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Constraints Affecting the Spread of Climate Resilient Technologies among the Farming Communities

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ABSTRACT: Climate resilient agriculture is fairly flexible if farmers are provided with right information, right tools, they can make necessary adaptations of their own. But some farmers will find it difficult because of unavailability of technology, poor soil quality, lack of irrigation, lack of funds in addition to institutional or cultural barriers. To achieve climate resilient agriculture, the collaboration of farmers, extension system and research system is prerequisite. For technology spread agricultural extension system needs various players like public, private, CBO, farmers. At each stage of dissemination, factors affecting the spread of technology varies with type of organization. Management of all these factors and understanding elements of technology pathway leads to the successful spread of technology among farmers. An attempt is made to analyse the constraints affecting spread of climate resilient technologies among the farming communities. Ex-post facto research design was adopted for the investigation. The present study was conducted during 2021-22 in Telangana state. Khammam district was selected purposively keeping in the view of more spread of climate resilient technologies in the district. Enkoor mandal was selected purposively as the spread of climate resilient technologies is observed in the mandal. Two NICRA adopted villages and two NON-NICRA villages were selected from the mandal. Thus, total of four villages were selected for the study. 30 farmers were selected at random from each village to create a sample of 60 respondents from NICRA-adopted villages and 60 respondents from non-NICRA villages for the study. Thus, total of 120 farmers were selected. Among NICRA respondents under socio-psychological constraints, resistance to change the conventional practices (61.0%), economical constraints inadequate finance (71.3%), under technological constraints lack of own resources (48.3%) lack of weather-based information (48.3%) were constraints observed. Among NON-NICRA respondents under socio-psychological constraints, resistance to change the conventional practices (70.0%) economical constraints high cost of inputs (75.0%) under technological constraints lack of awareness of people about CRTs (climate resilient technologies) (86.6%) were the constraints observed.

Keywords: Climate resilient technologies, constraints, spread, farming communities.

INTRODUCTION

Climate change and agriculture are interrelated phenomena that occur on a global scale. The negative consequences of climate change have an impact on agriculture both directly and indirectly. This can happen as a result of variations in pests and diseases, variations in atmospheric carbon dioxide and ground-level ozone concentrations, variations in the nutritional value of some foods, variations in average temperatures, rainfall, and climate extremes (such as heat waves). Specifically Indian continent is highly vulnerable to all climate change impacts. Climate change has become important area for India in terms of food and nutritional security for the growing population. 50% of population in India has main occupation as "Agriculture". Agriculture and allied sectors contribute 20.19% of the Indian GDP (National Statistical Office, 2021). Farm operations are performed by selecting crop according to the climate, soil type and resource availability etc. Therefore, farming production and productivity is completely dependent on climatic

conditions (Bal and Minhas 2017). Weather disturbances, like changes in temperature, rainfall, solar radiation influence the agriculture and livestock. High temperature reduces crop duration, permit changes, grain yield increased senescence. For example, in India, an increase in temperature by 1.5° C and decrease in the precipitation of 2 mm reduces the rice yield by 3 to 15 % (Ahluwalia and Malhotra 2006). In the last 100 years the mean annual surface air temperature of India has increased by 0.4-0.6°C (Rupakumar *et al*., 2002). Annamalai *et al.* (2010) reported decreasing rainfall tendency in both southwest and northeast monsoon seasons in most parts of central and northern India.

Increasing crop resilience (ability to withstand these stressors) will be fundamentally important in a changing future, as it will reduce farmers' vulnerability to crop loss and increase a country's ability to maintain food security

Climate resilience can be enhanced by implementing short and long-term climate mitigation and adaptation strategies, as well as ensuring transparent and inclusive participation of multiple actors and stakeholders in decision-making and management processes

Climate resilient technologies (CRT) sustainably will increase agricultural productivity, and build resilience of agricultural and food security systems to climate change at multiple levels; and CRTs will help in reducing GHG emissions from agriculture and increasing carbon sequestration.

According to Stern (2006) any effective response to the challenge of climate change through mitigation must be based on an international understanding that its origins, impact, scale and urgency require action that is global and collective. So, to combat climate change effects by understanding the origins, impact, scale and urgency the mitigation or adaptation process will be behind the schedule. And also, other factors like technology accessibility, complexity etc. delay the adaptation and mitigation process. In this context, to accelerate the process of adaptation and mitigation, the institutions, farmers, and policy makers need to understand different dissemination pathways in climate resilient agriculture.

The Indian Council of Agriculture Research (ICAR) started the NICRA project in 2011 to give farmers the coping skills they need to deal with climate aberration. The project's goal is to advance climate-resilient agriculture technologies to address the country's climate change scenario and demonstrate the best solutions to assist farmers in adjusting to the effects of climate change. Under the National Initiative on Climate Resilient Agriculture's (NICRA) technology demonstration component, the climate resilient practices and technologies are implemented in four modules with farmer participation: crop interventions, NRM interventions, livestock interventions, and institutional interventions. The climate resilient technologies to tackle impacts of climate change are disseminated by various systems like both public and private extension systems. This technology transfer does not necessarily occur between research system and farmer. The diffusion of technologies is from research - extension, from extension - farmer, from farmer - farmer, and occur at multidimensional level including horizontal/ vertical/ diagonal spread etc.

The present investigation made an attempt to analyse the constraints affecting spread of climate resilient technologies among the farming communities.

MATERIALS AND METHODS

Ex-post facto research design was adopted for the investigation. Telangana state was chosen for the study. Khammam district was selected purposively keeping in the view of more spread of climate resilient technologies in the district. Enkoor mandal was selected purposively as the spread of climate resilient technologies is observed in the mandal. Two NICRA adopted villages and two NON-NICRA villages were selected from the mandal. Thus, total of four villages were selected for the study. 30 farmers were selected at random from each village to create a sample of 60 respondents from NICRA-adopted villages and 60 respondents from non-NICRA villages for the study. Thus, total of 120 farmers were selected. The data was collected using a pre tested structured interview schedule and analysed using SPSS. The major findings of the study were presented as follows;

RESULTS AND DISCUSSIONS

Socio-Psychological constraints. The data in the table revealed the scoring pattern of socio-psychological constraints in the rank order**.** Among NICRA farmers resistance to change the conventional practices (61.0%), followed by inability to take risk (48.3%), less interest in climate-resilient agriculture (45.0%), illiteracy of the farmer (33.3%), others not adopting the technology (33.3%), labour scarcity (24%). Among NON-NICRA farmers the constraints were in the order of, resistance to change the conventional practices (70.0%), others not adopting the technology (66.7%),inability to take risk (66.7%), illiteracy of the farmer (58.3%), labour scarcity (51.7%), less interested in climate-resilient agriculture (30.0%).

Most farmers stated that they are unable to accept new farm practices because they are afraid that farming in a rainfed situation is unpredictable, and they do not want to take any risks so they continue to use the same old conventional practices.

As most of the farmers were less educated or illiterate, they were unable to take decisions regarding climate resilient agriculture. Increasing labour scarcity is one more problem in agriculture because most of the available labour were participating in daily labour activities. The results were in line with the findings of Waris *et al*. (2019).

Economical constraints. The data in the table revealed the scoring pattern of Economical constraints in the rank order**.** Among NICRA farmers inadequate finance (71.3%), high labour cost (66.6%), high cost of investments in land or farm machinery (63.3%), lack of assets like land farm machinery etc (58.3%), high cost of inputs (50.0%), insufficient funds/high interest rates (48.3%). Economic constraints of NON-NICRA farmers were in the order of, high cost of inputs (75.0%), inadequate finance (71.7%), high cost of

investments in land or farm machinery (63.3%), high labour cost (63.3%), insufficient funds/high-interest rates (58.3%), lack of assets like land, farm machinery etc (48.3%).

Farmers have expressed difficulty in obtaining timely finance, as a result of which they were unable to purchase seed, fertiliser, and other inputs on time, and this was viewed as a significant constraint. The findings were in line with the findings of Saikia *et al*. (2019).

Technological constraints. The data in the table revealed the scoring pattern of technical constraints for NICRA respondents in the rank order lack of own resources (48.3%), lack of weather-based information (48.3%), lack of information on latest technology within time (43.3%), lack of knowledge on climate resilient technologies (33.3%), lack of drought or saline tolerant varieties (33.3%), lack of awareness of people about CRTs (26.6%). Technological constraints of NON-NICRA farmers were in the order, lack of awareness of people about CRTs (86.6%), lack of information on the latest technology within time (80.0%), lack of knowledge of climate resilient technologies (66.6%), lack of drought or saline tolerant varieties (63.3%), lack of weather-based information (60.0%), lack of extension contacts (60.0%), lack of own resources (58.3%). the findings were in line with the findings of Balasubramanian Nanjappan (2018).

Most farmers were unable to implement climate-resilient technologies without technical and financial support. Despite KVK's repeated trainings and demonstrations, farmers are hesitant to implement the technologies due to financial constraints and farmer coordination. Drought-tolerant varieties should be made available in sufficient quantities at the farmer level so that farmers can cultivate these varieties. As the land has become more fragmented over time, the small size of the farm was regarded as a constraint.

Table 1: Distribution of respondents according to their constraints in spread of climate resilient technologies.

Sr. No.	Constraints	NICRA (n=60)			NON-NICRA (n=60)		
		F	%	rank	F	%	rank
Socio-psychological constraints							
1	Illiteracy of the farmer	20	33.3	V	35	58.3	III
2	Inability to take risks	29	48.3	II	40	66.7	II
3	Less interested in climate-resilient agriculture	27	45.0	III	18	30.0	V
4	Others not adopting the technology	20	33.3	V	40	66.7	II
5	Labour scarcity	24	40.0	IV	31	51.7	IV
6	Resistance to change the conventional practices	37	61.0	I	42	70	I
Economical constraints							
1	High cost of inputs	30	50.0	V	45	75.0	I
2	Inadequate finance	43	71.3	I	43	71.7	II
3	High labour cost	40	66.6	II	38	63.3	IV
4	Insufficient funds/high interest rates	29	48.3	VI	35	58.3	V
5	High cost of investments in land or farm machinery	38	63.3	III	41	68.3	III
6	Lack of assets like land, farm machinery.	35	58.3	IV	29	48.3	VI
Technological constraints							
1	Lack of knowledge on climate resilient technologies	20	33.3	III	40	66.6	III
2	Lack of information on latest technology within time	26	43.3	II	48	80.0	II
3	Lack of drought or saline tolerant varieties	20	33.3	III	38	63.3	IV
4	Lack of own resources	29	48.3	I	35	58.3	VI
5	Lack of Awareness of people about CRTs	16	26.6	IV	52	86.6	I
6	Lack of weather-based information	29	48.3	I	36	60.0	V
7	lack of extension contacts	26	43.3	II	36	60.0	V

CONCLUSIONS

The present study revealed that the majority of the NICRA farmers are having the constraints such as inadequate finance high labour costs, the small size of the land, lack of own resources, farmers resistance to change the conventional practices, inability to take risks, less interest in climate-resilient agriculture. The major constraints faced by NON-NICRA farmers are resistance to change the conventional practices, others not adopting the technology resistance high cost of inputs, inadequate finance, high cost of investments in land or farm machinery, lack of awareness of people about CRTs, lack of information on the latest technology within time, lack of knowledge of climate resilient technologies, lack of drought or saline tolerant varieties. Most farmers were unable to implement climate resilient technologies without technical and financial support. Despite KVK's repeated trainings and demonstrations, farmers are hesitant to implement the technologies due to financial constraints and farmer coordination. Drought-tolerant varieties should be made available in sufficient quantities at the farmer level so that farmers can cultivate these varieties. Farmers, financial institutions, and agro-advisory service providers should all consider continuous learning and sharing of climate resilient practices, climate, and agro-advisory knowledge to be a crucial tool. This will eventually increase farmers' ability to adapt, while also increasing their awareness of and altering their attitudes toward farming that is climate-smart.

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