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Impact of NICRA Project on Knowledge, Skill and Attitude (KSA) of Farmers on Climate-Resilient Agrotechnology's in the NICRA Operated District of Odisha

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ABSTRACT

A study was undertaken in March to June 2020 in the three NICRA districts i.e., Kendrapara, Jharsuguda and Kalahandi, Odisha, India to address the major climatic hazards through climate-resilient practices. A mixed-method research design that combines both qualitative and quantitative research techniques was deployed in this study. This was a test-control study, where the comparison was made between the NICRA- farmers (Test) and non-NICRA farmers (Control). The districts, blocks and villages selected a purposive sampling approach to ensure proper representation. The respondents were selected following the random sampling method. A total of 120 NICRA farmers, 60 Non-NICRA farmers and 30 Officials were selected in the sample. Now climate change adversely exaggerated the economic growth of farmers due to the climate change effects. The mean knowledge score of NICRA farmers was 69.96±5.88 whereas non-NICRA farmers were 37.71±2.67. The mean difference between the NICRA and non-NICRA farmers was -32.25 and the significant p=0.000. The knowledge score of NICRA farmers on CRA was found to be highly significant. The mean score of skill practice was 73.76±7.46 for NICRA farmers and that for non-NICRA farmers was 41.65±7.08. This implied that NICRA farmers had a significantly very high skill score than non-NICRA farmers (p=0.001). The mean attitude score of the NICRA farmer was 92.44±5.47 and that of the non-NICRA farmer was 71.65±6.63. The difference was highly significant (p=0.000). The mean attitude score of NICRA farmers was found to be significantly higher than non-NICRA farmers(p<0.001).

KEYWORDS: Agriculture, knowledge, skill, attitude, climate change, resilient, NICRA

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1. INTRODUCTION

Indian agriculture not only provides food security but also ensures livelihood security of 58% population where the knowledge, skill and attitude of farmers are playing a dominant role to boost their agrarian economy (Azhagiri, 2019). Climate change has special relevance to Odisha because of its location and geographic conditions (Mishra, 2017). Odisha has a tropical climate with high temperatures, high humidity, medium to high rainfall and short & mild winters. Sustainable agriculture requires innovative knowledge and skill with new content and forms of knowledge and new processes of learning (Kroma, 2006). The performance and effectiveness of extension services change the behaviour of farmers towards more production of crops (Antwi and Lindsay, 2021). Farmers are to be valued for their local experiential knowledge as they see it as having practical, personal and local relevance (Lamm et al., 2011). All stakeholders including farmers are to be included during knowledge generation and recognized as co-author (Sumane et al., 2018). Diversified knowledge is to be blended and shared in the public domain to bring a change in the knowledge and attitude of farmers toward sustainability (Tume et al., 2019). Both formal and informal knowledge needs to be brought together during innovation processes (Sumane et al., 2018).

Floods, cyclones, droughts, natural calamities and changing precipitation patterns are the major hazards related to climate change in NICRA project areas of Odisha (Das and Ansari, 2021). Climate change has an impact on agriculture, livestock, forestry, weather trends and patterns, rainfall and energy security (Hussain et al., 2020). Effective climate change policies and responsive strategies can enhance the rights and welfare of these households for equal distribution and access to resources, especially in socio-political structures. in the community (Delfino et al., 2019). Farmers' knowledge and perception of climatic risks and their adaptive responses are a prerequisite for well-targeted agricultural adaptation planning (Below et al., 2015). Farmers' adaptation responses are influenced by their framing of climatic trends as well as the multiple benefits get from the agricultural systems (Below et al., 2015). Changes in farming practices are necessary to reduce emissions and adapt to climate change. Farmers' knowledge directly influences their attitudes and practices toward climate change adaptation and mitigation measures **(**Nguyen et al., 2019).

NICRA operational villages are mainly dominated by small and marginal farmers. Those farmers required more reliable agricultural information, knowledge and skill in appropriate climate-resilient agro-technologies (Jadon et al., 2022). Over the years, the attitude of the farmers was changed due to the multifarious activities of the NICRA project. NICRA demonstrated proven technologies in the farmer's field in various Agro Climatic Zones (ACZ) and Agro-Ecological Situations (AES). As a result, farmers are considerably adopting climate-resilient agro-technologies along with income-generating activities for higher profit and sustainable development (Medhi et al., 2018).

Climate-resilient agro-technologies envisage the sustainable and judicious use of the available farm resources without upsetting the agricultural, livestock production and farm incomes in the climatic changing scenario (Rana et al., 2018). Hence, climate resilience has become a standard feature of agricultural and rural development strategies (Taylor and Bhasme, 2021). The climate-resilient agro-technologies (CRA) practices can amend the current situation and sustain agricultural production from the local to the global level in a sustainable manner (Lenka et al., 2022). Farmers have to be updated regarding available technologies and knowledge. The ever-increasing population and shrinking of land areas are creating a challenge to increase production and earn profit. Hence, technological innovations in agrotechnology are essential for farmers to change their socio-economic conditions (Chowhan, 2021). With this background, National Innovation on climate resilient agriculture (NICRA) is operating in five climate-vulnerable districts of Odisha. The project aimed to enhance the resilience of Indian/Odisha agriculture to combat climate change and climate vulnerability through strategic research and technology demonstrations in different ACZ/AES.

2. MATERIALS AND METHODS

A study was undertaken in the month of March to June 2020 in the three vulnerable districts (Kendrapara, Jharsuguda and Kalahandi) of Odisha. National Innovation on climate resilient agriculture (NICRA) is operating in five climate-vulnerableerable of Odisha, India. In this process three districts namely Kendrapara, Jharsuguda and Kalahandi were selected based on the different agroecological situations. A mixed-method research design that combines both qualitative and quantitative research techniques was deployed in this study. This was a test-control study, where the comparison was made between the NICRA- farmers (Test) and Non-NICRA farmers (Control). The districts, blocks and villages were selected following a purposive sampling approach to ensure proper representation. The respondents were selected following the random sampling method.

In each district, the only block under the NICRA project was selected. In the block, two NICRA villages and one Non-NICRA village were selected randomly out of the villages. A total of 120 NICRA farmers, 60 Non-NICRA farmers and 30 Officials were selected in the sample.

Knowledge, skill and attitude of the farmers were measured through a Likert five-point-rating scale. Questions were designed in a way to have many correct responses. If the respondent is unable to say anything, then the score is 0, If he/she gives one correct response (CR) score is 1, two CR Score is 2, 3 CR, the score is 3, 4 or more CR score is 4. The statistical tests and procedures were used for analyzing the data with the help of statistical tools like mean, S.D., frequency, percentage, t-value etc. were used for the analysis of data.

3. RESULTS AND DISCUSSION

The profile of farmers has been studied to appreciate the result of the study in a better way. The knowledge, skill and attitude score has been obtained from the farmers of NICRA and non-NICRA areas based on the responses to 20 questions administered to them with the help of a structured question.

3.1. Knowledge score of farmers

It revealed from the above table 1 that the mean knowledge score was 69.96±5.88 and that of non-NICRA farmers was 37.71±2.67. The mean difference between the NICRA and non-NICRA farmers was -32.25 and the significant p=0.000. The knowledge score of NICRA farmers on CRA was found to be highly significant than non-NICRA.

Table 1: Comparison of mean knowledge score of NICRA and non-NICRA farmers (n=180)

NICRA / non-NICRA farmer	N	Mean	SD	Mean diff.	t	p
NICRA	120	69.96	5.88	-32.25	-50.46	0.000
non-NICRA	60	37.71	2.67			

Table 2 provides the district-wise mean±SD on knowledge of NICRA and non-NICRA farmers in respect of three districts. It is invariable found that in all the districts the NICRA farmers have got substantially higher knowledge of CRA than the non-NICRA farmers. The height means score of 72.13±7.33 was found in Kalahandi and the lowest mean score was 68.69±4.79 in Kendrapara. But in non-NICRA, the highest is in Kalahandi (38.63±3.03) and the lowest in Jharsuguda (36.44±2.76). The above analysis implied that the NICRA project has a defined impact on the level of knowledge of CRA technologies than non-NICRA farmers (Sarkar et al., 2014).

Table 3 furnished a comparison of the mean knowledge score of NICRA farmers among the districts. The highest score was seen in the Kalahandi district i.e., 72.13±7.33 and the lowest score was found in the Kendrapara district. There was a significant difference in the mean knowledge score (p=0.015).

Table 3: Comparison of mean knowledge score of farmers in NICRA districts (n=120)

District	N	Mean	SD	Lower bound	Upper bound	ANOVA p-value
Kalahandi	40	72.13	7.33	69.78	74.47	0.015
Jharsuguda	40	69.06	4.67	67.57	70.56	
Kendrapara	40	68.69	4.79	67.16	70.22	
Total	120	69.96	5.89	68.89	71.02	

Over the year NICRA projects have drastically changed the knowledge score of farmers through a multifarious approach in all dimensions (Sarkar et al., 2014). Farmers are being encouraged to adopt new technologies based on their suitability for farms. Technology adoption among young farmers was comparatively higher than among old farmers (Das et al., 2019). The knowledge level of farmers and farm women have increased due to various interventions. Agriculture innovation required more knowledge of agriculture and the adoption of resilient technologies (Zossou et al., 2020).

3.2. Skill score of farmers

Table 4 compares the means score on the skill of NICRA and non-NICRA farmers. The mean score of practice was 73.76±7.46 for NICRA farmers and that for non-NICRA farmers was 41.65±7.08. The mean difference of the score was -32.11. This implied NICRA farmers had a significantly very high skill score than non-NICRA farmers (p=0.000).

Table 2: Comparison of mean knowledge score of the farmer in NICRA and non-NICRA areas (n=180)

Districts	Farmers				Mean diff.	t	p
	NICRA (n=120)		non-NICRA (n=60)				
	N	Mean±SD	N	Mean±SD			
Kalahandi	40	72.13±7.33	20	38. 63±3.03	-33.50	-24.94	0.000
Jharsuguda	40	69.06±4.67	20	36.44±2.76	-32.62	-33.88	0.000
Kendrapara	40	68. 69±4.79	20	38.06±1.65	-30.62	-36.39	0.000

Table 4: Comparison of mean skill score of farmers in NICRA and non-NICRA areas (n=180)

NICRA/ non-NICRA farmers	N	Mean	SD	Mean diff.	t	p
NICRA	120	73.76	7.46	-32.11	-28.17	0.000
non-NICRA	60	41.65	7.08			

Table 5 presents the comparison of the means score of NICRA and non-NICRA farmers by districts. In all three districts, Kalahandi, Jharsuguda and Kendrapara the mean score on the skill of NICRA farmers was significantly higher than non-NICRA farmers. The comparison of the mean score with lower and upper bound in table 6 is furnished. There is significant variation in the mean skill score among the districts (p=0.000).

Table 5: Comparison of mean skill score of farmers in NICRA and non-NICRA areas (n=180)

District	FARMERS	N	Mean	Std. deviation	Mean difference	t	p
Kalahandi	NICRA	40	76.16	6.85	-38.84	-27.31	0.000
	non-NICRA	20	37.31	4.12			
Jharsuguda	NICRA	40	74.97	7.69	-36.53	-22.64	0.000
	non-NICRA	20	38.44	4.74			
Kendrapara	NICRA	40	70.16	6.57	-20.96	-13.64	0.000
	non-NICRA	20	49.19	5.07			

3.3. Attitude score of farmers

Attitude is the main driving factor for transformation. The impact of NICRA in shaping the attitude of farmers for the adoption of CRA was studied in table 7.

The table 7 shows that the mean attitude score of the NICRA farmer was 92.44±5.47 and that of the non-NICRA farmer was 71.65±6.63. The mean difference was -20.79. The difference was highly significant (p=0.000). The comparison of attitudes between NICRA and non-NICRA farmers in each of the three districts is presented in table 8.

Table 6: Comparison of mean skill score of farmers in NICRA districts (n=120)

District	N	Mean	SD	Lower bound	Upper bound	ANOVA p-value
Kalah-andi	40	76.16	6.85	73.97	78.35	0.000
Jharsu-guda	40	74.97	7.69	72.51	77.43	
Kend-rapara	40	70.16	6.57	68.06	72.26	
Total	120	73.76	7.46	72.41	75.11	

Table 7: Comparison of mean attitude score of farmers in NICRA and non-NICRA areas (n=180)

NICRA / non-NICRA farmer	N	Mean	SD	Mean diff.	t	p
NICRA	120	92.44	5.47	-20.79	-20.98	0.000
non-NICRA	60	71.65	6.63			

Table 8: Comparison of mean attitude score of farmers in the NICRA and non-NICRA areas (n=180)

District	Farmers	N	Mean	SD	t	p
Kalah-andi	NICRA	40	95.25	1.88	-47.93	0.000
	non-NICRA	20	67.06	2.27		
Jharsu-guda	NICRA	40	95.28	1.89	-42.67	0.000
	non-NICRA	20	67.56	2.58		
Kend-rapara	NICRA	40	86.78	5.91	-5.98	0.000
	non-NICRA	20	80.31	2.43		

In each district, the mean attitude score of NICRA farmers was found to be significantly higher than non-NICRA farmers (p<0.001)

Table 9 revealed that the mean attitude score of NICRA farmers among three districts shows a significant variation (p=0.000). In the district of Kalahandi, the score was 95.25±1.88 and in Jharsuguda was 95.28±1.89. But, in

Table 9: Comparison of mean attitude score of farmers in NICRA areas (n=120)

District	N	Mean	SD	Lower bound	Upper bound	ANOVA p-value
Kalah-andi	40	95.25	1.88	94.65	95.85	0.000
Jharsu-guda	40	95.28	1.89	94.68	95.89	
Kend-rapara	40	86.78	5.91	84.89	88.67	
Total	120	92.44	5.47	91.45	93.43	

the district of Kendrapara, the mean attitude score was 86.78±5.91 much lower than the other two districts.

Table 10 shows that the knowledge and skill levels of non-NICRA farmers were <40% and between 40 to 49% whereas NICRA farmers' knowledge scores was more than>50%. But in attitude score, all the NICRA and non-NICRA farmers were more than 50% attitude score. NICRA farmers were more than 50% knowledge, skill and attitude scores as compared to non-NICRA farmers in all three NICRA districts. There was a significant difference in knowledge, skill and attitude scores of NICRA and non-NICRA farmers.

Table 10: Percentage of knowledge, skill and attitude score of NICRA and non-NICRA farmers

% Knowledge score	NICRA farmer / non-NICRA farmer				Total	
	Non-NICRA		NICRA			
	No.	%	No.	%	No.	%
<40%	44	73.3	0	0	44	24.4
40-49%	16	26.7	0	0	16	8.9
≥50%	0	0	120	100	120	66.7
% Skill score						
<40%	24	40	0	0	24	13.3
40-49%	23	38.3	0	0	23	12.8
≥50%	13	21.7	120	100	133	73.9
% Attitude score						
<40%	0	0	0	0	0	0
40-49%	0	0	0	0	0	0
≥50%	60	100	120	100	180	100
Total	60	100	120	100	180	100

4. CONCLUSION

Various agro-climatic parameters in the multilocation demonstration programme were very much effective in changing the knowledge, skill, and attitude of the farmers toward the adoption of improved technology. Skill had assisted them to accelerate their crop production and productivity. Age, farming experience and level of education of farmers had a positive impact on acquiring knowledge, skills, and attitude. Long-term strategies are to be designed and developed to mitigate its impacts through feasible and proven climate-resilient agro-technologies or practices.

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