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RESEARCH ARTICLE

Extent of Adoption of SRI Technology for Sustainable Rice Production in Nagaland

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ABSTRACT

SRI technology provides enormous scope to scale up the productivity and income of farmers. The present study was carried out in the state of Nagaland to evaluate the extent of the adoption of SRI technology for sustainable rice production. The study was conducted in the Kohima district of Nagaland as the prevalence of the System of Rice Intensification was observed higher in this district in comparison to other districts. The data was collected from a sample of 120 farmers using a pre-tested interview schedule by conducting personal interviews. The findings of the study revealed that most (73.33%) of the farmers had a moderate level of adoption of SRI technology. The variables of extension contacts, formal information sources, scientific orientation, training exposure, and attitude influenced the extent of SRI technology adoption among paddy farmers. Major constraints faced by farmers included marketing, logistics as well and relevant policies for easy access to technology. Hence farmers should be motivated through need-based training and demonstrations to adopt the requisite package of practices of SRI to reduce the technological gap, minimize constraints, and promote sustainable rice production thereby enhancing their income and profitability.

Key words: *Sustainable rice production; System of rice intensification; Adoption.*

System of rice intensification (SRI) is a synergistic management technique that involves four components of rice cultivation, such as planting, irrigation, weeding, and nutrient management strategies. SRI has been shown to help increase yield and substantially reduce water and other input requirements by altering crop, soil, water and nutrient management practices. The components of SRI include crop planting, water management, and weed control, combined with soil aeration and the use of organic fertilizers based on the principles of soil management, plant management and water management (*Dahiru, 2018*). The improvement in the productivity of rice has been one of the main objectives of agriculture development programs by the government over the past decades. The SRI was first introduced by Fr. Henri de Laulanie in Madagascar in 1980s' and spread to almost 50 countries across Asia, Africa, and South America (*Dagar et al*., *2015*). System of Rice Intensification (SRI) is one of the few innovations developed by the farmers that have resulted in a greater level of interest and enthusiasm not only among the farmers but also among scientists. SRI was diffused first to Tamil Nadu State in India during the year 1999, followed by Andhra Pradesh (*Johnson, 2011*). SRI consists of some principles including transplanting of younger seedlings (< 15 days) at wider spacing in a square grid pattern, only one seedling per hill, water management with alternate wetting and drying, mechanical weeding, and use of organic compost fertilizer instead of chemical fertilizer (*Mondol et al., 2017*). *Hasan et al. (2016)* reported that the Alternate Wetting and Drying technique under SRI could save irrigation requirements to a great extent.

Asia's population is projected to increase from 3.7 billion in 2000 to 4.6 billion in 2025. The community is faced with two challenges i.e., scarcity of water and availability of cereals such as rice (*Shanmugasundram, 2015*). SRI technology promises a much-needed boost to productivity in rice with better water use efficiency (*Krishna, 2016)*. Rice is grown all over the world and is a staple food for more than half of the world's population. India is the second leading producer of rice in the world (*Sharma et al. 2015*). Rice is the major staple food crop in the North Eastern Region of India covering 3.51 million hectares that accounts for more than 80% of the total cultivated area and 7.8 per cent of the total rice area of India (*Mohanty,2014*). The economy of Nagaland is primarily based on agriculture. Agriculture provides a living for almost 70% of the population. Rice is the main food source for the people in Nagaland. Paddy is grown in an area of 16000 ha in Kohima district, with a yield of 43,443 MT (Nagaland Statistical Handbook, 2021). In Nagaland, SRI technology was introduced under the National Food Security Mission (NFSM) in the year 2013. Districts covered under NSFM rice include Dimapur, Phek, Kohima, Tuensang, Mokokchung, Wokha, Peren, Kiphire, Longleng, Zunheboto and mon. So far, the adoption of SRI has been found to be highest in the district of Kohima. Kezoma village of Kohima district has the most farmers adopting SRI, and it is also the first village to use this method on a large scale. The paddy farmers use mostly traditional agricultural techniques. As a result, production is low (363.300 Ton th) (Nagaland Statistical Handbook, 2021). Paddy being a staple food, productivity must be improved. Increasing rice productivity and profitability is one of the most important ways to improve the income and welfare of rural households. Since years, the State Department of Agriculture has taken initiatives to promote SRI paddy cultivation techniques, but the expected result is yet to be achieved. Keeping these facts in view, a research study was conducted with the objective of evaluating the extent of adoption and factors influencing the adoption of SRI paddy cultivation technology.

METHODOLOGY

The study was conducted in the Kohima district of Nagaland as the use of the System of rice intensification was observed to be highest in this district in comparison to any other district. It consists of seven Rural Development Blocks viz, Kohima, Chiephobozou, Tseminyu, Jakhama, Chunlikha, Sechu-zubza and Botsa. Jakhama block has the maximum number of SRI farmers. Therefore, the Jakhama block was purposively selected for the present study. From this block, three villages namely Kezoma, KezoBasa and Kigwema were purposively selected since these villages had a large number of SRI paddy cultivators. Thus 30 SRI paddy farmers and 10 conventional paddy farmers were selected from each village (three villages) to make a sample size of 120 Paddy Farmers. Personal interview was conducted for the collection of primary data using a pre-tested interview schedule. Data was analyzed in terms of mean, standard deviation, correlation coefficient, etc., using SPSS software.

RESULTS AND DISCUSSION

Level of SRI technology adoption : It was revealed from Table 1 that 73.33 per cent of the paddy farmers had a medium level of adoption with respect to SRI paddy cultivation practices, while 18.89 per cent of the respondents had a low level of adoption (due to lack of training and awareness) and 7.78 per cent of them had a high level of adoption. These findings were in line with the findings of *Debbarma et al.* (2018) who found that the majority of the respondents (60%) had a medium level of extent of adoption of SRI technology. *Singh and Varshney (2010)* found that the majority of the respondents (44.17%) were found to be medium adopters. *Kumari and Prakash (2020)* reported that the majority (50%) of the respondents had a medium level of adoption whereas, Chandran and Chakravarty (2022) found that farmers exhibited a low level of adoption.

Table 1. Distribution of respondents based upon overall adoption level of recommended SRI technology (N=120)

Adoption level	No.	%
Low (<19.1)	17	18.89
Medium (19.1-24.9)	66	73.33
High (>24.9)	07	07.78

Association of socio-economic variables with the extent of SRI technology adoption : Table 2 revealed that formal information sources (r=0.270), extension contact (r=0.285), scientific orientation (r=0.910), training exposure(r=0.603) and attitude (r= 0.870) had positive and significant correlation with the extent of technology adoption by respondents at 1% level of probability. This implied that the respondents having higher productivity of paddy, formal information sources, extension contact, scientific orientation, training exposure and attitude exhibited higher levels of extent of technology adoption. *Singh et al. (2017)* reported that an increase in the yield also increased the surplus production of rice as well as the income level of the farmers. It was also found that age (r=-0.233) had a negative and significant correlation with the extent of technology adoption by respondents at a

Table 2. The correlation coefficient between socio-economic variables and the extent of SRI technology adoption

Variables	"r:	p-value
Age	-0.233*	0.010
Sex	-0.100^{NS}	0.273
Family Size	0.154^{NS}	0.091
Family Type	-0.108^{NS}	0.238
Education	0.039^{NS}	0.671
Size of total land holding(acre)	-0.034^{NS}	0.711
Size of land holding under SRI	-0.148^{NS}	0.105
Annual income	0.157^{NS}	0.085
Income from paddy cultivation	-0.035^{NS}	0.703
Mass media	-0.357**	<.000
Formal information sources	0.270**	0.002
Informal sources	0.593^{NS}	0.519
Social participation	0.101^{NS}	0.269
Extension contact	0.285**	0.001
Market orientation	-0.274**	0.002
Scientific orientation	0.910**	<.000
Training exposure	0.603**	<.000
Attitude	0.870**	<.000

**Significant at 1 % of the level of probability,
*Significant at 5 % of the level of probability,
NS = Non-significant

5% level of probability. While mass media (r=-0.357) and market orientation (r=-0.274) had a negative and significant correlation with the extent of technology adoption by respondents at `1% level of probability.

Further, it was found that sex (r=-0.100), family size (r=0.154), education (r=0.039), size of total land holding(acre)(r=-0.034), size of land holding under SRI (r=-0.148), annual income(r=0.157), income from paddy cultivation (r=-0.035), informal sources (r=0.593) and social participation (r=0.101) had non-significant correlation with the extent of technology adoption by the respondents. Thus, these variables did not influence the extent of technology adoption.

Constraints faced by farmers in the adoption of SRI technology : It was evident from Table 3 that the major constraint faced by respondents was identified as marketing constraints. In order to overcome this constraint, initiatives need to be taken to construct marketing sheds and proper storage houses so that various traders can procure the produce in bulk directly from the designated places. The next constraint was the logistic constraint. This constraint can be overcome by creating proper marketing infrastructures and educating the farmers about the proper system of market functions. The third constraint was the policy level constraints. Therefore, the government should take the initiative to procure the produce from the farmers so as to provide a sense of guarantee of minimum crop loss. Providing incentives or subsidies, setting up storage facilities, and encouraging the farmers to go for large-scale cultivation can have a huge impact on the extent of SRI cultivation technology and the productivity of paddy. Extension constraints ranked fourth. Therefore, extension personnel should address the information relating to farms, pay regular visits to the villages and provide training according to their present needs. The farmers should be made aware to avail the benefits from different government schemes by organizing periodic village meetings. Production constraints ranked fifth. Therefore, to minimize this problem, an awareness campaign should be organized. Further, the government should set up a system that may provide on-farm services to the farmer. Lack of technical knowledge/skills constraints ranked sixth. Therefore, to overcome this problem, seminars, workshops, and training programmes should be conducted. Financial constraints ranked seventh. Farmers faced problems in obtaining loans from the banks. This problem can be avoided by creating awareness of the procedure of availing loans from various financial institutions.

Table 3. Constraints faced in the adoption of SRI technology

Nature of constraints	MS	Rank
Marketing constraints	0. 43	I
Logistics constraints	0.28	II
Policy related constraints	0.26	III
Extension constraints	0.25	IV
Production constraints	0.13	V
Technical knowledge/skills constraints	0.08	VI
Financial constraints	0.07	VII

CONCLUSION

The study concluded that SRI is a very beneficial rice production technology that may be helpful in increasing the productivity and income of farmers in comparison to conventional farming. Variables like formal information sources, extension contact, scientific orientation, training exposure, attitude, age, mass media, and market orientation were found important in influencing the SRI technology adoption by the farmers. As most of the farmers had a moderate level of SRI technology adoption, they should be motivated and encouraged through training and demonstrations by the government agencies to increase the extent of SRI technology adoption thereby reducing the technological gap. Farmers should be provided with quality inputs increased avenues of marketing and storage and required logistics for enhancing productivity and profitability at the farm level.

CONFLICTS OF INTEREST

The authors have no conflicts of interest.

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