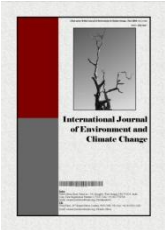

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Problems in the Adoption of Climate-Resilient Technologies by the Farmers of Telangana State, India

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

Climate change refers to significant changes in global temperature, precipitation, and wind patterns. Climate change hasa serious impact on the natural resources available on the earth. Climate change adversely affects human health and quality of life. A majority of the population depends on agriculture directly or indirectly and it is more vulnerable to climate change. To mitigate the adverse effects of climate change, climate-resilient agriculture has become a boon to the farmers in areas that are vulnerable to climatic effects like drought, floods, etc., National Innovations on Climate Resilient Agriculture (NICRA), is a project launched by the Indian Council of Agricultural Research (ICAR) with the aim to enhance the resilience of Indian agriculture to climate change and climate variability through strategic research and technology demonstrations. *Krishi Vigyan Kendras* (KVKs) is the main implementing agency of NICRA. With the help of KVKs, the interventions of NICRA were accessible throughout the country. The present study was conducted in the Nalgonda district and Khammam district of Telangana. The *ex-post-facto* research design was used for the study. A sample of 120 respondents from NICRA implemented villages and 60 farmers from non-NICRA implemented villages were selected randomly for the study. The major problems in the adoption of

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CRA technologies were limited knowledge of CRA technologies (91.66%) followed by inadequate trainings regarding climate-resilient practices (90.00%),inadequate weather based agro advisory services (88.33%), limited outreach of extension services about climate-resilient technologies to (76.66%), non -availability of required implements in custom hiring centres at the time of heavy demand (73.33%), etc., In case of non-NICRA implemented villages, the major problems faced by the respondents were lack of confidence among the farmers to adopt the new CRA technologies due to the fear of failure (93.33%), lack of awareness on climate-resilient technologies among non-NICRA farmers (90.00%), Difficulty in the understanding of CRA technology (86.67%), adoption of CRA technologies demand more resources like water, labour and money (83.33%), less number of need-based training on CRA technologies (75.00%), lack of access to improved crop varieties and other inputs (70.00%), etc.

Keywords: Adoption; problems; climate-resilient technologies; NICRA.

1. INTRODUCTION

The economy of India is rooted in agriculture and most of the farmers being smallholders are highly correlated with the adverse effects of climate change.Climate change poses a threat to food access for both rural and urban populations by reducing agricultural production and incomes, increasing risks, and disrupting markets. Poor producers, the landless, and marginalizedethnic groups are particularly vulnerable [1]. As the agriculture sector has to face the hostile effects of climate change and climate variability, adaptation strategies are indispensable for farmers to deal with them [2]. Hence, a project called NICRA (National Innovations on Climate Resilient Agriculture) was launched by ICAR by Honourable Union Minister for Agriculture and Food Processing Industries Shri Sharad Pawarji on 2nd February 2011. The project consists of four components namely strategic research on adaptation and mitigation, Technology demonstration on farmer's fields to cope with current climate variability, Sponsored/ Competitive research grants to fill critical research gaps, and Capacity building of stakeholders [3-5].

Among these four components, the technology demonstration component deals with demonstrating proven technologies for the adaptation of crop and livestock production systems to climate variability [6,7]. This component is implemented in selected vulnerable districts of the country through location-specific interventions by *Krishi Vigyan Kendras*in participatory mode. In each village, the interventions of NICRA were made available through four modules *viz.,* Natural Resource Management, Crop production, Livestock& Fisheries, and Institutional interventions [8-10].

Lack of knowledge about cultivation practices, lack of availability of seeds in the market, resistance to change the conventional practices, high cost for construction of well or farm ponds, lack of adequate information on CRA technologies and weather status to plan their farming activities were some of the problems faced by beneficiaries of NICRA [11,12,13]. The present study was conducted with an objective to unearth the problems in the adoption of CRA technologies by the respondents in NICRA implemented villages and non-NICRA implemented villages of Telangana, India.

2. MATERIALS AND METHODS

Ex-post-facto research design was chosen for the investigation. This design was considered appropriate as the phenomena in the study have already occurred. The study was conducted in Climate Resilient village namely Nandhyalavarigudem village of Atmakur (S) Mandal of Nalgonda district and Nacharam village of EnkoorMandal of Khammam district of Telangana state where the NICRA interventions were implemented and two non-NICRA implemented village from Nalgonda district and the other from Khammam district were selected randomly.A sample size of 60 respondents from each Climate Resilient village were selected for the study concentrating more on the farmers who had actively participated in the training programmes regarding climate resilient practices and also implemented those practices in their farming and 30 respondents from each non-NICRA implemented village were selected randomly for the study. Thus, a total sample size of 180 farmers was selected for the study. The problems elucidated in the study were analysed by using frequencies and percentages.

3. RESULTS AND DISCUSSION

The major problems faced by the respondents in the adoption of CRA technologies in NICRA implemented villages were limited knowledge of

CRA technologies (91.66%) followed by inadequate pieces of training regarding climate-resilient practices (90.00%),inadequate weather based agro advisory services (88.33%), limited outreach of extension services about climate-resilient technologies to (76.66%), non-availability of required implements in custom hiring centres at the time of heavy demand (73.33%), lack of availability of markets for adopted varieties or hybrids (70.83%), absence of regular committee meeting to appraise the members about required information (68.33%), inadequate community activities to promote CRA technologies (64.16%). The results were presented in Table 1.

In the case of non-NICRA implemented villages, the major problems faced were lack of confidence among the farmers to adopt the new CRA technologies due to the fear of failure (93.33%), lack of awareness of climate-resilient technologies among non-NICRA farmers (90.00%), difficulty in understanding of CRA technology (86.67%), adoption of CRA technologies demand more resources like water, labour, and money (83.33%), less number of need-based training on CRA technologies (75.00%), lack of access to improved crop varieties and other inputs (70.00%), insufficient access to weather-related information by agro advisory services (58.33%), high capital investment is needed for farm machinery and land developmental activities (55.00%), less expertise of field staff on climate change and its management practices (50.00%). The results were presented in Table 2.

Table 1. Problems faced by the respondents of NICRA implemented villages in the adoption of CRA technologies (n=120)

S.No.	Problems faced by the NICRA farmers	Frequency*	Percentage
1.	Limited knowledge of CRA technologies	110	91.66
2.	Limitedtraining organised by KVK on climate-resilient practices/technologies	108	90.00
3.	Inadequate weather-based agro-advisory services	95	79.00
4.	Absence of regular committee meetings to appraise the members about the required information	82	68.33
5.	Non-availability of required implements in custom hiring centres at the time of heavy demand	88	73.33
6.	Inadequate community activities to promote CRA technologies	77	64.16
7.	Lack of outreach of extension services about all the climate-resilient technologies to individual farmers	92	76.66
8.	Lack of availability of markets for adopted varieties or hybrids	85	70.83

**Cumulative response*

Table 2. Problems faced by the respondents of non-NICRA implemented villages in the adoption of CRA technologies (n=60)

S. No	Problems faced by non-NICRA farmers	Frequency*	Percentage
1.	Lack of awareness ofclimate-resilient technologies among non-NICRA farmers	54	90.00
2.	Difficulty in the understanding CRA technology	52	86.67
3.	Less number of need-based training on CRA technologies	45	75.00
4.	Insufficient access to weather-related information by agro advisory services	35	58.33
5.	Lack of confidence among the farmers to adopt the new CRA technologies due to the fear of failure	56	93.33
6.	Lack of access to improved crop varieties and other inputs	42	70.00
7.	Less expertise of field staff on climate change and its management practices	30	50.00
8.	High capital investment is needed for farm machinery and land development activities	33	55.00
9.	Adoption of CRA technologies demands more resources like water, land, and money	50	83.33

**Cumulative response*

4. CONCLUSION

Although, the CRA technologies were proven to be efficient in the areas where it is implemented the major problems faced by the respondents in the adoption of CRA technologies were limited knowledge of CRA technologies, inadequate training,inadequate weather based agro advisory services, etc.,whereas, in case of areas where NICRA is not implemented, the major problems faced were lack of confidence, lack of awareness, difficulty in understanding CRA technology, etc [14-16]. The present study suggests a suitable strategy for upliftingthe adoption of CRA technologies.

DISCLAIMER

The products used for this research are commonly and predominantly used products in our area of research and country. There is absolutely no conflict of interest between the authors and producers of the products because we do not intend to use these products as an avenue for any litigation but for the advancement of knowledge. Also, the research was not funded by the producing company rather it was funded by the personal efforts of the authors.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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