A Study on adoption of climate resilient technologies in adopted villages of Bandipora District under National Initiative on Climate Resilient Agriculture (NICRA) Project.

Abstract

The need to study the extent of adoption of climate resilient technologies (CRTs) under the changing climatic conditions have been at the centre of focus of many extension programmes, aimed at improving livelihood security under the current scenarioThe current study was conducted in Bandipora District of Jammu and Kashmir with the objective to investigate the adoption rate of climate resilient technologies of National Initiative on Climate Resilient Agriculture (NICRA) Project and to study the adoption behaviour of the beneficiaries of the Project implemented by Krishi Vigyan Kendra of Bandipora. Eighty beneficiaries were selected from 4 strata by proportionate allocation method (PAM). In addition to this, 40 non-beneficiaries were also selected from same villages by simple random sampling technique (RST). The present study investigates the extent to which climate resilient technologies are being adopted by the farmers under the Project National Innovations on Climate Smart Agriculture (NICRA) in the adopted villages of Bandipora District. It further studied the association of personal profile of respondents with the extent of adoption of Climate resilient technologies. A structured interview was employed to obtain data from 120 respondents. Results revealed during the study medium to high levels of adoption by the respondents of climate resilient technologies. The profile characteristics viz. Age, gender, marital status, education, family size, land holding, occupation, annual income, farming experience, trainings attended, extension contacts, information source, scientific orientation, economic motivation and innovativeness had positive and significant association with the extent of adoption of climate resilient technologies by the farmers.

Keywords: Adoption, Climate resilient technologies, NICRA.

Introduction

Climate change is one of the biggest environmental challenges of present time. The term climate change has been defined by International Panel on Climate Change (IPCC) as any change in climate over time, whether due to natural variability or/and as a result of human activity Climatic vulnerability has been associated with structural, institutional and technological weaknesses, increases poverty and as well as related to tropical regions (IPCC, 2007; Tajpara et al.2020)It has become a major concern to society because of its potentially adverse impacts on livelihood and food security worldwide. The major concern is not weather climate variations will have a hostile impact on agricultural productivity but the degree of losses in productivity is because of climate uncertainties and

the outlook of mitigating the harmful effects through the adoption of suitable climate resilient practices (Vinaya et al. 2021)The current and future impacts of climate change are the major sources of concern in south Asia due to predominance of rainfed subsistence agriculture in the region and Indian region is also affected by extreme weather events and by long run climate variability which can severely reduce the crop yields and can increase the levels of uncertainty with respect to agricultural production and output prices. The projected change in climate for in 2100 indicates an increase in the temperature and rainfall between 2.5-4.5^0 C and 15 and 24 per cent respectively (*Bal et al. 2016*). Therefore a self-sustainable agriculture is necessary for a nation like India to ensure food and nutritional security to the increasing population (*Chauhan and Vinaya 2016)*. The situation can further lead to vulnerability of small and marginal farmers living in this Himalayan region. Therefore by adopting climate resilient technologies, the farming communities can significantly improve their livelihood securities. India, like most other developing countries, is more exposed to the implications of climate change in view of the large portion of population depending on agriculture any adverse impacts on these natural resources will have consequences on the nation's livelihood security and economy. Future projections based on observed climate trends indicate that the global temperatures are consistently rising at an alarming rate compared to the global average during the 21st century .therefore it is most likely India might be strongly affected by changing climate. In India, noticeable negative impacts are implicit with medium-term (2010-2039) climate change, foretold to reduce yield of major crops by 4.5 to 9 %, that adds to about 1.5 per cent of GDP per annum (*Venkateswarlu et. al*, 2013). Increasing agricultural productivity through the adoption and diffusion of modern agricultural technologies is recognised as one of the key pathways for economic and agricultural transformation in developing countries, particularly in regions experiencing huge adverse effects of climate change. Hence there is a need to concentrate more on Climate smart technologies capable of mitigating the adverse effects of climate change, the climate smart agriculture concept was proposed by Food and Agriculture organization of the United Nations (FAO) at the Hague conference on Agriculture, Food security and Climate change in the year 2010. National Innovations on Climate Resilient Agriculture (NICRA) is a network project of the Indian Council of Agricultural Research (ICAR). The Project was launched during February, 2011. The aims of the project were to enhance climate resilience agriculture through strategic research and technology demonstration which covers agricultural and horticultural crops, fisheries livestock and natural resource management. Many climate resilient technologies including growing drought resistant varieties of crops, adoption of soil and water conservation measures, planting of new crop varieties, changing planting dates, use of crop insurance mechanisms and irrigation practices have been adapting the farming community in developing nations to deal with the adverse impacts of climate variations and to guartee sustainable yields (*Di Falco and Veronisi 2013*)The present study is expected to be very relevant for the national level organizations, NICRA, planners, policy makers, and researchers to identify points of success and failures, thus to reshape further step of their action. Relevance of the study has been enriched by some proposals for up-scaling these technologies to more compatible, convenient but advanced levels. Further, the study will offer few recommendations to facilitate replication of project activities in other parts of the country.

The Primary motivation behind the present study is the estimation of overall adoption of the climate resilient technologies in the study area.

Materials and Methods

To investigate the adoption of Climate resilient technologies introduced through the Project National Initiative on Climate Resilient Agriculture (NICRA), the investigator primary survey data collected from the beneficiaries and non-beneficiaries of the Project in the operational area. The present study was conducted in Bandipora district of Jammu and Kashmir, which was selected purposively because of being the only district of north Kashmir in which this project is functional since 2014 till date and the project has been implemented through Krishi Vigyan Kendra Bandipora of SKUAST-Kashmir. The Kendra has adopted 12 villages of the district under the project. A list of Project beneficiaries was obtained from Krishi Vigyan Kendra Bandipora which depicted the distribution of the respondents in these villages as the beneficiaries and non-beneficiaries of the Project were the respondents of the study. The proportionate allocation method was employed to select 80 beneficiaries and from the selected villages and 40 non-beneficiaries were also taken for study selected by simple random sampling technique as a control group, therefore the total sample size for the study was 120 (80 beneficiaries and 40 non-beneficiaries). Thus a total of 80 beneficiaries and 40 non-beneficiaries from 12 villages were selected randomly as shown in sampling plan. The data collected was analysed by using frequency distribution, percentage and mean. The list of Climate Resilient Agriculture technologies implemented through Krishi Vigyan Kendra (KVK) Bandipora in the respective locale of the study was considered for the present study. The Pearson's correlation analysis was performed to analyse the independent variables with the adoption level of beneficiaries viz. Age, gender, marital status, education, family size, land holding, occupation, annual income, farming experience, trainings attended, extension contact, source of information, scientific orientation, economic motivation and innovativeness.

Results

Adoption of climate resilient technologies by respondents.

Adoption of the climate resilient technologies is the extent to which the respondents accepted, integrated and used the new technologies, ideas or practices in farming for enhanced resilience, adaptation and mitigation to extreme weather conditions. The data about the overall adoption of the respondents is depicted in the Table 1

Table 1: Overall adoption of the respondents.

S.No	Category (Score)	Beneficiaries		Non-Beneficiaries	
		Frequency	Percentage	Frequency	Percentage
1	Low Adoption (Up to 20)	04	5.00	32	80.00

2	Medium Adoption (20-40)	46	57.50	08	20.00
3	High Adoption (Above 40)	30	37.50	0	0.00
Mean		**34.96**		**19.05**	
Standard Deviation		**8.75**		**6.34**	

Interpretation of the data presented in table-1 reveals that majority (57.50 %) of the beneficiaries of the Project had medium adoption followed by 37.50 per cent of the beneficiaries with high adoption and remaining 05.00 per cent of the beneficiaries had low adoption of climate resilient technologies. As far as the non-beneficiaries farmers are concerned fourth- fifth (80 %) of them had low adoption and rest one-fifth (20.00 %) of the non-beneficiaries had medium level of adoption about the climate resilient technologies demonstrated under NICRA Project. The findings are in line to that of findings of Mani (2016)

Practice wise adoption of climate resilient technologies by respondents.

The practice wise adoption of the climate resilient technologies by the respondents was investigated to know the practices which have higher adoption and those with least adoption. The data in table 2 depicts the practice wise adoption of the demonstrated climate resilient technologies.

Table 2: Level of Adoption of demonstrated climate resilient practices.

Practice	Categories	Beneficiaries		Non-beneficiaries	
		Frequency	Percentage	Frequency	Percentage
Recommended varieties	Low	26	32.50	32	80.00
	Medium	51	63.75	08	20.00
	High	03	03.75	00	00.00
Sowing time	Low	05	6.25	12	30.00
	Medium	60	75.00	27	67.50
	High	15	18.75	01	02.50
Spacing	Low	38	47.50	28	70.00
	Medium	41	51.25	12	30.00
	High	01	1.25	00	00.00
Seed rate.	Low	29	36.25	35	87.50
	Medium	49	61.25	05	12.50
	High	02	2.50	00	00.00
Water management	Low	12	15.00	20	50.00
	Medium	54	67.50	19	47.50
	High	14	17.50	01	02.50
Nutrient management	Low	28	35.00	28	70.00
	Medium	41	51.25	12	30.00
	High	11	13.75	00	00.00
Soil management	Low	21	26.25	27	67.50
	Medium	46	57.50	13	32.50
	High	13	16.25	00	00.00

Adoption of recommended varieties.

It is clear from the table 2 that majority (63.75 %) of the beneficiaries had medium adoption of recommended climate resilient varieties, followed by 32.50 per cent of the beneficiaries having low adoption of the recommended varieties and only 03.75 per cent of the beneficiaries had high adoption of recommended varieties. The results are similar to the findings of Chouksey et al., (2021); Mahokar et al., (2019); Rai et al., (2018) and Harikrishna et al., (2019). In case of non-beneficiaries, majority (80.00 %) had low adoption of the recommended varieties, 20.00 per cent of the non-beneficiaries had medium level of adoption about climate resilient varieties. None of the non-beneficiaries had high level of adoption of recommended varieties. The data in the Table 4 further reveals that 36.25, 61.25 and 2.50 per cent of the beneficiaries were having low, medium and high adoption of the recommended seed rate, while as majority (87.50 %) of the Project beneficiaries and 12.50 per cent of the non-beneficiaries were having low and medium level of adoption regarding the seed rate, it is worth to mention that none of the non-beneficiaries was found in the high adoption category regarding the seed rate. The findings in similar to the findings of *Narayana* (1992), *Mani* (2016), *Niyasimi* (2017) and *Sultana* (2019)

Relation between adoption and independent variables.

The independent variables were also correlated with extent of adoption of climate resilient technologies. The correlation was separately worked out for the beneficiaries and non-beneficiaries of NICRA Project and the results are presented in table 3 as under:

Table 3: Correlation coefficient of selected independent variables with the level of adoption of respondents.

S.No	Variable	Beneficiaries		Non-beneficiaries	
		'r' Value	'p' Value	'r' Value	'p' Value
1	Age	0.294	0.008**	-0.157	0.332^{NS}

2	Gender	-0.325	0.003**	-0.157	0.332^{NS}
3	Marital status	-0.232	0.038*	-0.109	0.503^{NS}
4	Education	0.369	0.001**	0.387	0.014*
5	Family size	0.287	0.010**	-0.045	0.785^{NS}
6	Total land holding	0.464	0.000**	0.345	0.029*
7	Occupation	0.589	0.000**	0.414	0.008**
8	Annual income	0.622	0.000**	0.183	0.259^{NS}
9	Experience in farming	0.147	0.193^{NS}	-0.180	0.267^{NS}
10	Trainings attended	0.807	0.000**	0.399	0.011**
11	Extension contacts	0.704	0.000**	0.231	0.152^{NS}
12	Sources of information	0.679	0.000**	0.512	0.000**
13	Scientific orientation	0.675	0.000**	0.729	0.000**
14	Economic motivation	0.704	0.000**	0.580	0.000**
15	Innovativeness	0.646	0.000**	0.657	0.000**

*** Correlation is significant at the 0.05 level** **** Correlation is significant at the 0.01 level**

NS- Non-significant.

From the Table-3, it is elucidated in case of beneficiaries of the Project, independent variables such as age, educational qualification, family size, land holding, occupation, annual income, trainings attended, extension contacts, sources of information, scientific orientation, economic motivation and innovativeness had a positive and significant relationship with the level of adoption of the beneficiaries whereas, gender and marital status had a negative and significant relation with the adoption level of respondents. However farming experience had non-significant relation with the adoption level of beneficiaries. The data presented in table 3 further reveals that in case of non-beneficiaries, education, total land holdings, occupation, and trainings attended sources of information, scientific orientation, economic motivation and innovativeness had a positive and significant relation with level of adoption of the non-beneficiaries. The independent variables like annual income and extension contacts had positive but non-significant, however age, marital status, gender, family size and experience in farming had a negative but non-significant relation with the adoption level of non-beneficiaries. The majority (57.50 %) of the beneficiaries had medium adoption, whereas about fourth- fifth (80 %) of non-beneficiaries had low level of adoption. This might be due to the fact that the respondents were skeptical about the climate resilient technologies. Further the respondents had low to medium innovativeness and were reluctant to change their old age cultivation practices. Similar results were reported by *Chouksey et al.,* (2021) and *Manjunath et al.,* (2018).

Conclusion

It may be concluded that adoption of climate resilient crop varieties implemented through the Project helped the farmers living in this hill and mountain agro-ecosystem and enabled them to better cope with changing and abrupt climatic shocks through an approach that includes sustainably using existing natural resources and adaptation of appropriate mitigation technologies developed by the CRIDA to overcome climate stress. An extension strategy should be devised in accordance with the findings of the study for scaling up the climate resilient technologies already adopted for the benefit of farming community living in small production systems.

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