IAMWARM project in Pongaliyur village. Six acres of rice out of 180 acres

under rice in this area have been cultivated under SRI. The farmer visited has used 25 kg seeds/acre, planting 2 to 3 seedlings/hill and in rows. The farmers expressed the opinion that they could not follow SRI practices due to local problems and assured the visitors that they would adapt all the components of the SRI practices during the next season of rice cultivation.

Group IV: Field visit to Thunda Kadavapathi

Dr. J. Ravi. Professor, TNAU, presented the reflections of the 4th group of delegates who visited the SRI fields under TN IAMWARM Project in Thundu Kadavapatti village. In this area, about 140 acres are under SRI management out 1000 plus acres under rice cultivation. Eleven farmers are adopting SRI method of cultivation so far. Generally, small farmers are more willing to adopt SRI. As puddling and transplanting are to be done within a week, medium and large-holding farmers are reluctant to adopt SRI cultivation.

The farmers adopting SRI have used 15 kg seeds/acre planting 20-25 day-old seedlings at 2 seedlings/hill in rows and not in square planting. These farmers also could not adopt all the components of SRI due to practical difficulties and local labour problems. Labour shortage and non-availability of labour timely were expressed as major challenges in adopting SRI.

Discussion:

Much of the plenum discussion that followed these reports on the previous day's field visits comprised critiques of the visits themselves rather than of the technical and social features that they displayed. Nonetheless several interesting comments were made.

i) Farmer-to-farmer extension is more likely to be effective than that delivered by official extension services; ideally, communication should be via farmer groups – with a key farmer in the lead to supervise the others.

ii) SRI is a matter of degree, not an immutable thing; even a few of the component practices can produce benefits, as seen in the visits. But farmers should know what are the full set of recommended practices and what are the benefits they forgo by using only some of these. There is reason to be sympathetic to the constraints articulated by individual farmers, but even so, it is better to keep moving toward more comprehensive adoption of the component practices. There are two faces or facets of SRI – the ideal and the actual. There is ample evidence that the practices work together, if all practices are utilized and are used as recommended, with appropriate adjustments (timing, spacing, etc.) to local conditions. There are tradeoffs for farmers not doing so, which they should be informed of. But decisions on what to do, how much and how well, remain up to the farmers themselves.

iii) Farmers need to have adequately explained to them the SRI principles that justify the recommended practices; at the same time, applications need to work within farmers' constraints while building up to full use of SRI in a step-wise fashion.

iv) Hired labour is a real problem in many areas. Small farmers or owner-operators have usually been better able and more willing to take up the new practices. Labourers claim that SRI is more

difficult, especially the transplanting. Also they do not like the fact that the landowner will gain additional income from the method and they will not, despite the extra care and diligence that the method requires of them. There is a productivity gain that derives directly from the new skills learned by the labourers. These new skills should therefore be rewarded. One way to deal with this would be for government and/or NGOs to offer training courses for labourers on transplanting and weeding, to award certificates of training, for which labouurers could expect to be paid, say, 25% more per day for having had this training and being more skilled practitioners of SRI cultivation, producing greater returns for their employers. This would create more buy-in from labourers and raise morale, as well as be equitable. Although landowners may not initially like this idea, there is evidence that they can be persuaded to entertain it as they benefit from more skilled labour under SRI.

v) There are difficulties in getting farmers to reduce their seed rates to the low levels made possible by SRI. Possibly state agencies (such as the IAMWARM project) could provide only 10 kg/ha to their beneficiaries to encourage sparser planting, which will benefit everyone, rather than merely trying to encourage them to reduce their seeding rates.

vi) There is difficulty in getting hired labourers to use the mechanical weeders (repetitive strain injury, usually to the back is being reported). One farmer reportedly had to pay labourers double to use the weeders. (In the field visits the previous year, as part of the Agartala symposium, most farmers interviewed reported that the mechanical weeders reduced labour and drudgery of weeding and were quite enthusiastic about the innovation. Why this difference between Tripura and Tamil Nadu receptions to this mechanization was not discussed.)

vii) Water management remains a major constraint on wider adoption of SRI, especially where surrounding fields remain under wetland rice. Seepage from neighboring fields keeps SRI fields more flooded than desired. This will require some combination of hardware (physical) and software (organizational) solutions. Use of raised beds for rice cultivation has many benefits for soil and water management and can be one effective response to this problem.

viii) Given the wide variety of responses encountered with respect to how many and which of SRI's component practices are being utilized, it is high time to establish some criteria for what is and what is not regarded as SRI. What are the critical practices and which are less important? What is the critical minimum for a farming system to "qualify" as SRI? This is important because people may write the method off (and some have most done so already) if they assess the new methods on the basis of only partial or even poor application of the recommended methods.

ix) It is important to remember that the benefits of SRI do not all accrue at the farm level. There are also larger water resource allocation benefits that increase the economic efficiency of water use. There are also broader economic benefits in terms of freeing up financial resources that do not need to be allocated to subsidies or water management infrastructure on the scale presently necessary to maintain or expend wetland rice cultivation with conventional practices.

4.2: Technical Session V: Other Countries' Experiences and Lessons regarding SRI

This session was chaired by Dr. Norman Uphoff, Cornell University, U.S.A.

NEPAL: Mr. **Rajendra Uprety**, District Agricultural Development Officer, Nepal, presented **Experiences with the SRI in Nepal**. He reported that presently SRI is being practiced by about 6,000 farmers in 1,000 ha, and that rice yield levels under SRI are 6.0 t/ha compared to 3.0 t/ha under conventional system. He said that farmers used rice seedlings of 9 to 11 days old for transplanting, and they use the rotary weeder several times, usually starting from 15 days. They have adopted spacings of 20 x 20 cm or 30 x 30 cm. Farmers with their own lands are more willing to adopt SRI, while farmers cultivating on leased lands are more reluctant.

AFGHANISTAN: Next, **Ali Mohamed Ramzi** from **Aga Khan Foundation** presented the report on **SRI Experiences in Afghanistan**. He reported that farmers have started adopting SRI by switching over from industry-related crops to higher-yielding rice crop under SRI cultivation. This has led to reduced demand for water for rice cultivation. Although the first year (2007), rice yields were lower from SRI fields than from with conventional practice,, this year (2008) rice productivity with SRI methods has increased to even 11 to 14 t/ha, with an average of 10.1 tons/ha compared to yields of 5 to 8 t/ha from conventionally-managed fields. SRI farmers are using 11-day-old seedlings at 1 seedling /hill, and tiller counts have reached even 133 tillers/hill at 72 days. (Why Afghan farmers, who do not have a long tradition of rice cultivation are accepting recommended practices more readily than the Tamil Nadu farmers visited the day before was not discussed.)

Ramzi, however, reported that the extension staff and farmers in Baghlan province faced some problems and constraints for getting SRI practices adopted:

i) It was very hard at first to convince farmers to follow wider spacing and to transplant young seedlings.

ii) More labourers were required to transplant in square geometry.

iii) Land leveling was difficult and required more time.

iv) Large-farm farmers were not interested to adopt SRI as they felt that it would be time-consuming and labour-intensive to adopt SRI in large areas.

v) Lack of sufficient organic manures for soil fertilization.

vi) Farmers had no experience in green manuring.

vii) Marking for transplanting was difficult in fields not leveled properly.

Ramzi requested that early maturing rice varieties be developed or introduced to reduce the irrigation water requirement, and that training be given to farmers to grow green manures with incentives provided to farmers to encourage them to adopt SRI.

BHUTAN: Mr. Karma Lhendup from the College of Natural Resources of the Royal University of Bhutan presented a report on **SRI Experiences in Bhutan**. Rice is grown in 50,000 ha in Bhutan during the main season from May to October, and the average rice yield is 3 t/ha. In SRI fields, IR 64 rice variety planted with a spacing of 24 x 24 cm has recorded yields 8.7 t/ha against 6.0 t/ha under conventional system. The weed *Potamegeton distinctus* has been a problem as a pernicious weed in SRI rice fields.

INDONESIA: Dr. Iswandi Anas, Director of the Soil Biotechnology Laboratory at the Agriculture University at Bogor (IPB), Indonesia, presented the report on **SRI Experiences in Indonesia**.

Indonesia was the second country where SRI was introduced after Madagascar. The introduction of SRI has permitted rice yields to be increased to 8.0 t /ha from 4.8 t/ha. The Indonesian Government has fixed a target of 5% increase in food production yearly to achieve food security. A large-scale evaluation

of SRI methods in Eastern Indonesia by a technical assistance team supervised by the Japanese firm Nippon Koei, over nine seasons (2002-2006) with a total of 12,133 on-farm comparison trials with 9,249.1 ha, showed that Sri methods could increase average yield by 78%, from 4.4 to 7.7 t/ha, with a 40% reduction in water requirements and 50% less chemical fertilizer. There is also a growing proportion of SRI practice in Indonesia that is fully organic. Training programmes on organic SRI have been conducted for farmers regularly over the past two years, funded by the Directorate of Land and Water Management in the Ministry of Agriculture.

MALAYSIA: Dr. Anizan Isahak from the National University of Malaysia reported that the Ministry of Agriculture, Government of Malaysia, has drawn up a programme to introduce SRI in Malaysia with the involvement of the university and research centers. She was optimistic that SRI system of rice cultivation will revolutionize rice farming in Malaysia.

4.3: Technical Session VI: Panel Discussion on Policy, Institutions and Strategies for Scaling-Up

This session facilitated by Dr. Biksham Gujja began by reminding everyone that to a large extent, SRI has been well accepted by farmers and Governments in many countries, particularly India, and furthermore it is spreading swiftly. This does not mean however, that all of its critics have been silenced or that all their doubts have been cleared. Debates on SRI will continue. This session was intended to contribute to that debate, with particular concern for the way ahead for SRI in India.

The panel discussion was structured by focusing on two sets of three questions; the first three constituting a quick survey of what panelists think is the current status of SRI in India in terms of benefits and constraints, and the second set of three addressing strategies and possible solutions. After the panelists had offered their thoughts on these issues, plenum participants were invited to do the same. This combined process provided lists of different answers, some of which were very similar, with most answers lending themselves to clustering according to certain themes.

Question 1: Does any panel member feel that there is no merit in SRI?

The panelists were unanimous in their agreement that there is merit in SRI.

Question 2: What is the single most important benefit of SRI?

Responses can be clustered into four categories, the first two of which have obvious similarities: Perceived Benefits, Productivity and Economic Factors, Environmental Considerations, and diverse other answers.

As far as ***Perceived Benefits*** are concerned, it was noted that farmers report that they can use less seeds and hence can afford better or even hybrid seeds. The increased self-sufficiency that they associate with SRI practice means that they can rely less on extensionists and other experts, while their dependency on banks is reduced. In fact, the barriers to entry were reported to be negligible compared to other rice production systems.

On the output side, SRI can increase farmers' household food security, while providing more biomass, which means more (and better) fodder for their livestock. All this can increase household incomes, farmer confidence, and quality of life at the household level. This in turn increases farmers' interest in rice production, while the grassroots adaptability of the component practices can inspire farmer-led innovations, both in husbandry and machinery.

Productivity benefits largely concerned the significant increase in total factor productivity that SRI affords. But the panel also identified indirect productive benefits in terms of: i) the typically improved quality of SRI rice; and ii) the tendency for farmers themselves to reclaim control of the productive process and become innovators and creators in their own right.

Environmental benefits accrue from reduced water requirements of SRI; its organic practice that improves soil health, microbial activity and soil biodiversity; and potential for reduced green house gases (methane is fairly certainly reduced when paddy fields are no longer kept continuously flooded; but possibly an increase in nitrous oxide could offset these gains). These effects contribute to sustainability while also causing farmers themselves to think about the environmental consequences of their farming systems.

Other benefits included the fact that SRI seems to attract scientists away from their laboratories into the field. In addition, SRI seems to be applicable to upland rice production as well as to flatter areas; SRI offers reduced entry barriers and can furthermore spread, almost by itself, without needing major infrastructural investments. Finally, its reduced reliance on water means that it is better equipped to adapt to climate change

<u>Question 3:</u> What are the two most significant constraints to SRI upscaling?

Responses to this question can be clustered into six categories: service delivery, vested interests and blinkered perspectives, knowledge gaps, conceptual factors, operational constraints, and financial considerations. Some of these constraints could be considered at odds with some of the benefits identified under Question 1.

Service delivery constraints are broad ranging and multi-level. At the highest institutional level, inadequate investments in sensitizing or informing policy makers result in a lack of political will, poor coordination between institutions, and institutional lags when it comes to the adoption of new paradigms. Old paradigms persist, and these tend to favour large "mega-projects" that are not focused on benefiting farmers themselves; there is need not only to store water and make it available, but also to regulate its flow, monitor its use, and facilitate its distribution. As result, irrigation water use is unregulated and badly managed. Badly needed is a new approach to training, an approach that has something for all levels of the institutional cascade while engendering increased understanding and horizontal cooperation – not least among the extension and irrigation services which the participants agreed lack insight, capacity and the ability to innovate.

Some blame for this could be attributed to ***vested interests*** among the politicians and administrators. This can be explained in part by the poor awareness-raising referred to above, but there is also resistance on the part of officials and academics, some of whom reportedly cannot accept SRI as a science (which it does not have to be to be effective). Equally, seed and fertiliser companies have an interest in resisting adoption of SRI because it reduces demand for their wares. (Although by reducing seed requirements by 80-90%, SRI methods make the cost of hybrid seed much less, so this could encourage its utilization.)

Knowledge gaps were also considered to be a constraint on the uptake of SRI, with specific examples cited as follows: a lack of understanding of the relationship between temperature and planting depth; the uptake of nutrients under SRI and the role played by soil organisms; the effect of pH values; and what happens to the soils of different types when fields are drained. These knowledge gaps arise from a lack of systematic research in various institutions and from poor synergy and cooperation between the institutions involved.

Poor ***conceptual*** understanding of SRI was also agreed as being a major constraint on its wider adoption. A combination of large communication gaps between the establishment and the farming communities, poor technology-transfer targeting, and the unfounded perceptions on the part of some farmers, who see SRI as both high risk and complicated, results in a lack of confidence. Various kinds of uncertainty can lead to reluctance to adopt the more challenging components of SRI such as wider spacing and single seedlings. Also, it was reported that some farmers consider SRI to increase the risk of pest attack (although most farmers have reported reduced incidences of pest attacks under SRI, and scientific evaluations in India and Vietnam have confirmed this). Finally, in this regard, it was posited that certain perceptions persuade potential adopters that to do so would risk their reputations amongst their peers; thus according to one participant, the ego cannot be ignored as a determinant.

Operational constraints fall into two sub-categories. The first concerns the difficulties in securing the resources by which to undertake SRI in an effective fashion. The first of these concerns is finding hired labour able and willing to use SRI practices; agricultural labour is not only in increasingly short supply, but also it lacks both the knowledge necessary for, say, shallow transplanting of delicate young seedlings, and, as we have seen, there if often lack of motivation to obtain such knowledge and skill. The second of these difficulties is getting the preferred inputs for SRI practice such as organic fertiliser, as well as affordable and ergonometrically-suitable equipment for weeding.

The second category of operational constraints concerns specific technical difficulties such as land leveling, which is crucial but difficult, especially on large fields, and maintaining soil aeration (which should be a collateral benefit of good weeding). Some participants also mentioned an increased incidence of certain pests as a constraint, although others were quick to report the opposite, saying that SRI practices actually seen to reduce the incidence of pests. Similar disagreements were reported with respect to non-productive tillers; some farmers regarded them as wasteful of the energy available to the plants, while some agronomists in the plenum claimed that unproductive tillers can be useful in remobilizing nutrients, and therefore do not represent an operational constraint.

The final category of constraints is somewhat at odds with one of the main benefits identified under the second question considered. This concerns ***finances***, in two ways. The first questionable because, according to some participants, SRI produces no tangible increase in financial benefits when compared with the extra effort involved, while others insisted, and gave some data, that showed substantial increases in net income. The second aspect is a lack of finances for research and for incentivizing officials to become involve in and committed to the broader dissemination of the method.

At this point, the panel turned to substantive issues concerning strategy for SRI dissemination.

<u>Question 4:</u> Is it possible to promote SRI on at least 5 million hectares in India in the next five years?

Discussion of this topic began with a consideration of whether or not setting a target for such an expansion was even desirable. Some panel members thought that it was, others not so. It was generally agreed that since 5 million ha is only 10% of the total area planted to rice, it should be possible. However, it was also agreed that a more meaningful assessment would be based on an estimate of the annual percentage increase of the area currently adopting SRI, the current baseline as it were, and this number is somewhat unclear. There seem to be only two states that are; taking SRI really seriously (Tamil Nadu and Tripura). Also, there is the issue, seen from the field visits, as to what should be considered as 'SRI practice,' since a big push from the government side may get a lot of only nominal adoption, with incomplete or poorly managed use of the recommended practices. The state government of Tamil Nadu has reported that SRI use in 2008-2009 will reach 750,000 ha, but this number was doubted by many if any rigorous concept of SRI is applied. The figure could be closer to 100,000 ha, with

perhaps no more than twice that total across the country currently planted to rice grown under SRI conditions. From this level, annual doubling could reach the 5 million ha target in five years.

It was then suggested that target setting along these lines would be rather academic in the absence of a firm definition of SRI. Given that SRI comprises a continuum of various practices, how many must be in place, and to what extent, before a particular farming system can be classified as SRI, or not. Without such guidelines, it will not be possible to know whether or not any target has been reached, rendering the target itself somewhat moot. Actually, the target would be only instrumental and the test of new-method adoption would be the yield and production results.

Nonetheless, it was generally agreed that any significant up scaling of SRI must involve a wider selection of players. Responsibility to promote the method would have to be taken up by more state governments, other official agencies, donors, NGOs, banks, et al.

One participant suggested furthermore, that a spatial target was inappropriate, suggesting instead that the number of families practicing SRI may be more important than the actual area planted. This however, was not generally agreed. It did inspire discussions as to whether any kind of target would be appropriate. It was suggested instead that, the scaling-up strategy should be based on meeting the needs of poor households, which would encourage devoting any resources available to be used for the benefit of the most needy.

Alternatively, given that SRI is primarily a means by which to increase total factor productivity, might it not be better to predicate targets on how much food is needed. This, after all, is what government has in mind when it calls for annual increased of 2 million tonnes. The smaller the area that this increased production requires, the better the potential contribution of SRI.

Regardless, however, of the nature of the target, it was acknowledged that if change is needed at policy level, it is difficult and meaningless to craft policies that have no targets, no indicators of progress and success. It was also acknowledged that policies involving either spatial or production targets, which would be intended essentially to push SRI (among other approaches perhaps), incur the risk of ignoring other policies that would pull farmers in the direction of greater total factor productivity, with the environmental consequences becoming collateral benefits. Improving markets and market access would be one such pulling strategy.

This having been agreed, the discussion moved on to the subject of preconditions for any significant expansion of SRI – most specifically, improved water availability and management. Without this, any discussion of SRI expansion remains academic. If the state organizations are unable or unwilling to make the paradigm shift to accountable, demand-driven service delivery, significant possibilities for more self-determinant irrigation services are still there in the form of groundwater irrigation (subject to regulation) and traditional catchment tanks, which when rehabilitated and well used can produce multiple social and environmental benefits.

It was concluded that it would be possible to promote SRI practices successfully on 5 million ha within the next five years. But to do this will require a broad-fronted strategy addressing policy and institutional issues (including service delivery). Difficulties in defining SRI were noted along with the need for indicators that concern production/productivity (which are more relevant to government's food security targets than spatial targets which say nothing about how much is actually produced). It was noted that the economic impacts of SRI practices on households' net income are as important as the usually-monitored agronomic impacts on yield per se. Finally, the discussions on SRI definition reminded participants that SRI is not an end in itself, but a means to other ends – higher productivity, improved health and well-being, and environmental conservation and integrity.

<u>Question 5</u>: If it is possible to achieve this expansion, then what major policy changes are required, and how they can be achieved?

Several themes emerged during discussions of this question, namely: policy, finance, institutions, capacity building, and research and adaptation. Since these themes were revisited throughout the discussion, for the reader's convenience, this summary consolidates the thematic discussions and introduces them in a (hopefully) logical order.

Beginning with ***policy***, although most participants agreed that expansion on the sort of scale discussed above (whether by production or by area) requires some sort of initiative at the policy level, there was wide-ranging discussion as to the appropriate nature of the initiative. Some participants, for instance, were convinced that the changes must begin at Union level (but accepted that for this to happen, major mindset changes may be required). On the other hand, others argued that this would be too top-down and that the any resulting policy framework would reflect the wishes of "we" the SRI proponents rather than "they" the poor farmers. This was countered, however, with the argument that as a strategy for both food security and the wise use of natural resources, Government needs to support medium and large farmers, not just small ones, as water-use conservation and reduced dependence on agrochemicals is an even bigger issue for them than smaller farmers.

The possibility was raised that a national policy may itself be a constraint, with state-level policies permitting more adaptability to local conditions – although it as acknowledged that the Union government would be more likely to be able to make funding available, although disbursements could be decentralised as is the case with other socially-oriented funds.

It was proposed that an absence of central policy might actually encourage more grass roots creativity. One participant questioned whether having an SRI policy is the right way to promote SRI. Why not craft a water policy predicated on demand management that addresses the need for better water management services? SRI would then be an embedded win-win strategy and as such, a means to an end, rather than as cautioned earlier, being made an end in itself. In line with the earlier comment about the need for changes in policy makers' mindsets, this suggested a need for reform before investment.

The discussion then moved on to other options that could, or would need to be addressed at policy level. To this end, the National Food Security and other missions (pulses and oil seeds, for instance) was referred to as a precedent. Why not has an SRI mission, with the objective of implementing 1 million ha per year? It was pointed out that the NFSM is only being implemented in 173 districts (all of which are apparently rice-growing districts), whereas SRI is reportedly practiced, at least to some extent, in 220 districts across India already!

Another option may be to invest in more irrigation, beginning with improved water control at the farm level. But, another participant reminded the plenum, for this to work, irrigation systems must be able to deliver water to the farms in the first place; a more integrated approach would therefore be required. The policy implication of this means that any investments would have to include the means to control and monitor as well as to convey water, and for this, the current supply-driven paradigm would, as suggested earlier, have to shift to demand management – another change of mindset. Given the infrastructure-oriented vested interests of the State Water Resource Departments and their (perceived?) autonomy, this would require considerable expression of political will.

Another politically costly, but potentially effective policy measure would be to remove fertiliser subsidies – but again, this would come up against strong vested interests of the fertiliser companies and the extension services which promote their wares.

The final policy option suggested concerned promotion of agricultural research that acknowledges and benefits from external innovations and is pleased to evaluate them, rather than defending professional turf to the detriment of the broader development agenda.

With respect to ***finance*** (which was also addressed under the 3rd question above)**,** no one doubted that finance would be required, either for institutional establishment or for the incentivisation of potential SRI farmers. As one participant suggested, "Peanuts of investments will not serve the purpose", especially if it is decided to establish large-scale field demonstrations that have a lot of costly overhead. The promotion strategy would need to be efficient and effective in its resource use, and surely a dedicated budget. It was noted that some funds already exist, in fact, that could be used for such extension purposes, and it may be possible to access them for the purpose of SRI demonstration and promotion. These include, for instance, the "Backward Regions Grant Fund" – for the poorest of the poor (tribal areas), or the funds set aside for "Farm innovation and Technology Transfer". But their remits would have to be extended if they are cover SRI research and testing on-farm. Even if such funds can be accessed, they are not likely to be available for demonstrations on a wide scale.

The general consensus was therefore that some sort of dedicated fund would be required; and although it would necessarily be centrally administered or overseen, ideally it should be accessed on a competitive basis and disbursed at State or even District level.

Such a funding facility would be ideal for financing research, demonstrations and capacity-building and possibly for the provision of subsidies and incentives. But with the exception perhaps of organic manure supplies, there are better options for this, options based on the increased value of SRI production as compared to traditional paddy cultivation. As far as subsidies are concerned, it is understood that these are already available for organic manure. Since other inputs such as seeds would be less under SRI, it is difficult to justify additional subsidies, especially as the methods are potentially more profitable than traditional wetland rice.

For SRI use to be sustainable, it should not depend on subsidies, rather generating sufficient benefits for farmers to want to continue. These benefits are multiple in nature. Not only is it reasonable to expect higher yields, SRI paddy grain is usually of better quality. Rice millers, it was reported from Sri Lanka, will pay around 10% premium for SRI paddy because there tends to be less chaff, less shattering, and less damaged grains. It therefore mills better and sells better. Ideally therefore, the market itself should provide incentives, incentives that are nonetheless tangible in real, financial terms to the grower.

Some participants suggest that the state should guarantee a premium price for SRI paddy. This would not be a subsidy, as the quality of this paddy is such that millers should get more than 10% more milled rice outturn, as just noted, because of reduced chaff and broken grains. Such a premium would be only fair to farmers who have produced a more valuable product. Further, SRI milled rice should be able to command a higher market price, which should be shared with the farmer producers, because there is less chalkiness and more evenness in the grains. (This was reported by the representative of Tilda Ricelands in his PPT presentation the first day; Tilda has found SRI rice to have less discoloration, fewer unripe grains, etc.) . The cost of a premium for SRI paddy would be borne by millers or agents who are making more profit from this higher-quality paddy, and the better remuneration would give farmers more incentive to switch to SRI production methods.

Regardless of what funding arrangements are eventually provided, there will be various ***institutional*** implications. [Superfluous statement] Some thought a national centre for SRI, perhaps in the form of a discrete directorate, would be advisable, while others objected that this would be establishing further bureaucracy. Similarly, some thought that any institutional strategy should be focused on and

accountable to small farmers while others stressed the importance of including medium and large-scale farmers in any institutional arrangements.

Less controversial was the idea of some sort of mission-based approach, either attached to an existing mission such as the NFSM, or formulated in its own right. Most participants agreed that any arrangement should either incorporate or coordinate with existing institutions in order to increase the impact of whatever initiative is finally adopted. It was also largely agreed that Government would be the preferred coordinator, and that stakeholder roles should be clearly demarcated within the institutional landscape, not least to avoid any sense of top-down, supply-driven pressure. Whatever the result, however, most agreed that crafting of the appropriate institutional arrangements should go hand-in-hand with ***capacity building***; and also were happy to 'think big' in this regard. Large-scale demonstrations were recommended, complemented by large-scale training programmes targeted at all levels. In fact, when the facilitator asked the plenum "what single thing would most help with expanding SRI coverage?" a woman farmer answered in her own tongue with the following suggestion: "Training a large number of farmers could be a worthwhile objective in its own right, and use farmer-to-farmer training to do so". Farmer-to-farmer training, in fact, was agreed as being the best way to promote SRI at the grass roots.

It was also stressed that training is equally important for other groups of people, with policy makers, water managers, and agricultural labourers. The latter were specifically mentioned, as training of labourers should result in improvements to their economic status.

Finally, with respect to capacity building, it was noted and agreed that in order to achieve the best results, training in such associated activities as seed production and selection and post-harvest operations should also be provided.

Participants seemed largely in agreement that there is a need for ongoing ***research***, with soil system dynamics, vermicomposting, and water systems management being identified as priority areas. It was also largely agreed that any research, even if centrally funded, should be largely devolved, ***adaptive***, and field- and locally-appropriate. It should furthermore engage farmers as much as possible, encouraging them to become experimenters and innovators in their own right (which is very much in the spirit of SRI), thereby changing the ways that they perceive rice.

Question 6: What kinds of financial resources and institutional mechanisms would be required to facilitate scaling up of SRI to the scale of five million hectares?

Discussions of this question dealt briefly with financing before focusing on institutional architecture and mechanisms.

With respect to ***financing***, it was suggested by one participant that promotion of and support to SRI expansion to 5 million ha would involve costs in the order of 24 crore rupees[1], which compares well with the budget for the National Food Security Mission. When expected savings in fertiliser subsidies and seed costs are taken into account, this would be practically self-financing, to create a permanent stream of benefit for farmer-producers and for consumers. But as discussed earlier, the fund should be vested at both state and union levels. Their expenditure should be flexible and smart, and for some uses (such as research), it should also be competitive. But there are ***institutional*** implications of any financial strategy. Before proceeding to summarise what participants had to say about these, it is necessary to recall broader concerns expressed with respect to the effect on farming alternatives of rural-urban

1 1 crore equals 10,000,000.

migration. Is it better, people wondered, to see SRI as a way to draw the migrants back to farm-based livelihoods, or i) should larger-scale farming be encouraged; or ii) is there a pressing need for a new generation of improved machinery that could replace or reduce the need for hired labour?

With this in mind, the discussion addressed questions of training and capacity building. It was stressed that training should be comprehensive, covering not only the basics such as transplanting and weeding, but also how SRI farmers might interact more effectively with the labour market and the practices involved in improved water management. After all, SRI cannot be fully and best utilized in the absence of water management facilities and skills.

For such training to be effective, it should be demand-driven, and hence it was suggested that any promotional activities should be village-based and long-term. Some participants suggested village-based work over periods as long as three years. The objective of such grassroots interactions would primarily to raise confidence by means of small-scale demonstrations. Ideally such demonstrations should be based on partnerships between the support agency (whether governmental or NGO) and the village and they should, *inter alia*, engage school children.

It was even suggested that partnerships could be established between outside companies and the farmers. However, on this subject, some participants noted the significant risk of resistance from the farm chemicals lobby and the seed industry. They can become partners only if they accept the objectives as well as methods of SRI.

To be most effective, any training, especially of hired labourers, should be rewarded by some sort of certification system, so they can qualify for better remuneration based on the greater skills they have acquired and on the increased productivity their skilled labor will confer on employers' fields. As a lady farmer expressed earlier, training should be widespread. There should also be vertical initiatives along the lines of improved extension services, and horizontal initiatives in the form of farmer-to-farmer training – this involves horizontal diffusion, as one participant called the process, or spreading a benign 'infection', as did suggested.

What are appropriate next steps…?

The actual institutional architecture need not be large; neither should it be concerned with big-budget style 'project approaches.' Instead, an effective arrangement might be comprised of a national secretariat that pools and shares information in support of state-level and local-level initiatives, while coordinating SRI promotion around the country. Actual initiatives would ideally be generated at district level or below, but they could be proposed to the secretariat through the respective states under their fund utilisation strategies. In addition to field demonstrations and the like, typical initiatives would include the facilitation of farm tool/machinery innovation; the training and certification of labourers; and awareness-raising, training and capacity-building amongst state water resource department officials (which may have to be initiated at state level).

5. Valedictory Session

This closing session of the Symposium was opportunity for summarization of thinking and experience shared during the preceding session, focusing on "the way ahead" and capped off by the closing message of the session's Chief Guest, ICAR's ex Director-General, Dr. G. P. Gautam. There were three sets of closing remarks, each focusing on "the way ahead".

The first remarks were given by Dr. Natarajan, Director of CSCMS, TNAU, who addressed "the way ahead" in terms of research, extension, management, up-scaling and the ongoing development of appropriate machinery. The second set of remarks was given by Dr. Norman Uphoff, the Chief Guest, who suggested that participants should think of SRI not as a *noun* with a precise and possibly restrictive meaning, but rather as an *adjective* that applies to various combinations of technical practices or results (SRI methods, principles, phenotypes, etc.). He ended his address by outlining his personal "way ahead" by mentioning his planned visits to various states in India to learn more about experience across the country. The third closing address was provided by Dr. Biksham Gujja of the WWF-ICRISAT Project, who called for the establishment of a specific fund to support a variety of initiatives to popularize SRI use, including the development of new and better machinery, including motorised weeders. He also suggested the need for policy-level initiatives intended to coordinate, even unite, administrative bureaus, research institutions, extension agencies and the like, in order to create and disseminate clear-cut messages about SRI that will reach throughout India's rice farming community.

Dr. Gautam's closing message reminded Symposium participants of the global food security challenge that must be met in the context of continuing population pressure and increasingly compromised natural resources. He provided a wide-ranging overview of technical issues and initiatives, which placed SRI within a broader milieu of agricultural innovations. He pointed out that other innovations, IPM for instance, had faced uphill struggles, just as SRI is facing currently. A flexible and adaptive approach will therefore be vital. He closed by calling for all stakeholder agencies to "pull together" and declared the willingness of his own institution ICAR to adopt any new technology that helps the farmer. The 3-day event closed with a vote of thanks by Prof. P. Muthukrishnan, who heads the Dept. of Agronomy in TNAU.

6. Summary: The Way Ahead

Based on the panel and plenum discussions that took place under Technical Session VI, the way ahead can be summarised as follows:

- Given that SRI comprises a range of various technical practices, not all of which are necessarily completely suitable or adoptable at some locations, there is a need to establish some generally acceptable definition of what SRI is and is not. This is not for the purposes of a strict approach with the farmers, but rather is considered necessary for targeting, monitoring and possibly certification purposes.
- Increased efforts should be made to develop innovative farm tools and machinery to reduce both drudgery and dependence on hired labour. Breakthroughs are particularly needed for land leveling, transplanting, and weeding/aeration.
- The current national food security agenda coupled with increasing demands msfr upon scarce water resources provides an opportune context for the up-scaling of SRI rice. Accordingly, it would be beneficial to set a target of having 5 million ha of rice land under SRI cultivation within 5 years – although there is scope for an alternative target based on production and productivity.
- To achieve this goal will require a broad-fronted, comprehensive awareness-raising and training programme at all levels – not least including state Water Resources Agencies and ATMA. Such training should include a certification process, especially for agricultural labourers whose greater participation in the increased profits accruing to SRI should be facilitated.
- Intervention will also be required at policy level. This should be based not only on the direct benefits of SRI rice in terms of profitability and productivity; but also on externalities such as the opportunity costs of water and development finances saved by the method. Policy initiatives should therefore concern not only agriculture and food security, but also water and other natural resource management policies, and possibility energy policies.
- Institutional structuring and capacity-building will be required. In particular it would be good to set up a national SRI secretariat as a clearing house for information and for the coordination of SRI activities, undertaking macro-management of fund for support of SRI dissemination and further refinement (see next bullet). Partnerships of one sort or another between state agencies, communities, NGOs, and the commercial sector are foreseen, while SRI promotion will require prolonged on-the-ground involvement at community level. Such institutional arrangements will, of course, require a degree of initial crafting, but should be highly adaptable to conditions pertaining at the various levels involved. With this in mind, a national but highly decentralised mission-style approach would be advisable, perhaps even based on cooperation or incorporation into an existing mission such as the National Food Security Mission.

- A dedicated fund for SRI promotion should be established. Given India's vibrant economy and budgets already in-place, it is not expected that donor support will be necessary, especially given that SRI will produce very significant savings within certain existing funding arrangements such as the current fertiliser subsidies, and the benefits to farmers and to the environment from substantial seed savings (80-90%) and irrigation water (25-50%). A figure of Rs. 2,400 Crores has been suggested for such a fund, but the actual fund and its operational aspects have yet to be designed.[2]
- All of these suggestions need to be documented in the form of a proposal for discussion by the government. In order to increase potential buy-in, it will be essential to involve agents of change within government during the preparation of the proposal, which can begin immediately.

[2] The Cambodian business bi-monthly – ECONOMICS TODAY (www.etmcambodia.com) – which has a feature article on SRI in its Oct. 1-15, 2009 issue, Vol. 2, No. 48 – has calculated that the increased production from SRI methods (with 100,000 farmers) at 1 ton/ha documented increase is $11 million, and seed and fertilizer savings add another $2 million for farmers' benefit – no accounting of value of water saving, which would be substantial and monetizable in India – so that already there is annual $13 million benefit – more than justifying the proposed allocation of $2 million a year for the next five years to bring SRI knowledge to all farmers.

Annexure:

Revised WORKSHOP PROGRAMME

1. WORKSHOP PROGRAMME

2.1 DAY 1: 1st DECEMBER

Inaugural Session

FROM	TO	ITEM	RESPONSIBLE PARTY
09:00	10:00	Registration	
10:00	10:05	Invocation and Lighting of the Lamp	
10:05	10:15	Welcome, Purpose and Objectives of the Symposium	Dr. Biksham Gujja Senior Policy Advisor, and WWF Project Leader, WWF-ICRISAT Project
10:15	10:20	Presidential Address	Dr. C. Ramasamy Vice Chancellor, TNAU
10:20	10:25	Remarks	Tmt. Manonmani SRI Farmer, Tamil Nadu
10:25	10:45	Book Releases and Felicitations	
10:45	10:55	Keynote Address	Dr. P. L. Gautam DDG (Crops), ICAR New Delhi
10:55	11:05	Chief Guest Address	Dr. Norman Uphoff Cornell University, USA
11:05	11:10	Vote of Thanks	Dr. Vinod Goud WWF-ICRISAT Project

TECHNICAL SESSION I: Experience Sharing By Farmers

FROM	TO	ITEM	RESPONSIBLE PARTY
11:30	11:40	Introduction and Opening Remarks of the Chairman	Mr. A. Ravindra Director, WASSAN
11:40	11:50	Farmer 1	
11:50	12:00	Farmer 2	
12:00	12:10	Farmer 3	
12:10	12:20	Farmer 4	
12:20	12:30	Farmer 5	
12:30	12:40	Farmer 6	
12:40	12:50	Discussion	
12:50	13:00	Concluding Remarks	Chairman

TECHNICAL SESSION II: SRI In India

FROM	TO	ITEM	RESPONSIBLE PARTY
14:00	**14:10**	Introduction and Opening Remarks of the Chairman	Dr. Norman Uphoff Cornell University USA
14:10	**14:30**	Status of SRI in India and Challenges Ahead	Dr. Biksham Gujja Senior Policy Advisor, and WWF Project Leader, WWF-ICRISAT Project
14:30	**14:50**	Summary of SRI Research Initiatives and Future Priorities in India	Dr. B.C. Viraktamath, Project Director, DRR, Hyderabad
14:50	**15:10**	SRI: Pro-poor Option for Household Food Security and Resource Conservation	Dr. B. C. Barah Principal Scientist, NCAEP (ICAR), New Delhi
15:10	**15:30**	Jai Sri: Celebrating Civil Society Involvement with SRI in India	Dr. C. Shambu Prasad Associate Professor Xavier Institute of Management, Bhubaneshwar
15:30	**15:50**	Re-Strategising SRI Promotion Under the National Food Security Mission	Mr. A. Ravindra Director, WASSAN, Secunderabad
15:50	**16:10**	Promoting SRI in India: The Experience of the Sir Dorabji Tata Trust	Mr. Biswanath Sinha Programme Officer SDTT, Mumbai
16:40	**17:00**	*A Plant Physiologists Perspective on SRI Performance in Uttar Pradesh*/1	*Dr V.P. Singh* *ICRAF*
17:00	**17:20**	Farmer Level Problems, Constraints and Innovations in SRI Cultivation	Dr. T.M. Thiyagarajan Former Dean/Director TNAU
17:20	**17:40**	*Future of SRI Cultivation in India*/1	*Dr M Diwakar* *Director, DRR, Patna*
17:40	**18:50**	Discussion	Chairman
18:50	**19:00**	Concluding Remarks	Chairman

Notes */1 scheduled, but did not take place*

2.2 DAY 2: 2nd DECEMBER, PARALLEL SESSIONS AND FIELD VISITS

TECHNICAL SESSION IIIa: Research Studies/1

FROM	TO	ITEM	RESPONSIBLE PARTY
08:00	**08:10**	Introduction and Opening Remarks of the Chairman	Dr. T.M. Thiyagarajan Former Dean/Director, TNAU

TECHNICAL SESSION IIIa: Research Studies[1]

FROM	TO	ITEM	RESPONSIBLE PARTY
08:10	08:20	The Science of SRI	Dr. T.M. Thiyagarajan Former Dean/Director, TNAU
08:20	08:30	Evaluation of the Principles of SRI and their Influence on Growth Parameters and Grain Yield	Dr. R. Mahender Kumar et al., DRR, Hyderabad
08:30	08:40	Effect of Crop Geometry Levels under SRI on Tillering Behaviour and Yield	Dr. N. Thavaprakash Department of Agronomy TNAU
08:40	08:50	Grain Quality Parameters of Cultivars as Influenced by SRI	Dr. Ravindar Babu Principl Scientist DRR, Hyderabad
08:50	09:00	SRI in Quality Seed Production of Paddy Variety ADT39	Dr. Manonmani Associate Professor, Dep't of Seed Science and Technology, TNAU
09:00	09:10	Evaluation of SRI Practices for Sustainable Rice Farming in the Cauvery Delta Zone	Dr. R. Rajendran Professor (Agronomy) TRRI, Aduthurai, TN
09:10	09:20	Influence of SRI on Pesticide Usage	Dr. Ch. Padmavathi Scientist (Entymology) DRR, Hyderabad
09:20	10:20	Discussion	Chairman

Notes 1/ Rapporteur: Dr. Ch. Padmavathi, DRR

TECHNICAL SESSION IIIb: Extension, Tools and Constraints[1]

FROM	TO	ITEM	RESPONSIBLE PARTY
08:00	08:10	Introduction and Opening Remarks of the Chairman	Dr. M. Mahadevappa Former Chairman ASRB
08:10	08:20	Farmer Participatory Extension: A Case Study of SRI Technology Adoption in North-Western Agro-Climatic Zone of Tamil Nadu	Dr. M. N. Budhar Regional Research Station TNAU, Paiyur
08:20	08:30	Promotion of SRI in Rainfed Rice Cultivation among Farmers in Dangs District of Gujarat	S.M. Patwarden BAIF Development Research Foundation, Pune Maharashtra
08:30	08:40	Local Adaptation and Practices of SRI in Tamil Nadu	Ms. Priya Nagesh Samanvaya, Chennai

TECHNICAL SESSION IIIb: Extension, Tools and Constraints/1

FROM	TO	ITEM	RESPONSIBLE PARTY
08:40	08:50	SRI Transplanter	Dr. Rangasamy, Dean Agricultural Engineering College and Research Institute, Kumulur
08:50	09:00	Development of a Motorised Weeder for SRI	Dr. D. M. Jesudas Professor and Head Department of Farm Machinery, TNAU
09:00	10:40	Discussion	Chairman

Notes 1/ *Rapporteur: Dr. R. Mahender, DRR*

TECHNICAL SESSION IIIc: Economic Impact Assessment and Markets/1

FROM	TO	ITEM	RESPONSIBLE PARTY
08:00	08:10	Introduction and Opening Remarks of the Chairman	Dr. B.C. Barah Principal Scientist NCAEP(ICAR), New Delhi
08:10	08:20	Differential Efficiency Levels at SRI and Non-SRI Situations	Dr. K. Palanisami Director UWMI-TAT ICRISAT
08:20	08:30	Cost/Benefit Analysis of Sri in Paddy Cultivation	Dr. M. Anjugam Associate Professor Dep't of Agricultural Economics, TNAU
08:30	08:40	Impact Assessment of SRI Cultivation	K.N. Selvaraj Professor Department of Agricultural Economics, TNAU
08:40	08:50	Commercial Opportunities for Organic SRI Producers	Mr. Ken Lee and Ms. Caryl Levine Lotus Foods, USA
08:50	09:00	Role of Banks in Promotion of SRI	Mr. V. K. Rao General Manager NABARD
09:00	09:10	Sharing from participants (e.g., farmers)	
09:10	09:20	Sharing from participants (e.g., farmers)	
09:20	10:20	Discussion	Chairman

Notes 1/ *Rapporteur: Professor K. N. Selvaraj, Department of Agricultural Economics, TNAU*

TECHNICAL SESSION IIId: Institutional and Policy Issues/1

FROM	TO	ITEM	RESPONSIBLE PARTY
08:00	08:10	Introduction and Opening Remarks of the Chairman	Dr. C. Shambu Prasad, Associate Professor, XIMB, Bhubaneshwar

TECHNICAL SESSION IIId: Institutional and Policy Issues/1

FROM	TO	ITEM	RESPONSIBLE PARTY
08:10	08:20	Popularisation of SRI Cultivation through the IAMWARM project in Tamil Nadu	Dr. M. V. Rangaswamy Director, WTC, TNAU
08:20	08:30	Scaling-up SRI: TRIAD Initiatives Hold the Key to its Success	Dr. N. Sen Gupta Senior Faculty, Calcutta University
08:30	08:40	Scaling-up of SRI through Farmer Field Schools: AMEF's Experience in Tamil Nadu	Tmt. T. K. Gandhimadi AMEF, Dharmapuri
08:40	08:50	Role of Government and Panchyat Raj Institutions in Large-Scale Adoption of SRI in Tripura	Dr. Baharul Islam Majumdar Senior Agronomist, Depatment of Agriculture Tripura
08:50	09:00	Food Security and SRI: A Reflective Note Based on PRADAN's Experience in Eastern India	Mr. D. Karmakar PRADAN Purulia, West Bengal
09:00	09:10	PSI Experience in Northern India	Mr. Debasish Sen People's Science Institute, Dehradun
09:10	09:30	Discussion	Chairman

Notes 1/ Rapporteur: Dr. P. Punna Rao, Director, Extension, ANGRAU, Hyderabad

Once the group sessions had been completed, participants were encouraged to visit an exhibition of posters and machinery innovations that had been mounted in the antechamber to the plenary hall. Although the exhibition was in place throughout the entire duration of the symposium, this was the only time slot formally allocated to allow participants to enjoy the various exhibits on show.

TECHNICAL SESSION IIIe: Plenary

FROM	TO	ITEM	RESPONSIBLE PARTY
11:00	11:10	Introduction and Opening Remarks of the Chairman	Dr. G.S.G. Ayyangar Joint Secretary & Advisor, Ministry of Home Affairs Government of India New Delhi
11:10	11:20	Presentation of Group I	Group Rapporteur
11:20	11:30	Presentation of Group II	Group Rapporteur
11:30	11:40	Presentation of Group III	Group Rapporteur
11:40	11:50	Presentation of Group IV	Group Rapporteur
11:50	12:30	Discussion	Chairman

TECHNICAL SESSION IVa: Exposure Visits to SRI Rice Fields (13:30 to 18:30)

GROUP	CHAIRMAN	RAPPORTEUR	COODINATOR	LOCATION
I	Dr B. J. Pandian WTC, TNAU	Dr. C. Jayanthi WTC, TNAU	Dr K. Sathyamurthy	Anamalai

TECHNICAL SESSION IVa: Exposure Visits to SRI Rice Fields (13:30 to 18:30)

GROUP	CHAIRMAN	RAPPORTEUR	COODINATOR	LOCATION
II	Dr S. Ramasamy Dep't of Agronomy TNAU	Dr. R. Rajendran	Dr R. Krshnan	Kaliapuram
III	Dr. T.M. Thiyagarajan Former Dean, TNAU	Dr. N. Maragatham	Dr. J.R. Kannan Babu	Pongaliyur
IV	Dr. M.V. Rangasamy Director, WTC TNAU	Dr. S. Mahendran	Dr. Kumar	Thundu Kadavapthi

2.3 DAY 3: 3rd DECEMBER

TECHNICAL SESSION IVb: Reflections on the Field Visits

FROM	TO	ITEM	RESPONSIBLE PARTY
08:00	08:10	Introduction and Opening Remarks of the Chairman	Dr. Iswandi Anas Director, Soil Biotechnology Laboratory Agricultural Univ. of Bogor Indonesia; and Coordinator of Indonesian Association for SRI
08:10	08:25	Presentation of Group I	Group Rapporteur
08:25	08:40	Presentation of Group II	Group Rapporteur
08:40	08:55	Presentation of Group III	Group Rapporteur
08:55	09:10	Presentation of Group IV	Group Rapporteur
09:10	09:40	Discussion	Chairman
09:40	09:55	Observations and Conduding Remarks	Chairman
09:55	10:00	Vote of Thanks	

TECHNICAL SESSION V: Other Countries' Experiences & Lessons Regarding SRI

FROM	TO	ITEM	RESPONSIBLE PARTY
10:30	10:35	Introduction and Opening Remarks of the Chairman	Dr. Norman Uphoff Cornell University, USA
10:35	10:45	Global Update on SRI	Chairman
10:45	10:55	SRI Experiences of Nepal	Rajendra Uprety District Agric Dev't Office Morang
10:55	11:05	SRI Experiences in Afghanistan	Ali Mohamed Ramzi Aga Khan Foundation
11:05	11:15	SRI Experiences in Bhutan	Karma Lhendup Royal University of Bhutan
11:15	11:25	SRI Experiences in Indonesia	Dr. Iswandi Anas Coordinator of Indonesian Association for SRI

TECHNICAL SESSION V: Other Countries' Experiences & Lessons Regarding SRI

FROM	TO	ITEM	RESPONSIBLE PARTY
11:25	**11:35**		
11:35	**11:45**		
11:45	**12:40**	Discussion	Chairman
12:40	**12:55**	Observations and Conduding Remarks	Chairman
12:55	**13:00**	Vote of Thanks	

TECHNICAL SESSION VI: Panel Discussion on Policy, Institutions and Strategies for Scaling Up

FROM	TO	PARTICIPANTS
14:00	**16:00**	**Facilitator:** • Dr. Biksham Gujja, WWF-ICRISAT Project **Panel Members:** • Dr. Norman Uphoff, CIIFAD (Cornell University), USA • Mr. Surjit K. Chaudhary, APC and Principle Secretary (Agriculture) Government of Tamil Nadu • Dr. G. S. Ayyangar, IAS, Joint Secretary and Advisor, Ministry of Home Affairs (Disaster Management), Government of India • Dr. T.M. Thiyagarajan, Former Dean, TNAU • Dr. Aravind Paddi, Director of Agriculture, Orissa • Mr. A. Ravindra Babu, Director, WASSAN • Mr. Biswanath Sinha, Programme Officer, SDTT • Dr. B. C. Barah, Principal Scientist, NCAEP (ICAR), New Delhi • Mr. Debashish Sen, Director, CPWM, PSI, Dehradun • Dr. C. Shambu Prasad, Associate Professor, XIMB, Orissa • Farmer • Farmer • Farmer • Farmer

Valedictory Session

FROM	TO	ITEM	RESPONSIBLE PARTY
16:30	**16:40**	Opening Remarks by the Chairman	Dr. C. Ramasamy, Vice-Chancellor TNAU
16:40	**17:10**	Concluding Remarks	Dr .S. Natarajan, Director, CSCMS, TNAU Dr. Norman Uphoff, Cornell University, USA

Valedictory Session

FROM	TO	ITEM	RESPONSIBLE PARTY
			Dr. Biksham Gujja, Project Leader, WWF-ICRISAT Project
17:10	**17:40**	Awards and Felicitations	
17:40	**18:00**	Message from the Chief Guest	Mr. Surjit K. Chaudhary APC and Principal Secretary (Agriculture) Government of Tamil Nadu
18:00	**18:15**	Vote of Thanks	Prof. P. Muthukrishnan Head, Department of Agronomy, TNAU