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Impact of climate resilient agricultural technologies and social interaction under NICRA project in Madhya Pradesh

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Abstract
The study was conducted in four districts of Madhya Pradesh to assess the impact of various Technological Interventions of National Innovations on Climate Resilient Agriculture (NICRA) Project on socio-economic and agricultural practices of the farmer beneficiaries of the project. A total of 300 farmers (20% farmers of each village) were selected randomly for the study and data were collected by a personal interview with the help of a structured schedule. The data collected were classified, tabulated and statistically analyzed. The findings of the study revealed that the majority of NICRA beneficiaries' (66.33%) believe medium level impact NICRA followed by low (23.7%) and high (10.3%) on overall agricultural scenario of the villages selected under NICRA. The study also concludes that impact of agricultural technologies promoted under NICRA has positively and significantly correlated with age, farming experience, annual income, social participation and economic motivation at the 1% level of significance.

Keywords: Respondents, climate change resilient, socio-economic, NICRA

Introduction
Climate change is a long-term change in the statistical distribution of weather patterns spanning timescales ranging from decades to millions of years. The Temperature and precipitation differences between years were substantially higher than projected. Crop losses may increase if climate variability rises as a result of the expected climate change. As a result of the complicated impact of global warming on agriculture, different crops will behave differently. The tropics are more reliant on agriculture since 75 percent of the world's population lives in the tropics, and agriculture is the primary activity of two-thirds of these people. Any influence on tropical agriculture will harm their livelihood due to low levels of technology, a wide range of pests, illnesses, and weeds, land degradation, unequal land distribution, and rapid population expansion. Rice, wheat, maize, sorghum, soybean, and barley are the six major crops grown in 40% of the world's farmed area, accounting for 55% of non-meat calories and 70% of animal feed.

As a result, any impact on these crops will affect food security. The concept that climate influences development and development influences climate has become generally recognized in recent years. The gaseous composition of the earth's atmosphere has changed dramatically in recent decades, owing to increased emissions from the energy, industrial, and agriculture sectors, as well as widespread deforestation and rapid changes in land use and land management methods. Climate change, if left unchecked, will stop development and harm the well-being of present and future generations. Climate change will have a global impact, but much of the damage would occur in underdeveloped countries, where 11 percent of arable land might be damaged, resulting in a drop of nearly 16% of agricultural GDP. In the previous two decades, researches revealed productivity losses of 4-6 percent in rice, 6% in wheat, 18 percent in maize, 2.5 percent in sorghum, 2% in mustard, and 2.5 percent in potato due to adverse effects of climate change and this trend is likely to continue in future years. According to a research by the Parliamentary Standing Committee on Agriculture, climate change losses amount to 4-9 percent of the agricultural economy each year, resulting in a 1.5 percent reduction in overall GDP.

Therefore, the effects of climate change on agricultural productivity and entire agricultural scenario needs to be studied scientifically and develop feasible strategies to mitigate its adverse impact, hence a mega network research and extension programme has been long

overdue. Keeping necessity of such project in mind, the Indian Council of Agricultural Research (ICAR) has launched a network project called National Innovations on Climate Resilient Agriculture (NICRA) in February 2011. It is India's first known Central Government project to address the problem of climate change and its impact on agriculture. The programme, which is running under the supervision of the Indian Council of Agricultural Research, covers more than 100 districts across the country those are vulnerable to extreme weather conditions. The major goal of the project is to improve climate resilience agriculture by conducting strategic research and technological demonstrations in areas such as agricultural and horticultural crops, fisheries, livestock, and natural resource management and also social mobilization through institutional interventions.

The NICRA is being implemented in 09 districts of Madhya Pradesh since its inception through KVKs under JNKVV, Jabalpur and RVSKVV, Gwalior. The present study was conducted to assess the overall impact of technological interventions conducted under NICRA on agricultural scenario and farming community.

Research Methodology

The study was carried out in four NICRA districts of M.P. namely Tikamgarh (under JNKVV-KVK), Satana (under NGO-KVK), Morena (under RVSKVV-KVK), and Ratlam (under NGO-KVK). The investigation was conducted in the year 2021-22. Sampling for the study was done from 12 NICRA villages (3 from each selected district). 20% of total beneficiaries from each NICRA village were chosen as respondents by adopting simple random sampling without replacement technique for the study. Data were collected by personal interview method with the help of a structured schedule. Fifty NICRA beneficiaries (other than respondents) were selected randomly for pre-testing of interview schedule. The associated scientists of implementing institutes or KVKs were also interviewed for recording their perceptions on NICRA. The dependent variables of this study was impact of agricultural technology and independent variables were age, caste, education, farming experience land holding, cropping intensity, crop diversification, and annual income, source of information, social participation, extension contact, economic motivation, risk orientation and innovativeness. Statistical tools like percentage (%), frequency, mean, standard deviation (SD), coefficient of variation (CV), correlation coefficient and regression coefficient were used for the analysis of the data.

The respondents were asked to give their score on various parameters decided for impact assessment on three point continuum i.e. completely agree (03), partially agree (02) and not agree (01). An overall cumulative score of each respondent on impact parameters was considered for overall impact analysis making three categories (Low, Medium and High) based on the basis of mean and standard deviation.

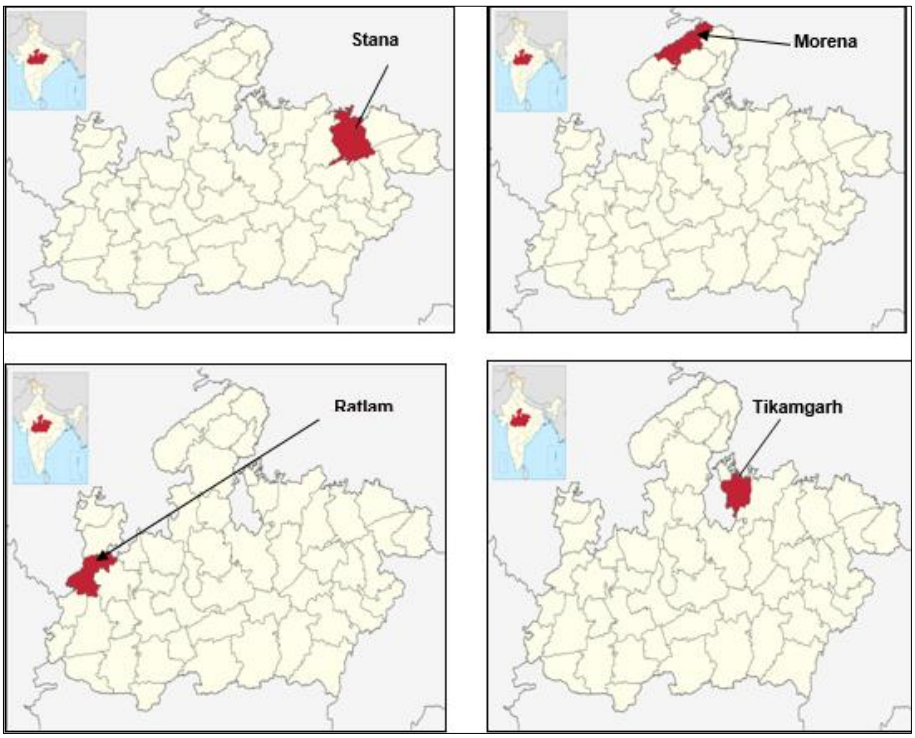

Fig 1: Map of M.P. state showing location of dictricts selected for the study

Results of the study

Overall impact of NICRA on agricultural scenario

As per the responses subtracted in Table 1, about two-third of the respondents (66.33%) i.e. NICRA beneficiaries believes medium level of impact of the NICRA project followed by low (23.7%) and high (10.3%). As per triangulation of the qualitative observations and quantitative data collected from beneficiaries and scientists involved in implementation of NICRA, awareness level of farmers towards climate resilient technologies had significantly increased which motivates farmers to implement them on their farms. The similar findings also reported by Pise *et al*. (2018) and Medhi *et al*. (2018) [5, 6] in their studies.

Table 1: Impact of NICRA on agricultural scenario n=300

Category	Score	No. of Respondents	% of Respondents
Low Impact	< Mean–S.D.	71	23.7
Medium Impact	b/w Mean ± S.D.	198	66.0
High Impact	>Mean + S.D.	31	10.3

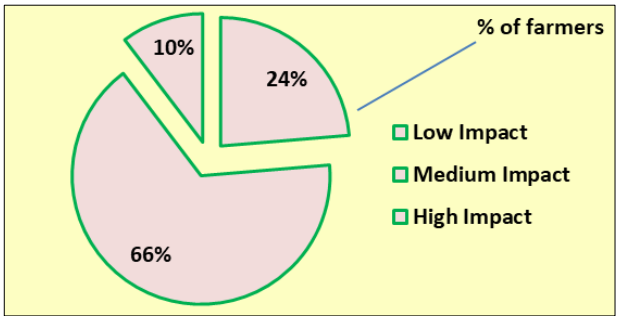

Fig 2: Impact of NICRA on overall agricultural scenario

Relationship between profiles variables and Impact of climate resilient technologies

The correlation co-efficient (r) value was obtained and the data being reported in Table 2 to study the nature of the relationship between the profile variables and the impact of NICRA technologies. The data given in Table 2 shows that the value of correlation coefficient of independent variables like age (0.178), farming experience (0.167), annual income (0.167), social participation (0.151), economic motivation (0.193) with the respect of impact of NICRA technologies was positive and significant relationship at the 1% level of significance. The correlation coefficient between education (0.131*) and innovativeness (0.147*) with the respect of impact of NICRA technologies had positive and significant relationship at the 0.5% level of significance. As a result, it was possible to deduce that there was a positive and significant relationship between NICRA technologies and their impact. Rest of the variables i.e. Caste, land holding, cropping intensity, crop diversification, social information, extension contact and risk orientation showed non-significant relationship with respect of NICRA impact.

Table 3 provides the statistical data on multiple linear regression analysis of profile/ variables with the level of NICRA impact on farming. Linear regression model also confirms similar trend of association between profile variables and impact of NICRA on farming and farmers.

Table 2: Relationship between profile/independent variables with levels of impact n=300

S. No.	Profile/Independent variables	Correlation Coefficient
X1	Age	0.178^{**}
X2	Caste	0.040^{NS}
X3	Farming experience	0.167^{**}
X4	Education	0.131^{*}
X5	Land Holding	0.061^{NS}
X6	Cropping Intensity	-0.049^{NS}
X7	Crop Diversification	0.104^{NS}
X8	Annual income	0.151^{**}
X9	Social Information	-0.050^{NS}
X10	Extension Contact	0.070^{NS}
X11	Social Participation	0.151^{**}
X12	Economic Motivation	0.193^{**}
X13	Risk Orientation	0.071^{NS}
X14	Innovativeness	0.146^{*}

****** 1% level of significance NS=Non Significant

Table 3: Multiple Linear Regression Analysis of Profile Variables with the Level of Impact

S. No.	Independent Variables	Standard Error	't' Stat	'P' Value
X1	Age	0.161	0.506	0.613
X2	Caste	0.473	-0.604	0.547
X3	Farming experience	0.157	0.493	0.622
X4	Education	0.358	1.963	0.051
X5	Land Holding	0.474	0.046	0.963
X6	Cropping Intensity	0.584	-0.666	0.506
X7	Cropping Diversification	0.606	0.428	0.669
X8	Annual income	0.793	1.519	0.130
X9	Social Information	0.078	-1.377	0.170
X10	Extension Contact	0.134	-1.657	0.099
X11	Social Participation	0.177	0.685	0.494
X12	Economic Motivation	0.155	1.879	0.061
X13	Risk Orientation	0.172	-0.862	0.389
X14	Innovativeness	0.148	1.325	0.186

Conclusion

The findings of the study concludes overall positive and significant impact of NICRA on crop productivity, input use efficiency, reduction in risks due to frequent weather aberrations and reduction in cost of cultivation. The impact of climate resilient agricultural technologies demonstrated under the project was perceptible in terms of increased productivity, irrigation potential through farm ponds and micro irrigation techniques. Ultimately, cropping intensity is increased as people started sowing crops during summer and Rabi season due to availability of more water through rain water harvesting ponds. As a result, NICRA had a greater influence in terms of enhanced income and overall wellbeing of farming community.

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