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Highlight

Assessing SRI as a Process:
Evidence from India

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This paper brings out the untold history of SRI evolution in India.

Indian farmers have been following one or the other SRI practices since long; not because of its super yield potential but as experiments and innovations to work out local optima.

The paper emphasizes the need to evaluate SRI as a 'process' in an 'innovation system framework' that conventional economic evaluation tools do not provide.

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Assessing SRI as a Process: Evidence from India

Research Highlight Based on a Paper Titled: Understanding Scientific Controversies: The Case of the System of Rice Intensification(SRI)

Public debates on the system of rice intensification (SRI) in 2004 provide insights into the controversy surrounding its underlying science. An article on SRI that appeared in the *Nature* magazine in March 2004 captioned "Proponents Call it a Miracle. Detractors Call it Smoke and Mirrors. Will SRI feed the Hungry or Needlessly Divert farmers from Tried and True Techniques?" is indicative. It brought out the longstanding controversy between International Rice Research Institute (IRRI) scientists who have been consistently dismissing SRI as anecdotal, lacking peer review, and technically flawed, and the proponents of SRI who have been asking scientists to look at SRI fields and listen closely to farmers' experiences and if necessary to revise their understanding based on new knowledge. The IRRI journal *Rice Today* (July- September) later in the year carried a more polarized debate between Norman Uphoff, director of the Cornell International Institute for Food, Agriculture and Development (CIIFAD), and Thomas Sinclair, an agronomist with the U.S. Department of Agriculture. Uphoff argued that SRI is best situated to answer the needs of farmers in the twenty-first century. Sinclair, however, dismissed SRI as not meriting serious attention, derisively referring to it as 'UFO' (Unconfirmed Field Observations).

The controversy is about two 'ways' of growing rice- one that is established and 'scientifically' supported by the international scientific community, and the other, so far, by groups of farmers, social scientists, and a few scientists.

Controversies are integral to collective production of knowledge; disagreements on concepts, methods, interpretations, and applications are the lifeblood of science and one of the most productive factors in scientific development. Recent literature on scientific controversies have pointed out that political, social, or historical subtexts need to be recognized and that the scientific community has a role in shaping the controversy often using rhetorical tools (such as 'UFOs') to capture public imagination. Controversies also involve methodological disputes relating to conduct of field trials, observations, analysis of data, and, more importantly, how SRI undermines a well-established practice of rice cultivation. The controversy is about two 'ways' of growing rice- one that is established and 'scientifically' supported by the international scientific community, and the other, so far, by groups of farmers, social scientists, and a few scientists. The former favors input intensive methods and miracle

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seeds to increase yields, the latter an input sensitive approach that capitalizes on the experimental capabilities of farmers.

Assessments of SRI that seek to treat it as a 'technology' like any other improved crop variety ignore the evolution of SRI and farmers' experiences.

Critics of SRI seem to be asking "If this really works in the field, why is it not replicable in the laboratory? How can it violate established principles of rice science?" SRI has evolved independent of controlled laboratory experiments leading to a technology that could be replicated through on-station and on-farm trials. Assessments of SRI that seek to treat it as a 'technology' like any other improved variety ignore the evolution of SRI and farmers' experiences.

Evolution and Spread of SRI in India

As a system of growing rice, SRI has evolved over two decades, involving fifteen years of observation, experimentation, and mastery in Madagascar, and a rapid spread to 21 countries in the next six years. Developed by Father Henri de Laulanie, a French priest settled in Madagascar, it emerged out of experimentation and close observations of 'aberrant' farmers who had vigorous plants without transplanting rice in clumps but as single seedlings. Laulanie's later experiments involved avoiding flooding, distant spacing of single seedlings, and transplantation of young seedlings. This resulted in a combination of practices that were soon optimized for performance in Madagascar resulting in very high yields, in some instances close to 20 tons/ha, with much reduced inputs of seed, water, fertilizers, and pesticides.

The system was popularized by an organization that Laulanie set up called as Association Tefy Saina (ATS). This practice of rice intensification, however, met with stiff resistance from scientists within the rice research community. In 1994, Norman Uphoff of CIIFAD collaborated with ATS to experiment with SRI to increase yields on lowland rice and to wean farmers away from slash-and-burn cultivation. After extensive trials in Madagascar, Uphoff and CIIFAD started popularizing the system in other parts of the world from 1997 onwards. An international conference on SRI was held in China in 2002 with participants from 15 countries describing their experiences.

In India SRI has a complex evolution. Though India is one of world's largest rice producers, its interest in SRI was delayed. The lone on-station trial in India by T. M. Thiagarajan of the Tamil Nadu Agricultural University (TNAU), Coimbatore, which was reported in the China conference indicated some saving in water use but little increase in yield, thus leading to rejection of the technology. In the last two years SRI witnessed a rapid spread in the major rice growing areas of Tamil Nadu and Andhra Pradesh. Evaluations have shown a 2-3 tons/ha average increase in yield in independent trials by farmers. The question of assessing the prospects of SRI in India, therefore, needs to be reframed. Why is it that an approach that seemingly did not work in 2002 has now thousands of farmers practicing it in 2004, and many more ready to take it up ? An ongoing study on SRI based on field level experiences of farmers, scientists, and enthusiasts provides some answers.

Thiagarajan first heard about SRI in 2000 from Ten Berge of Wageningen with a focus on soil aeration and water saving. The modified SRI practice that was evaluated by TNAU did not use all SRI principles; water and fertilizer were in

excess of normal SRI practice. Independently, there was interest in SRI from organic farmers interested in Low External Input Sustainable Agriculture (LEISA) in Pondicherry, Karnataka and Tamil Nadu who heard about SRI from their networks. These groups created an atmosphere for SRI's entry.

In May 2002, Uphoff gave several lectures about prospects of SRI in India following which the department of agriculture in Tamil Nadu and Andhra Pradesh agreed to send professionals to Sri Lanka for a learning visit sponsored by CIIFAD. In Pondicherry, SRI trials were on at Annapurna Farm in Auroville and later the M. S. Swaminathan Research Foundation (MSSRF) tried SRI on small plots in its "biovillage". Following Uphoff's presentations in November at the second International Agronomy Congress held in New Delhi and to top officials in the Ministry of Agriculture, PRADAN, an NGO, took up SRI work in Jharkand and West Bengal.

SRI in India has existed for much longer than official field trials.

The Acharya N. G. Ranga Agricultural University (ANGRAU) in Hyderabad sent its director of extension, Alapati Satyanarayana, and a regional director of research to Sri Lanka in January 2003. An initial sceptic of SRI, Satyanarayana, a well known pulse breeder and a native of the rice growing delta region, returned with passionate zeal and is today one of the strongest proponents of SRI. His acceptance of SRI illustrates the efforts that practitioners of SRI, farmers, researchers, and others have made to take the SRI agenda forward. Satyanarayana had initially resisted visiting Sri Lanka. He was jolted when he accidentally cut his finger stroking the paddy stalks that were stronger and rougher than normal. He also noticed thriving plants in an SRI field while neighboring plots were suffering from drought. He realized that there was something fundamentally different about these paddy fields where the crop varieties had no role to play. The difference possibly lied in the genotype-environment interaction (G x E). He returned to India determined to try SRI in a big way and conducted over 300 trials in different agro-ecological regions across Andhra Pradesh during the kharif 2003 season, demonstrating the possibilities of SRI to farmers and the scientific community.

The study revealed that SRI in India has existed for much longer than official field trials. In Tamil Nadu the state government made a grant of over Rs. 2 lakh for SRI promotion and evaluation in the Cauvery delta that was followed up by an official plan to cover 25 percent of the paddy area with SRI in 2004-05. TNAU's conference on "Transitions in agriculture for enhancing water productivity" at Killikulam in September 2003 discussed extensive reports from organic farmers who had heard and experimented with SRI. The extent of SRI spread in India is still not fully known but there is no doubt that SRI has come a long way since 2002.

Farmers' associations, organic farming networks, popular agricultural journals in regional media, internet and regional television channels have all been used by SRI practitioners in accessing and disseminating information.

SRI: Untold (Hi)stories and Diverse Connections

An ongoing study on perceptions of various stakeholders about the SRI system indicates several untold (hi)stories and connections. The study revealed that SRI in India has existed for much longer than official field trials through the work of diverse interest groups that include

various categories of farmers (conventional rice farmers, those keen to grow rice, seed farmers and experimental farmers). Prominently, certain groups and individuals not directly involved in farming activities have played an important role by experimenting, innovating, networking, and talking about SRI in different places and fora.

Organic farmers across South India, now important resource persons, have been involved in trials since 2000 and have seized the opportunity that SRI has presented. An important feature of SRI in India is the multiple sources of knowledge. Farmers' associations, organic farming networks, popular agricultural journals in regional media such as *Annadata*, internet and regional television channels have all been used by SRI practitioners in accessing and disseminating information. Some farmers like Kouligi from Melkote in Karnataka have taken initiatives to produce popular booklets in Kannada that have sold over 2000 copies. Others like Revathy from Tamil Nadu and Kishen Rao from Andhra Pradesh have produced videos and compact discs (CDs) on SRI.

In SRI, the interaction between research and extension staff with farmers is not a one-way street but a process with strong feedback loops, collectively contributing to the knowledge pool.

The diversity of information sources on SRI is matched by widespread experimentations and innovations. Some like Krishna Rao, a retired army person, see the evolving system of SRI as a good entry point into farming, providing a level playing field for new entrants like him. For Krishna Reddy, a poultry farmer from Raichur not used to growing rice, SRI's focus on farmyard manure provided an opportunity for experimentation and use of manure from his poultry farms. Several adopters of SRI have been from other professions and have taken to SRI by its experimentation potential and not so much by its ability to achieve 'super yields'.

For Jagga Raju, a farmer from West Godavari in Andhra Pradesh, SRI came as an explanation to the results of his experiments with rice as potted plants. Known for multiplication of seeds, he was approached by the Krishi Vigyan Kendra (KVK) at Undi with a new improved variety of rice (MTU 1071, now very popular among SRI farmers) in 2000. In his experiments with rice seeds in pots and in raised beds, Raju noticed profuse tillering in rice plants (over 150 tillers). Till then he had not heard about SRI, but had empirically proved that rice was not an aquatic plant. SRI in this case explained a farmer innovation. As a process, SRI seems to offer insights into an emerging innovation process in the rice fields of South Asia where the interaction between the research and extension staff with farmers is not a one-way street but a process with strong feedback loops, collectively contributing to the knowledge pool.

Sapay Srirammurthy, one of the first farmers to try out SRI in kharif 2003 in Andhra Pradesh, and the inventor of the famous marker now customized by ANGRAU and sold to several farmers across the state, has done several innovations in his rice fields. Organic farmers in Tamil Nadu too have experimented and improved upon their practice with SRI using several organic inputs with success. For Jagga Raju, Srirammurthy, Narayana Reddy, and many other farmers, SRI seems to have provided an outlet for their locked up innovative abilities.

SRI has taken root in India also because of external triggers that have enabled innovation. Drought in recent years and reduced water availability even in well-endowed canal irrigated areas often forced farmers to look for alternatives. A significant example is the experience of farmers in drought prone Anantapur district where a civil society organization the Timbaktu Collective —turned a crisis into an opportunity by using SRI principles. Over 500 farmers in tank irrigated Mustikovila and adjoining villages in Rabi 2003

had prepared their land but were deceived by rains that lasted only three days, forcing the local administration to close the sluice gates. Through the Timbaktu Collective some of the farmers had been to Narayana Reddy's farm to learn about paddy cultivation without flooding. One of the earliest to have experimented with SRI, Reddy considers SRI to be the "innovation of his lifetime". The farmers and the collective got together and decided to have strict monitoring and regulation of water use with water released only once in five days; and in the process were able to save their crop. That year Mustikovila had the largest patch of land (over 370 acres) with rice crop in the district, through the application of just one, not all, of the SRI principles. Here, SRI helped farmers mitigate risk and re-establish control over resources. Interpretations of SRI, as many field reports indicate, are varied and are constantly being reinterpreted and adapted locally.

A notable feature of SRI practice in India is the lead taken by extension scientists in promoting its use, while the rice research establishment has largely ignored it, despite several unresolved research issues. As an evolving system where technology has in a sense preceded science, the principles of 'success' of SRI need explication from a diverse set of disciplines. Field-level results are continuing to throw up several research questions that are in need of scientific understanding, if not validation. Amongst these are the possibilities of extending the SRI principles to other areas of research and other crops.

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Manuals on SRI in various states indicate diversity of approaches with varying emphasis on organic methods of cultivation. The biggest source of diversity, though, is in farmers' fields where individual farmers have adapted SRI to what they think is best in their region or farm. Farmers in Thanjavur in the Cauvery delta are following the Kadiramangalam system of SRI, invented by Gopal, which involves double transplantation. In Karnataka and Andhra Pradesh farmers inspired by Narayana Reddy of Dodballapur have adopted direct seeding. Several farmers have been using different spacing options and trying to work out local optima.

In each region, there is a different combination of factors. SRI as a system is being practised by both state and civil society though, often as parallel streams. In Karnataka, civil society has been in the forefront, while in Tamil Nadu, the state has been pro-active in pushing SRI in the delta regions with subsidies and targets. Civil society groups in Tamil Nadu have opposed state's 'chemical SRI' while in Andhra Pradesh, there is little variance in practices between the state and civil society. There is also a difference between state and civil society in reporting results. But in Jharkand, interactions among research scientists and farmers or civil society representatives have been largely interpersonal and rarely institutional.

Assessing SRI as 'Process'

In India not all farmers trying out SRI have been successful. SRI plots have failed often from poor understanding of the principles, mistakes in practice, poor soils, etc. Small farmers have in many cases not been as successful and the propagation of SRI in India, at least by governmental agencies, has not provided sufficiently for poor or less endowed dryland areas. A more important assessment still needs to be made to better understand the process of spread of innovation.

Assessing SRI's prospect as a 'technology' often assumes that claims and counter-claims can be verified objectively through field trials and

experiments alone. However, as the experiences of SRI practitioners indicate, a much broader view is required on the complex choices made by user groups that place the ability to mitigate risk, handling water crisis, or the choice of growing rice as important considerations along with yield potential. SRI has increased yields in many cases but more importantly it has tapped the hitherto hidden innovative and experimental capacities of farmers. It has evoked sensitivity to diverse parameters of soil, fodder, pest incidence, maturity, grain size, and density. Farmers speak of the flavor of scented rice through SRI or its ability to 'play the monsoon'. Farmers have often given SRI diverse meanings not originally envisaged, linking it up with their own agendas, adapting the 'technology', innovating upon it, and taking the agenda further. For others, it has meant a new possibility for sustainable agriculture or revitalizing traditional seed varieties that lost out in the Green Revolution's agenda and now have a chance of revival.

A closer look at the writings on SRI indicates an underplayed narrative in the 'rice wars' debate. SRI has been promoted more as an approach, a strategy, even a philosophy, rather than as a technological package. Learning, adaptation, innovation, diversity, and system— these seem to be the key words in SRI. In a sense, to use Sinclair's phrase, SRI is an UFO, but the UFO refers to 'understood field observations'.

Dealing with complex and evolving systems such as SRI requires a new framework that conventional economic evaluation tools do not provide. The innovation system framework that conceptualizes innovation in more systemic, interactive, and evolutionary terms has greater potential in assessing SRI and pointing to the way ahead. It allows for the possibility of reconfiguring the rice war debate by focusing on linkages in the innovation system between research and extension, state and civil society, and working practices (institutions) and policies that promote knowledge flows and learning among all organizations within a sector. In fact, rather than close ranks, the scientific community would do well to appreciate the features of SRI for its ability to show a way forward in agricultural research.

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For instance, the exchange of information freely by researchers with farmers, and vice versa, is one of the positive aspects of SRI in India. This is a process that is rarely witnessed, despite talks of participatory research within the research community. The issues raised by SRI are not altogether new. Farmers and civil society have been in the forefront of raising issues concerning alternative conceptions of science, a cognitive element always ignored by the research establishment. They have also raised the need for a different way of looking at farming and the complexities that it entails. SRI needs to be seen by the research establishment as a dialoguing point where it could contribute to newer agendas, instead of criticizing it from conventional viewpoints.

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IWMI-Tata Water Policy Program

The IWMI-Tata Water Policy Program was launched in 2000 with the support of Sir Ratan Tata Trust, Mumbai. The program presents new perspectives and practical solutions derived from the wealth of research done in India on water resource management. Its objective is to help policy makers at the central, state and local levels address their water challenges – in areas such as sustainable groundwater management, water scarcity, and rural poverty – by translating research findings into practical policy recommendations.

Through this program, IWMI collaborates with a range of partners across India to identify, analyse and document relevant water-management approaches and current practices. These practices are assessed and synthesised for maximum policy impact in the series on Water Policy Research Highlights and IWMI-Tata Comments.

The policy program's website promotes the exchange of knowledge on water-resources management, within the research community and between researchers and policy makers in India.

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