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Adaptation of Farmers Regarding Climate Resilient Technologies in Rewa Block of Rewa District in Madhya Pradesh

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ABSTRACT

Climatic discrepancy is a new challenge to the farming communities. Apart from losses caused due to variable climatic condition, it also affecting the decision making ability of farmers due to lack of awareness and knowledge. Perception and attitude regarding climate change affects farmers' willingness for adaptation. Adaptation to climate change planning of alternate agricultural management practices in response to change in climate condition well in advance. It has been felt necessary to assess the adaptation of farmers regarding Climate Resilient Technologies. The present study was undertaken in Rewa block of Rewa district. Through random sampling, one hundred twenty farmers from Rewa block were selected purposively from ten villages. The result showed that 45.83 per cent exhibited medium level of adaptation regarding Climate Resilient Technologies. Variables like education, size of land holding, farming experience, farm resources, local personal channels, local cosmopolite channels, mass media contact, innovative proneness, risk orientation, scientific orientation, Knowledge regarding climate change, change proneness had significant relationship with their adaptation and had fair degree of association. Lack of awareness about long term climate change and Lack of timely information related to climate resilient technologies were major constraints perceived by the farmers in adoption to Climate Resilient Technologies.

Keywords: Adaptation, Climate change, Climate resilient technologies, Constraints, Krishi Vigyan Kendra

INTRODUCTION

Climate change and agriculture are interdependent progressions on a global scale. The consequence of climate change started imposing its impact on agriculture of India. Agriculture provides livelihood security to estimated 61.5 per cent of the Indian population in general and over 85 per cent in particular to rural India. (Agricultural Census of India, 2011). Majority of Indian population considered more vulnerable because of its direct or indirect dependence on agriculture. Successful adaptation to changing climate is important for sustainable productivity. Adaptation refers to adjustments in ecological, social, or economic systems in response to actual or expected climatic stimuli and their effects or impacts. It refers to changes in processes, practices, and structures to moderate potential damages or to benefit from opportunities associated with climate change (unfccc, 2020).

The impacts of changing climate on agricultural have been severely felt in India. In recent years it has been projected that under the scenario of a 2.5ºC to 4.9ºC temperature rise in India, rice yields will drop by 32-40 per cent and wheat yields by 41-52 per cent. This would cause GDP to fall by 1.8-3.4 per cent (GOI, 2011).

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There has been growing interest regarding human perception and value system toward climate change. Several global studies have indicated that India is particularly vulnerable to climate change, and is likely to suffer with damage to agriculture, food and water security, human health and cattle populations. Although farmers has low knowledge regarding climate change (Sanodiya *et al.,* 2019).

The recognition that climate change related threats to agriculture also represent threats to quality of life on a global scale which has led to an increasing amount of attention to adaptation and mitigation strategies for agriculture by the farmers (Howden *et al.,* 2007). Adaptation and mitigation are two basic solutions to avoid the ill effects of climate change. Adapting to changing climate is a continuous process. A strategic planning is required to reduce the consequences of long-term climate change which may severely affect the livelihood security of the poor. To enhance the resilience of Indian agricultural (including crops, livestock and fisheries) to climatic variability and climate change through strategic research on awareness and adaptation, National Initiative on Climate Resilient Agricultural (NICRA) Program was launched in 2010-11 by ICAR New Delhi. Krishi Vigyan Kendras are also working to create awareness and improving adoption rate of such technologies. Present paper attempts to analyze adaptation of farmers regarding climate resilient technologies.

METHODOLOGY

The present study was conducted in Rewa district of Madhya Pradesh in 2018-19. Rewa district comes under highly vulnerable district to climate change (CRIDA, 2013). Out of 9 blocks of district, Rewa block was selected purposively because Krishi Vigyan Kendra and College of Agriculture are situated in this block. Ten villages were selected randomly for the present study with the help of KVK scientists and other officials. A list of farmers from each selected villages, was prepared from this sampling frame. The farmers were selected from each village through proportionate random sampling method to get a sample of 120 respondents with the help of Krishi Vigyan Kendra (KVK) and other officials. The data were collected personally with the help of pre tested interview schedule. The researcher personally contacted the respondents. Data collected were quantitative as well as qualitative in nature. The qualitative data were converted into quantitative form. The statistical techniques like frequency, percentage, average, and mean were used in the study. Chi square test and Co-efficient of association were applied for drawing the inferences based on statistical results obtained from statistics analysis.

RESULTS AND DISCUSSION

A. Natural Resource Management Technology: It was observed that the mean adaptation score in natural resource management technology was Moisture conservation (mean score 2.37, rank I), Water saving irrigation method (mean score 1.94, rank II), Water harvesting and recycling for supplemental irrigation (mean score 1.87, rank III), Conservation tillage (mean score 1.58, rank IV), Artificial ground water recharge (mean score 1.41, rank V).

B. Crop Management Technology: It was observed that the mean adaptation score in crop management technology was Water saving paddy cultivation methods (SRI, direct seeding) (mean score 2.16, rank I), Advancement of planting dates of rabi crop in areas with terminal heat stress (SRI, direct seeding) (mean score 2.06, rank II), Drought / temperature tolerant varieties (mean score 1.85, rank III), Community nurseries for delayed monsoon (mean score 1.37, rank IV) Custom hiring centers for timely planting (mean score 1.31, rank V), Frost management in horticulture through fumigation (mean score 1.21, rank VI). Some of the adaption techniques were also observed by Brar *et al.* (2020).

C. Livestock and Fisheries Technology: It was observed that the mean adaptation score in livestock and fisheries technology was, Breed up – gradation and nutrient supplement management (mean score 1.65, rank I), Preventive vaccination (mean score 1.54, rank II) Demonstration of fodder production (mean score 1.50, rank III), Management of fish pond during water scarcity and excess water (mean score 1.44, rank IV).

Table 1: Level of Adaptation of respondents regarding climate resilient technologies

S. No.	Technologies	Adaptation			Total score	Mean score	Rank
		High	Medium	Low			
A.	**Natural resource management technology**						
1.	Moisture conservation	65	35	20	285	2.37	I
2.	Water harvesting and recycling for supplemental irrigation	25	55	40	225	1.87	III
3.	Water saving irrigation method	30	53	37	233	1.94	II
4.	Conservation tillage	16	38	66	190	1.58	IV
5.	Artificial ground water recharge	15	35	70	170	1.41	V
B.	**Crop management technology**						
1.	Drought / temperature tolerant varieties	30	42	48	222	1.85	III
2.	Advancement of planting dates of rabi crop in areas with terminal heat stress	50	28	42	248	2.06	II
3.	Water saving paddy cultivation methods (SRI, direct seeding)	55	30	35	260	2.16	I
4.	Frost management in horticulture through fumigation	10	18	90	146	1.21	VI
5	Community nurseries for delayed monsoon	15	30	75	165	1.37	IV
6	Custom hiring centers for timely planting	13	25	82	158	1.31	V
C.	**Livestock and fisheries technology**						
1.	Demonstration of fodder production	15	30	75	180	1.50	III
2.	Preventive vaccination	25	40	55	185	1.54	II
3.	Management of fish pond during water scarcity and excess water	10	33	77	173	1.44	IV
4.	Breed up–gradation and nutrient supplement management	20	59	41	199	1.65	I
D.	**Institutional intervention**						
1.	Establishment of seed bank	25	40	65	220	1.83	I
2.	Establishment of fodder bank	20	30	70	190	1.58	II
3.	Creation of agriculture commodity groups	12	20	88	164	1.36	IV
4.	Collective marketing	12	28	80	172	1.43	III
5.	Climate literacy programs	10	20	90	160	1.33	V

D. Institutional Intervention: It was observed that the highest mean adaptation score in Institutional intervention was Establishment of seed bank (mean score 1.83, rank I), Establishment of fodder bank (mean score 1.58, rank II) Collective marketing (mean score 1.43, rank III). Creation of agriculture commodity groups (mean score 1.36, rank IV) and Climate literacy program (mean score 1.33, rank V).

It was found that among all the climate resilient technologies mean adaptation score of natural resource management technology was highest (1.83), followed by crop management technology (1.66), livestock and fisheries technology (1.53) and Institutional intervention (1.51). It was also found that overall average mean adaptation score of all technology was 1.63.

Table 2 indicates the adaptation index of different climate resilient technologies among the farmers. It is evident that the Natural resource management technology occupied I rank having the highest (61.27) adaptation index followed by Crop management technology (55.50), Livestock and fisheries technology (51.17), Institutional intervention (50.32).

Table 3 showed that out of total, a higher number exhibited medium level of adaptation regarding Climate Resilient Technologies (45.83%) followed by low level

Table 2: Adaptation Index regarding climate resilient technologies

Climate Resilient Technologies	Adaptation Index	Rank
Natural resource management technology	61.27	I
Crop management technology	55.50	II
Livestock and fisheries technology	51.17	III
Institutional intervention	50.32	IV

Table 3: Distribution of the respondents according to overall adaptation of climate resilient technologies

Extent of adaptation	Number of respondents	Percentage
Low	40	33.33
Medium	55	45.83
High	25	20.83
Total	**120**	**100**

of adaptation regarding Climate Resilient Technologies (33.33%) and only 20.83 per cent showed high adaptation, regarding Climate Resilient Technologies. The finding of Sangeetha *et al.* (2018) supports this result.

Table 4 depicts the χ^2 and "C" value indicating the relationship between profile of the respondents with their adaptation regarding Climate Resilient Technologies. The characteristics namely, education, size of land holding, farming experience, farm resources, local personal channels, local cosmopolite channels, mass media contact, innovative proneness, risk orientation, scientific orientation, Knowledge regarding climate change, change proneness had significant relationship with their adaptation and had fair degree of association. The result also depict that age and social participation establish negligible degree of association with adaptation regarding Climate Resilient Technologies. Ayanwuyi *et al.* (2010) also reported that farm size, education, and farming experience had positive and significant relationship with adaptation strategies of farmers in Oyo state of Nigeria.

The results in Table 5 show that the respondents faced several constraints in adaptation of Climate Resilient Technologies. The major barriers identified were as lack of awareness about long term climate change (76.66%), lack of timely information related to climate resilient technologies (70.00%), lack of knowledge regarding appropriate adaptation measures (68.33%), decrease of ground water level (66.66%), Ineffective crop insurance policies (65.00%), Lack of crop demonstration and trials on farmers field concerned with climate change (63.33%), Lack of awareness about climate resilience (60.83%), Poor availability and

Table 4: Association between profile of the respondents and adaptation regarding climate resilient technologies

Characteristics	χ^2	d.f.	C	Degree of association
Age	5.21	4	0.11	Negligible
Education	19.12	6	0.39	Fair
Landholding	18.25	6	0.31	Fair
Farming experience	11.39	4	0.32	Fair
Farm resources	16.45	4	.032	Fair
Social participation	1.43	4	0.10	Negligible
Local personal channels	10.77	4	0.31	Fair
Local cosmopolitan channels	11.35	4	0.11	Fair
Mass media contact	12.97	4	0.29	Fair
Innovative proneness	15.56	4	0.31	Fair
Risk orientation	13.77	4	0.42	Fair
Scientific orientation	13.84	4	.0.31	Fair
Knowledge regarding climate change	18.65	4	0.40	Fair
Change proneness	16.94	4	0.38	Fair

Table 5: Constraints perceived by the farmers in adoption to climate resilient technologies

S.No.	Barriers	Number of respondents	Percentage	Rank
1.	Lack of awareness about long term climate change	92	76.66	I
2.	Lack of timely information related to climate resilient technologies	84	70.00	II
3.	Lack of awareness about climate resilience	73	60.83	VII
4.	Poor availability and accessibility of short duration drought and heat tolerant crop varieties	68	56.66	VIII
5.	Lack of crop demonstration and trials on farmers field concerned with climate change	76	63.33	VI
6.	Difficult to work in the field due to severe temperature	55	45.83	XI
7.	Decrease of ground water level	80	66.66	IV
8.	Lack of knowledge regarding appropriate adaptation measures	82	68.33	III
9.	Lack of storage facility in the village	65	54.16	IX
10.	Ineffective crop insurance policies	78	65.00	V
11.	Lack of training and exposure visits related to climate change	63	52.50	X
12.	Lack of technical advisory services at local level	40	33.33	XII

accessibility of short duration drought and heat tolerant crop varieties (56.66%), Lack of storage facility in the village (54.16%), Lack of training and exposure visits related to climate change (52.50%), Difficult to work in the field due to severe temperature (45.83%) and lack of technical advisory services at local level (33.33%).

CONCLUSION

Since Climate Change is emerging as a new challenge, farmers are unaware regarding its long term impact on farming as well as on their socio economic conditions. Extension efforts should be intensify to increase awareness and adoption of suitable practices to mitigate the harmful effects. Adaptation to climate change may help the farming community in securing their livelihood. Study explored that majority of respondents (45.83) had medium adaptation towards Climate Resilient Technologies. Since Adaptation is a continuous process, various trainings, and demonstrations may help to reduce the effects locally as well as globally. About 76.66 per cent of respondents were lacking awareness about long term climate change, in such situation use of ICT tools and techniques can be proved efficient to create awareness and also in spreading early warning. Krishi Vigyan Kendras are efficient to amalgamate all modern extension and communication techniques such as mobile advisories, whatsapp interactions and other social media; so they must be well equipped for potential use. Effect of participatory planning cannot be ignored to amplify adaption towards Climate Resilient Technologies. Chouksey *et al.* (2019) stated that efforts regarding climate resilient technology needs extension intensification to generate more and effective awareness.

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