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RESEARCH ARTICLE :

Technological interventions in rice production for rural livelihood management

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SUMMARY : Technological interventions with respect to rice production and suitable methods of approach for transfer of technology under rain fed and irrigated areas to sustain a livelihood system specifying attributes of innovations were studied taking 240 respondents from 4 villages comprising both rain fed and irrigated situations. It was found that the extent of adoption was highest in nutrient management followed by variety replacement, whereas in irrigated condition variety replacement toped the list (70.83%) followed by nutrient management, SRI method. The 'z' value was found to be significantly different in case of SRI method, nutrient management and variety replacement whereas extent of adoption of IPM and hybrid rice cultivation remains same. The 'z_r' value of 4.19 in case of rainfed condition implies rice cultivation is a huge water-demanding enterprise. However, role of poverty reduction and feedback system registered minimum role. Market was also an important component for paddy technology adoption.

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KEY WORDS :
Rice cultivation, Technological interventions, Adoption, Attributes of innovation

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BACKGROUND AND OBJECTIVES

The population of India has already crossed 103 billion and is still increasing alarmingly and that put a great pressure on the food grain production of India. On a rough reckoning it is an acceptable fact that India achieved a marvellous success in food grain production from a bare 51 million tons in 1951-52 to 212 million tons in 2003 but India is still hungry. What would happen if India needs to produce an additional 100 million tons of food grain by 2020 AD to feed its increased population? This poses a major challenge not only for the policy makers but also more directly to the agricultural educationist, scientists and extension professionals.

Orissa employs around 73 per cent of its population in farming who contribute around 30 per cent to the net state domestic product. Of the total land area, around 40 per cent that translates to roughly around 87.46 lakh hectares are brought to agriculture every year and about 18.79 lakh hectares of this cropped area is irrigated. Thus, a major portion of the farm land depends on rain for water feeding the crop. Orissa contributes one tenth of the total rice produced in the country. The state has 4.5 million ha under rice cultivation, which covers both irrigated and rainfed areas. India is the second largest producer of vegetables in the world, next to China. These are grown in about 6 million hectares forming 3 per cent of the total cropped area. Though Orissa is self sufficient in the production of rice, but associated technologies play an important role in economic development. Adoption and diffusion of technology are two interrelated concepts described to use or not to use and the spread of technology among economic units over a period of time.

Objectives :

– To take stock of technological

Table A : Sample information			
District	Blocks	Villages	Total respondents
Angul	Chhendipada	Nuagaon	60
		Jaripal	60
	Atthamalik	Berham	60
		Mandarbahal	60

interventions in the areas of study with respect to rice production.

– To ascertain suitable methods of approach for transfer of technology under rainfed and irrigated areas to sustain a livelihood system specifying attributes of innovations or technology

RESOURCES AND METHODS

Angul district of Odisha lies between 20° 31' N and 21° 40' N latitude and 84°15' E and 85° 23' E longitude. The total geographical area of Angul is 6232 sq.kms. Odisha state has 30 districts and Angul district was selected purposively as being in the mid-central Table A and zone it represents the overall livelihood system as it covers parameters like rural, semi-urban, rainfed, irrigated, agriculturally dominant and moving towards industrialization. The relevant secondary data has been collected from 2 blocks of the district selected purposively. From each block, 2 villages have been selected purposively as per diversification and livelihood strategies adopted for sustaining livelihood. Respondents were selected by simple random sampling with replacement. From each village, 60 households were selected taking 12 per cent of the population. A total of 240 respondents (Table A) comprised the sample for study. The data collection was done with the help of a structured interview schedule, experts view and focused group discussion.

The entire study comprised of dependent and independent variables with good number of intervening variables.

OBSERVATIONS AND ANALYSIS

Improvement in yield for long term growth depends on host of factors including technology, use of quality seeds, fertilizers, pesticides, micronutrients and irrigation. For India, farming system has been experimenting a fusion of technology from time to time. It is said that Indian agriculture absorbs more technology than other countries of world. The ICAR and SAU system and private firms are trying their hard to introduce profitable technology suiting to local agro-climatic situation to bring a change in the living system of farmers. Comparatively more attention has been paid to resource poor areas like drought prone and rain fed areas to bring spectacular change in farming scenario. The area under study consists of rain fed as well as irrigated situation and the effect of interventions of technology has been considered under various parameters.

Rice cultivation :

Rice is the staple food for more than 65 per cent of the people. Planning and prioritizing rice research requires deep understanding of peoples' access to and use of natural resources and other forms of capital–physical, finance, human, natural, social capital and their interactions with other agencies.

The difference in adoption of both areas in relation to variety replacement, nutrient management, SRI, IPM and hybrid rice cultivation are presented in Table 1.

A glance at Table 1 reveals that extent of adoption was highest in nutrient management followed by variety replacement, SRI method and IPM in rain fed areas whereas in irrigated condition variety replacement toped the list (70.83%) followed by nutrient management, SRI method and IPM. In both cases adoption of hybrid rice intervention was least compared to other 4 interventions. In case of rainfed area, farmer gave more importance to nutrient management.

Difference in adoption of interventions in rice cultivation :

As discussed earlier eight important variables indicating

Table 1 : Adoption of technological interventions in rice cultivation **(n=240)**

Sr. No.	Interventions	Rain fed (n=120)				Irrigated (n=120)				Difference in adoption
		Adopters		Non-adopters		Adopters		Non-adopters		
		f	%	f	%	f	%	f	%	%
1.	Variety replacement	47	39.17	73	60.83	85	70.83	35	29.17	31.67
2.	Nutrient management	55	45.83	65	54.17	71	59.17	49	40.83	13.34
3.	SRI method	43	35.83	77	64.17	62	51.67	58	48.33	15.84
4.	I.P.M	42	35.00	78	65.00	56	46.67	64	53.33	11.67
5.	Hybrid rice cultivation	14	11.67	106	88.33	16	13.33	104	89.17	1.66

recommended interventions was examined taking both situations which revealed the following results.

A look at the Table 2 indicates that z value was found to be significantly different in case of SRI method, nutrient management and variety replacement whereas extent of adoption of IPM and hybrid rice cultivation remains same. It implies that sufficient attention has not been paid to popularize IPM and hybrid rice in both the situation.

Relation between socio-economic status and adoption of technological interventions :

The socio-economic variable invariably influences adoption behaviour of the farmers. The research findings have clearly established that higher the SE status, greater was the rate of adoption. In order to find out existing relationship between socio-economic status and adoption behaviour, with respect to technological interventions in six enterprises included in the study was analysed.

The calculated score on socio-economic variable obtained by an individual and score obtained for adopting components of different interventions were tested under zero order correlation which yielded following results. The sample adopting particular technology was taken in to consideration leaving out non-adopters.

Analysis of Table 3 reveals that irrigation was significantly associated with rice cultivation. Rice cultivation is a huge water-demanding enterprise. It is estimated that around 50 per cent of total irrigation water available is used for rice cultivation.

To ascertain suitable methods of approach for transfer of technology under rainfed and irrigated areas to sustain a livelihood system specifying attributes of innovations or technology.

Adoption of an innovation according to a recent review of the adoption literature is principally influenced by the characteristics and circumstances of the farmer, and the characteristics of the practice, especially its relative advantage over existing practices and landholder's ability to trial the practice. Farmers adopt an innovation if they expect that the practice will help them achieve their goals, which may include economic, social and environmental goals.

Transfer of technology signifies dissemination of technology from place of production to place of use. The recent concept is that transfer of technology is complete when recipient of technology puts technology into action and derive benefits out of it.

Table 2 : Difference in adoption of interventions in rice cultivation

Sr. No.	Intervention	Rain fed	Irrigated	"z" value
		Adoption %	Adoption %	
1.	Variety replacement	70.83	39.17	3.00 **
2.	Nutrient management	45.83	59.17	2.50 *
3.	SRI method	35.83	51.67	4.60 **
4.	Integrated pest management	35.00	46.67	1.20 (NS)
5.	Hybrid rice cultivation	11.67	13.33	0.80 (NS)

* and ** indicates of significance of values at P= 0.05 and P=0.01, respectively; NS = Non-significant

Table 3 : Correlation co-efficient between socio-economic condition and adoption of technological interventions

Sr. No.	Enterprise	Rain fed condition		Irrigated condition	
		"z_r" value	"t" value	"z_r" value	"t" value
1.	Rice cultivation	0.361	4.19**	0.195	2.14 *

Table 4 : Stimulating approach for acceleration of transfer of technology **(n=240)**

Sr. No.	Enterprises	Paddy cultivation
	Approaches	%
1.	Multi channel information	25.00
2.	Pro-poor approach	19.17
3.	Public sector financing	40.83
4.	Service provider	24.58
5.	Feedback system	8.75
6.	Poverty reduction	8.79
7.	Competitive market	27.5
8.	NRM/Environment security	33.75
9.	Farmers federation	40.83
10.	Village extension worker/ para-extension worker	34.17

Rice cultivation :

Rice is the principal crop of Orissa. A number of innovations have been added to each growth components of rice by various research organizations. The study considered rice technology in terms of varietal substitution, nutrient management, SRI method, IPM and hybrid rice cultivation. A cumulative effect of adoption over these five components of rice have been taken into consideration and in a multiple choice, the preference about influence of approaches have been reflected in the Table 4. In the scale of influence for adoption, public sector financing and farmers group had equal footing (40.83 %) followed by para extension workers, environment concern or natural resource management, competitive and service provider. However, feedback system and poverty reduction element were the least influencing factors.

The second aspect of Table 4 depicts relative position of selected ten stimulating approaches taking the enterprise into consideration.

Co-efficient correlation of between enterprises and approaches :

Relation between enterprises and adoption for which different approaches are employed explains the situation under which farmers can accept or reject an innovation.

In case of rice, five selected components were taken in to consideration and ten approaches influencing decision making process and stimulating for adoption were found out as follows. A look at the Table 5 reveals that public sector finance played most important role followed by farmers group, environment and multichannel information in stimulating farmers for adoption of technology. However, role of poverty reduction and feedback system registered minimum role. Market was also an important component for paddy technology adoption.

Attributes of innovation for successful adoption :

Technology armed with certain useful attributes and useful to increase income of farmers has been focal point of adoption. A number of studies conducted in India has proved beyond doubt that technology based on certain important attributes is adopted rapidly than those who lack the same. Taking review of literature into consideration and experts in the field of transfer of technology, six important attributes of all the enterprises were taken in to consideration. These are relative advantage, affordability, social acceptability, timely availability, marketability and compatibility.

The technology relating to rice cultivation (Table 6) is accepted on the basis of attributes they possess to attract farmers. Out of six attributes, relative advantage in terms of profit, labour saving was found to be first considered followed by marketability, compatibility to farming system, availability of inputs in time, affordability of farmers and social acceptability in order. It may be inferred that relative

Table 5 : Rice technologies and stimulating approach

Sr. No.	Approaches	" z_r" value	"t" value
1.	Multi channel information	0.352	3.56 (**)
2.	Pro-poor approach	0.288	2.63(*)
3.	Public sector financing	1.043	2.31 (*)
4.	Service provider	0.287	2.61 (*)
5.	Feedback system	0.103	1.60 (NS)
6.	poverty reduction	0.004	0.01 (NS)
7.	Competitive market	0.363	3.64 (**)
8.	NRM/Environment security	0.656	10.50(**)
9.	Farmers federation	0.688	10.56 (**)
10.	Village extension worker/ para-extension worker	0.337	3.42 (**)

* and ** indicates of significance of values at P=0.0.5 and P=0.01, respectively; NS = Non-significant

Table 6 : Attributes of innovation for successful adoption **(n=95)**

Sr. No.	Enterprise	Rice cultivation	
	Attributes	M.S.	Rank
1.	Relative advantage	2.49	I
2.	Affordability	2.22	V
3.	Social acceptability	2.05	VI
4.	Timely availability	2.25	IV
5.	Marketability	2.39	II
6.	Compatibility	2.38	III

M.S.= Mean score

advantage and market demand play very important role in adoption of rice technologies in the area under study.

Conclusion :

This study examined the adoption status of technological interventions in rainfed and irrigated areas. The impact of improved rice varieties adoption on rice productivity and farming households' welfare in the study area using a cross sectional data of 240 farmers. The basic logic behind this is that poverty incidence is higher among the non-adopters than the adopters. A total of six interventions *viz.*, variety replacement, nutrient management, SRI, IPM and hybrid rice cultivation were considered owing to their influence on overall production and productivity. Technology adoption concentrates on factors that influence adoption of modern technology in relation to traditional technology. The findings reveal that the extent of adoption was highest in nutrient management followed by variety replacement, SRI method and IPM in rain fed areas whereas in irrigated condition variety replacement toped the list followed by nutrient management, SRI method and IPM. In both cases adoption of hybrid rice intervention was least compared to other 4 interventions owing to the reason that hybrid seeds are not affordable by the small and marginal farmers in the district. Government should give due importance to these factors while strategic planning. The variety replacement in irrigated area account for more risk capacity, progressive and resource rich which favours replacement of varieties in paddy. The adoption of improved rice varieties significantly generated an improvement in farming household living standard. Hence, efforts should be intensified to ensure farmers have access to adequate quality improved rice seed at the right time.

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