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Diffusion of Farmers' Innovation: A Case of System of Rice Intensification (SRI)

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ABSTRACT

System of Rice Intensification (SRI) is one of the few innovations developed by the farmers that have resulted in greater level of interest and enthusiasm not only among the farmers but also among scientists. However, there is a need to document as to how SRI diffused and adopted across different countries and various States in India. The initial diffusion of SRI was mainly through literature. SRI was experimented for about 15 years within Madagascar Island. The spread and improvement of Laulanié's innovation was initially undertaken by a Malagasy NGO, *Association Tefy Saina*. Dr. Norman Uphoff former Director of Cornell International Institute for Food, Agriculture and Development (CIIFAD), Ithaca, USA, has taken this method to the notice of outside world in the late 1990s. Articles published in *Tropicultura* by Laulanie'(1993) and by Rabenandrasana (1999) in *ILIEA Newsletter,* were the important sources of information for diffusion of SRI. At present, SRI has diffused to 43 countries out of the 113 rice-growing nations. In India, SRI has been diffused to 163 districts out of the 564 rice-growing districts. Tamil Nadu and Andhra Pradesh were the innovator States to adopt SRI. Its performance is good in Andhra Pradesh, Tamil Nadu, Karnataka, Orissa, Jharkhand and Tripura. The acceptance and performance of SRI mainly depends on the support of the Government and co-operation of farmers.

Key words : Adoption, CIIFAD, Diffusion, SRI.

The System of Rice Intensification (SRI) technique has received considerable attention globally including India due to its potential for yield improvement and water saving. The main features of this system includes transplanting of young seedlings singly in a square pattern with wide spacing; using more of organic fertilizers and keeping the paddy field moist with intermittent drying and wetting during the vegetative growth of plants. SRI causes better plant growth and development and optimizes the use of seed, irrigation water, labour, plant protection chemicals and fertilizers. Hence, there is increase in the productivity of land, water, capital and labour significantly over conventional method of rice cultivation. Owing to previously mentioned importance, there is a need to document as to how SRI diffused and adopted across different countries and various States in India. Hence, the present study was attempted to document and analyse the diffusion of SRI across different countries and various States in India.

MATERIAL AND MATHODS

Diffusion of System of Rice Intensification (SRI) was operationalised as a process by which SRI was communicated through certain channels over a certain period among the members of different countries and various States in India. The diffusion of SRI was studied across different countries and various States in India. The diffusion of SRI across different countries and various States in India was studied through secondary data collected through published documents.

RESULTS AND DISCUSSION

Diffusion of SRI across different countries

Father Henri de Laulanié, a Jesuit priest who spent over 30 years in Madagascar working with farmers, developed SRI in the early 1980s. In 1990, *Association Tefy Saina* (ATS) was formed as a Malagasy Non Government Organisation (NGO) to promote SRI. Four years later, the Cornell International Institute for Food, Agriculture and Development (CIIFAD), Ithaca, USA began cooperating with *Tefy Saina* to introduce SRI around the Ranomafana National Park in eastern Madagascar, supported by the U.S. Agency for International Development. It was during that time Dr. Norman Uphoff, then director of CIIFAD visited Madagascar and learnt about the SRI practices. He took lead role in popularizing this method to the rest of the world in late 1990s. SRI was experimented for about 15 years within Madagascar Island. Articles published in *Tropicultura,* by

Laulaine' (1993) and by Rabenandrasana (1999) in *ILIEA Newsletter,* were the important sources of information for diffusion of SRI (Fig.1). The first interest in SRI expressed outside Madagascar came from the International Institute for Rural Reconstruction (IIRR), an NGO in the Philippines, which invited ATS secretary to talk about SRI at an NGO conference on rice that was convened in June 1998, co-sponsored by ILEIA (Centre for Information on Low External Input and Sustainable Agriculture) based in the Netherlands. From this came a short article published on SRI (Rabenandrasana, 1999). During the same time, an elaborate article on SRI was published, based on a paper presented to a Bellagio conference on sustainable agriculture (Uphoff, 1999). Over the next few years, ILEIA published several more articles on SRI, and another NGO dedicated to smallholder agricultural improvement, ECHO (Educational Concerns for Hunger Organizations), based in Fort Myers, Florida, published an article that gave SRI further momentum (Berkelaar, 2001). CIIFAD began a SRI website on the internet (http://ciifad.cornell.edu/sri/) to facilitate exchanges of experience, information and ideas from 2000 onwards. The proceedings of international conference on SRI in 2002 at China created a repository of SRI (http://ciifad.cornell.edu/sri/proc1/index.html) information that served the dissemination of SRI very well.

It is revealed from Fig. 1 that SRI was diffused from Madagascar Island to Indonesia (*Sukamundi* rice research station of the Agency for Agricultural Research and Development), China (Nanjing Agricultural University), Cambodia (Centre for Studies and Development), Philippines (International Institute of Rural Reconstruction) and India (Tamil Nadu Agricultural University) in 1999-2000. All these countries became aware of SRI through the paper published in *ILIEA Newsletter* by Rabenandrasana (1999). SRI was diffused to Guinea from China (China National Hybrid Rice Research and Development Centre) in 2003 and to Morocco from India in 2008. Technical assistance was provided by India. SRI was diffused to Malaysia from India in 2009.

It is revealed from Fig. 2 that, SRI was diffused from Madagascar Island to Sri Lanka and Myanmar in 2000 and Rwanda in 2006. SRI was known in Sri Lanka through ILIEA *Newsletter,* (1999) and CIIFAD, Ithaca, USA. In Myanmar, SRI was known through Dr. Norman Uphoff. In Rwanda, SRI was known through *Association Tefy Saina* (ATS).

From Fig. 3 it is evident that SRI was communicated to Bangladesh in 1999-2000 (further popularised by pioneering district staff of an NGO, CARE/Bangladesh, and the Dept. of Agricultural Extension), Gambia (2000), Brazil (2002), Cuba (2002), Dominican Republic (2003), Mozambique (2004), Ethiopia (2003),Ghana (2003), Japan (2007), Mali (2007), and Kenya (2009) through CIIFAD. From Cuba through the Rice Research Institute, SRI has been diffused to Guyana (2003), Haiti (2004) and Barbados (2009). Apart from the above-mentioned countries, SRI is practiced in 15 more countries (Nepal, Sierra Leone, Benin, Laos, Senegal, Thailand, Vietnam, Coasta Rica, Zambia, Burkina, Bhutan, Iran, Iraq, Egypt, and Colombia). It is believed that SRI would have been diffused to those countries from Madagascar during the period 2001 to 2009.

A macro level diffusion of SRI across various States in India

Diffusion of SRI across various States in India is depicted in Fig. 4. Organic farmers in Tamil Nadu read the article by Rabenandrasana in *ILIEA Newsletter,* (1999) and experimented using native cultivars for the first time in India during the year 1999. In Auroville, a visitor from Madagascar brought a pamphlet on SRI in French language to Puducherry during the year 1999. The pamphlet was translated and an experimental SRI on a small plot of six cents (one is equal to 40 square meters) was carried out. Farmers in Tripura also read the article by Rabenandrasana in *ILIEA Newsletter,* (1999) and started cultivation from 1999. In the year 2000, Uphoff presented a seminar on SRI at the Ministry of Agriculture (Krishi Bhawan, New Delhi). There was no apparent response from the ministry. Dr. T. M. Thiyagarajan, Professor of Soil Science in Tamil Nadu Agricultural University (TNAU), learnt about SRI through a collaborative research programme on water-saving rice production organised by Wageningen Agricultural University (WAU), Netherlands during the year 2000. A first SRI experiment by research establishment in India was done by T. M. Thiyagarajan, TNAU, who collaborated with Dr. H. F. M. Ten Berge of WAU's Plant Research International (PRI) in the Netherlands. Trials were done with alternate flooding and draining (Prasad, 2006). Thiyagarajan (2002) reported that though there were no spectacular yield differences, the study confirmed that flooding was not needed to maintain yields (50-56% water saving was observed). Based on these results, although there was sufficient reasons for rejecting SRI as an option for rice production in India, it was the choices made by the farmers, researchers and policy makers to accept

Table 1. Districts where SRI method has been introduced (as on December, 2008).

State	SRI introduced districts	Total number of districts	Percentage
Andaman & Nicobar	02	03	66.67
Andhra Pradesh	22	23	95.65
Assam	02	24	8.33
Bihar	05	38	13.16
Chhattisgarh	04	16	25.00
Gujarat	03	23	13.04
Haryana	01	19	5.26
Himachal Pradesh	05	12	41.67
Jammu & Kashmir	01	15	6.67
Jharkhand	14	22	63.64
Karnataka	22	27	81.48
Kerala	06	14	42.86
Madhya Pradesh	03	48	6.25
Maharashtra	02	33	6.06
Meghalaya	04	07	57.14
Orissa	21	30	70.00
Puducherry	02	04	50.00
Punjab	07	17	41.18
Tamil Nadu	19	31	61.29
Tripura	04	04	100.00
Uttar Pradesh	06	70	8.57
Uttaranchal	05	13	38.46
West Bengal	03	18	16.67
TOTAL	163	511	31.89

and adopt SRI (Prasad, 2007). However, the scaling-up of SRI outside the research system in Tamil Nadu and Andhra Pradesh was mainly due to the efforts of public agencies, research institutes, universities, NGOs, farmer associations and private sector.

Dr. A.Satyanarayana and Dr. Jalapati Rao from Acharya N.G.Ranga Agricultural University (ANGRAU), Hyderabad visited Sri Lanka during 2003, on an exposure visit supported by CIIFAD to get first-hand information about SRI. He was fully persuaded about SRI merits and immediately undertaken 250 on-farm trials in 22 districts of Andhra Pradesh. Average yields in trials were 8.34 tonnes per hectare. The Andhra Pradesh SRI results contributed significantly to the changing perceptions on SRI both nationally and internationally (Prasad, 2006).

"Narayana Reddy, a leading organic farmer from Karnataka, read an article on SRI by CIIFAD in a magazine at a conference in France. Later he visited the SRI experiment fields at the T. S. Srinivasan Centre for Rural Development Training in Bethlapally, Hosur, and Tamil Nadu. He was excited by the results and encouraged fellow farmers and NGOs in his extensive, informal network of the organic farming community (Prasad, 2006).

During 2002, PRADAN (Professional Assistance for Development Action), a national NGO, began large-scale experiments on SRI in Eastern India especially in West Bengal and Orissa. Government of India (Ministry of Agriculture) issued press release on 31st May 2005 advising farmers to adopt SRI 'wherever feasible'.

From 2005, SRI practices gained momentum in States like Tripura, Andhra Pradesh, Karnataka, Orissa, Tamil Nadu, Jharkhand and Meghalaya. However, the process of diffusion of SRI has been very slow in States like Haryana, Maharashtra, Madhya Pradesh, Jammu & Kashmir, Assam, Uttar Pradesh, Gujarat, Bihar and West Bengal. At present SRI has been diffused to 163 districts out of 564 rice-growing districts (Table 1).

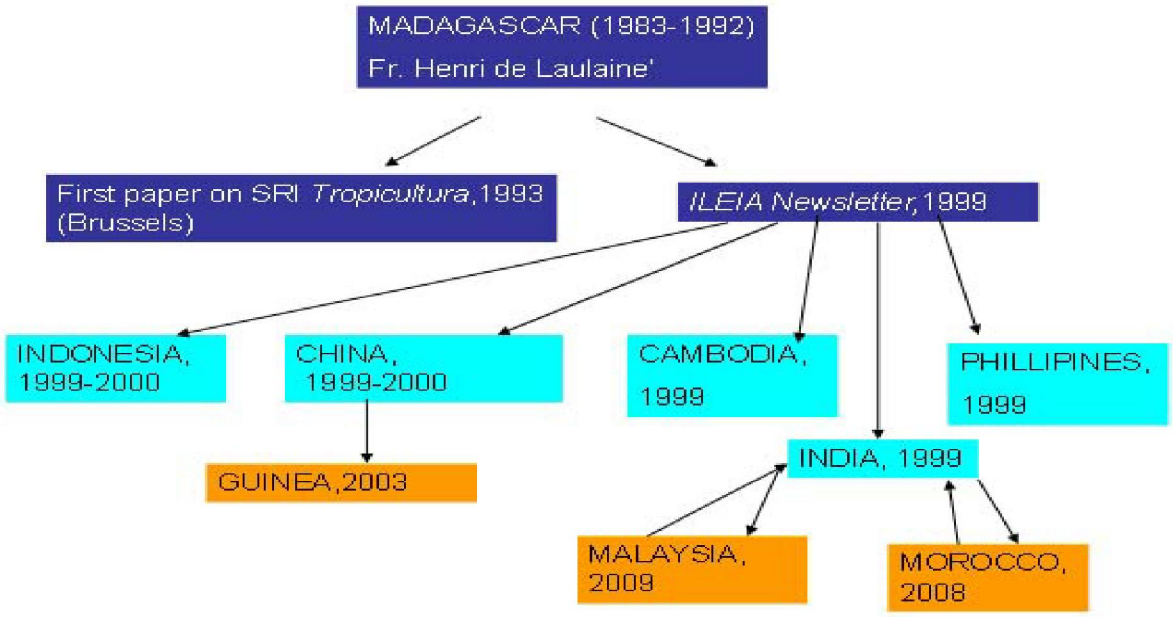

Fig. 1 Diffusion of SRI across different countries through ILEIA newsletter

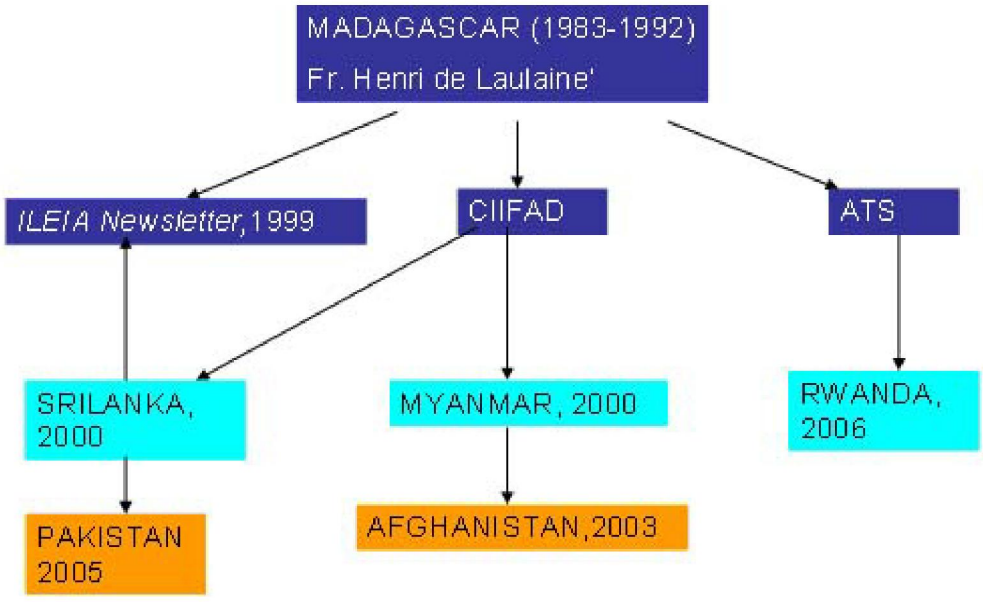

Fig. 2 Diffusion of SRI across different countries

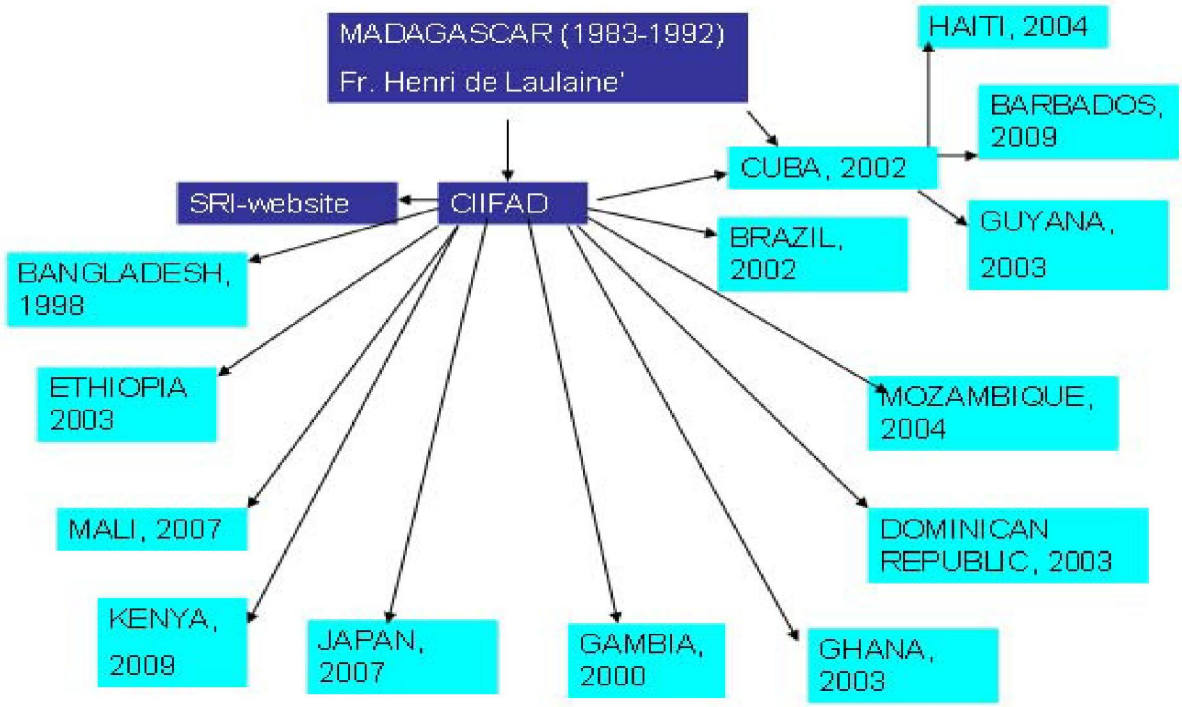

Fig. 3 Diffusion of SRI across different countries through CIIFAD

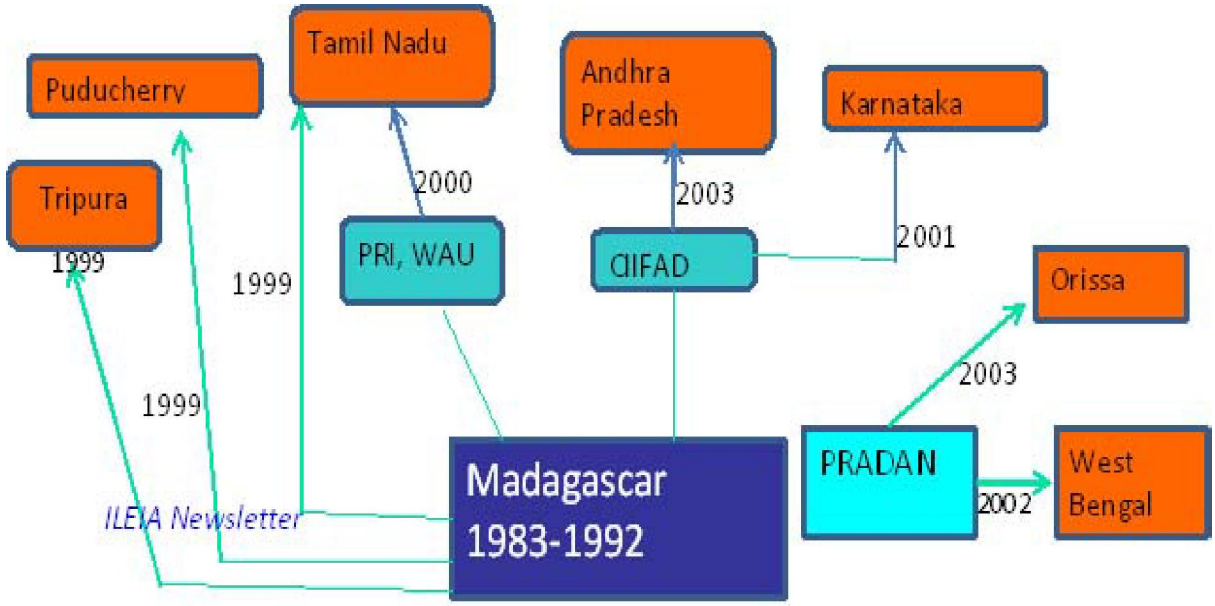

Fig. 4 Diffusion of SRI across various States of India

SRI can be seen in all four districts of Tripura State. The SRI has been introduced to a considerable extent in States like Andhra Pradesh (22 districts), Karnataka (22 districts) and Orissa (21 districts). Further, there is sixty per cent level of introduction of SRI in Tamil Nadu, Jharkhand, Meghalaya and Andaman & Nicobar. In rest of the rice-growing States, the spread of SRI is limited to few districts. The spread and improvement of Laulanié's innovation was initially undertaken by an NGO that he established in 1990 with some of his Malagasy colleagues, *Association Tefy Saina*. Their effort was expanded subsequently through collaboration with a North American university, working with the CIIFAD, which has worldwide networking connections. The initial diffusion of SRI was mainly through literature. The variety of persons who emerged as initiators of SRI evaluation and promotion were an animal nutritionist in Cuba, agronomists working with NGOs in Cambodia and Myanmar, a senior civil servant in Sri Lanka, an electrical engineer in Philippines, a University researcher in India, a retired professor in Bangladesh, a Government researcher from Gambia (while doing graduate studies at Cornell). China was the only country where the agricultural research establishment quickly showed much openness to SRI (Yuan, 2001, 2002; Uphoff *et al*., 2002). Apart from this, farmers' role and electronic communication played an important role in further dissemination. The SRI home page that CIIFAD has maintained in cooperation with *Association Tefy Saina* (http://ciifad.cornell.edu/sri/) has probably been the single-most effective part of the SRI innovation system. Watershed Support Services and Activities Network (WASSAN) have developed an SRI site particularly for an Indian audience (www.wassan.org/sri/), and it has recently been joined by a homepage operated with support from The World Wide Fund for Nature (WWF) (www.sri-india.net) for Indian SRI dissemination. At present, SRI is diffused to 43 countries out of 113 rice-growing countries. In India, SRI has been diffused to 163 districts out of 564 rice-growing districts. Tamil Nadu and Andhra Pradesh were the pioneering States to adopt SRI in India.

Conclusion

The System of Rice Intensification (SRI) technique has received considerable attention globally including India due to its potential for yield improvement and water saving. The main features of this system include transplanting of young seedlings singly in a square pattern with wide spacing; using more of organic fertilizers and keeping the paddy field moist with intermittent drying and wetting during the vegetative growth of plants. SRI results in better plant growth and development and optimizes the use of seed, irrigation water, labour, plant protection chemicals and fertilizers. Hence, there is increase in the productivity of land, water, capital and labour significantly over conventional method of rice cultivation. However, there is need for scientific explanation or research intervention to confirm whether transplanting young seedling one by one at wider spacing will give more tillers; younger the plant shorter will be the period of catch up; flooded condition affects the aerenchyma in roots and no need of standing water. Thus, System of Rice Intensification (SRI) is the synergetic effect of all the practices that helps to achieve the potential yield of rice varieties.

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