

RESEARCH ARTICLE

CLIMATE CHANGE- PERCEIVED IMPACTS ON AGRICULTURE,
VULNERABILITY AND ADAPTATION STRATEGY TO MITIGATE IT BY
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Abstract: Agriculture is the mainstay of the Indian economy, contributing to food security and livelihood of farming community. Climate change and agriculture are interconnected processes as change in climate affects production of agriculture produce. The rapid change in climate *i.e.* increasing temperature, long dry spell in rainy season, late set of monsoon *etc.* makes farmers condition vulnerable and pathetic. Farmers are not able to adapt fast enough in order to mitigate climate change adverse effects on agriculture. In order to be willing to take adaptation strategy, farming community need to perceive that the climate is changing, and need to take measure to mitigate its adverse effect on agriculture practices. There is also need to study about farmers faced constraint to climate change adaptation. In order to understand farmers perception on climate change and its impact, to identify adaptation needs and constraint faced to adaptation, structured schedule, focus group discussion and trend analysis has carried out of farmers of Alwar district. The study found that majority of farmers aware about the climate change and also perceived the increasing in temperature and low rainfall in district. For the maximum (82.00 percent) farmers show that climate change affects the quality and quantity of ground water and about more than 80 percent farmers says that climate change means unpredictable weather, decreasing of irrigation sources and less or no rain. This study also collected information on climate change adaptation strategies applied by farming community to mitigate its effect and make farming a profitable business. This is observing that farmers not aware about the low requirement water crops and also they were not practicing to conserve rain water for future use. Majority of farmers (more than 70 percent) were indicated that they are increase animal husbandry because of loss in crop production activity and also only cultivating traditional crop (millets and mustard especially). This study is suggested that agriculture scientist, policy maker and other line department need to more in tune with farmers and extension functionaries need to understand of how climate is changing in order to improve adaptation policy, formulation and implementation. Also need of capacity building at local level is vital to enable to adapt to changing climate.

Keyword: Climate Change, Agriculture, Vulnerability, Adaptation strategy

INTRODUCTION

Agriculture is strongly influenced by climate and weather. Climate change and agriculture both are interconnected. Climate change refers to any change in climate over time, whether due to natural variability or as a result of human activity (IPCC, 2007). Climate change affects agriculture in two ways- direct and indirect. Changes in climatic factors (for example, temperature, and rainfall) affect agricultural productivity through physiological changes in crops (Chakraborty *et al.*, 2000). In

addition, climate change also affects other factors of agriculture production, such as water availability, soil fertility, insect and pests, *etc.* (Porter, 2014). The climate sensitivity in the agricultural sector is uncertain, as there are many regional variations in rainfall, temperature, crops and cropping patterns, farming systems, soils and other management practices. In developing countries, climate change will cause major yield declines for the most important crops and increase in price for the most important agricultural produces *i.e.* rice, wheat, maize, and soybeans (Nelson *et al.*, 2009), and

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biomass declining. Projections for climate in the medium-run for India seem to indicate it will be warmer and wetter but with significant regional variation. Overall there will be (i) an increase in average surface temperature by 2–4°C, (ii) changes in the distribution of rainfall (inter-temporal and spatial) during both monsoon and non-monsoon months, (iii) decrease in the number of rainy days by more than 15 days, (iv) an increase in the intensity of rainfall by 1–4mm/day, and (v) an increase in the frequency and intensity of cyclonic storms (Ranuzzi and Srivastava, 2012). The impact of climate change was very visible in the year 2022, such as the arrival of heatwave in April, due to which the yield of wheat crop decreased. Along with this, there was no rain at the time of sowing in the *Kharif* season, or there was a long gap in the rains. Along with this, when the *Kharif* crop matured, it rained, which ruined the standing crop in the field, along with the quality of animal fodder. But now farmers have to understand the effect of climate, as its impact will affect the lives of farmers in the long run. Hence the present study was carried out on Climate Change- Perceived Impacts on Agriculture, Vulnerability and adaptation Strategy to mitigate it by farmers of Alwar district (Rajasthan) with the following specific objectives to study farmers perceptions and adaptation practices to climate change and variability.

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METHODOLOGY

The study was conducted in Alwar District, Alwar is located the north-east of Rajasthan between 27° 34' & 28° 4' north Latitudes and 76° 7' & 77° 13' east longitudes. This study is carried out in Village – Gurjarpur Khurd, Alwar District which is adopted village under National Innovations on Climate Resilient Agriculture (NICRA) Project by Krishi Vigyan Kendra, Navgaon (Alwar-1). 150 Farmers were selected randomly for this study from village Gurjarpur Khurd, Alwar District. Focus Group Discussion (FGD) with farmers and farm women was conducted and also a structured schedule was filled by respondent farmers and farm women. The survey schedule was constitute 6 parts in which part A was demographic and farm characteristics of respondents than Part B, C, and D constitute about perception, change, risk and impact about climate change and farming, Part E was constitute about adaptation towards climate change and Part F mention about constraint to climate change adaptation. Collected data were analyzed by using appropriate statistical methods *viz.*, mean, per cent, S.D., correlation and multiple regressions etc.

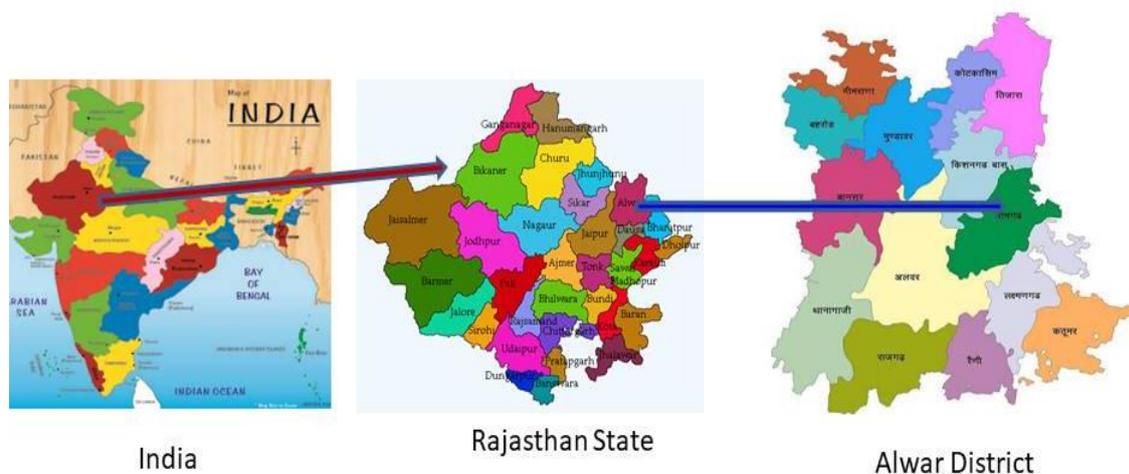


Fig 1: Location of the Study

RESULTS

Age, education, size of family and farming experience were considered as socio-personal

characteristics of the respondents. These characteristics were analysed and are presented in Table 1.

Table 1. Distribution of respondents according to their socio-personal characteristics

S. No.	Socio-Personal Characteristics	Per cent
1.	Age	
	Young (up to 35 years)	25.00
	Middle (36 to 55 years)	63.00
	Old (above 55 years)	12.00
2.	Education	
	Illiterate	00.00
	Primary school	06.00
	Middle school	12.00
	High school	28.67
	Higher Secondary	38.00
	College and above	15.33
3.	Family size	
	Small (up to 5 members)	36.00
	Medium (6 to 10 members)	52.00
	Big (> 10 members)	12.00
4.	Farming Experience	
	1-5 Years	8.00
	6-10 Years	12.48
	11-15 years	19.44
	16-20 years	23.00
	20 and above	37.08

It is observed from the Table 1 that the majority of the respondents (63.00%) belonged to middle age group (36 to 55 years), about 25.00 per cent respondents were of young age group (upto 35 years) and 12.00 per cent respondents were of old age group (more than 55 years), Thus, it may be concluded that the majority of farmers belonged to middle age group (36 to 55 years).

Education builds the ability of an individual to seek knowledge, understand and utilize things better and hence assessment of respondents' educational attainment was essential. When we discuss the data presented in Table 1, we found that 38.00 per cent of the respondents were educated upto higher secondary level and 28.67 per cent were educated upto high school level, followed by 15.33 per cent of the respondents who were educated upto college and above level. Whereas, 12.00 per cent respondents had education upto middle school level and only 06.00 per cent of the respondents had education upto primary school level. None of the respondents were

found in the category of illiterate. Thus it can be inferred that all the respondents were found to be educated and 38.00 per cent of them had above high school education.

Majority (52.00%) of the respondents had medium size of family (6 to 10 members) followed by 36.00 per cent with small size of family (upto 5 members). Rest of the respondents (12.00%) belonged to large size of family (more than 10 members). This indicates that the maximum number of the respondents belonged to medium size of family.

Farming Experience gives an idea about the respondent's experience in farming occupation in terms of year. As regard to farming experience, maximum number of respondents (37.08%) have above 20 years' experience in farming activities followed by 23.00 per cent respondents had 16-20 years farming experience and only 8.00 per cent farmers were experience 1-5 years in farming activities.

Table 2. Farmers general perceptions of climate change

Perception Variable	Increasing (%)	Decreasing (%)	No Change (%)	Do Not Know (%)
Temperature	92	0	7	1
Rainfall	4	94	2	0
Flood	0	0	96	4
Drought	93	0	6	1
Late onset of mansoon	89	5	4	2

The findings from the farmers' perceptions regarding changes in the climate are presented in table 2. The results revealed that majority of the farmers in this area are experiencing aberrations in the climate as they have been engaged in farming since many years. Majority of the farmers (92.00 %) perceived that temperature is increasing and has become unbearable especially during the past one decade. There was uniformity in their opinion (94.00 %) farmers were perceived regarding the decreasing of rainfall and its

unpredictable behaviour and resultant dry spells during cropping season and resultant dry spells. Farmers have perceived climate variability and reported that delayed monsoon onset (89.00 %) of the respondents and decreasing soil moisture as the critical factor affecting their cultivation. It was clearly evident from the FGD that the farmers were reluctant to take up vegetables crop due to the decreasing water quality and quantity in the village.

Table 3. Perceived impact of climate change on crop production

S.N.	Level of knowledge	Frequency	Per cent
1.	Low (upto 34 score)	17	11.33
2.	Medium (35-43 score)	27	18.00
3.	High (above 43 score)	106	70.67
	Total	150	100.00
	\bar{X} = 38.04	S.D=4.85	

The data presented in Table 3 indicate that out of total respondents majority (70.67%) of them had perceived high impact of climate change on crop production also reported that maximum (82.00 percent) farmers show that climate change affects the quality and quantity of ground water and about more than 80 percent farmers says that climate change means unpredictable weather, decreasing of irrigation sources and less or no rain. Past two decades shows low rainfall and also decreasing water quality main reason of farmers only growing traditional crop in *Rabi* season and in *Kharif* season they generally leave fallow land due to long dry spell. In the FGD farmers also mention that due to the water quality they have not taken vegetable crops and also pulses crop in the field. Majority of farmers also mentioned that the climate change also increase crop insect pest attack and crop diseases.

Farmer's perception on adaptation responses toward climate change:

The researcher found that during the FGD and discussion at the time of interview of farmers that adaptation strategies applied by farmers to cope with the impact of climate change, the majority of the farmers reported use of high quantity of fertilizer and manuring as the most suitable option, followed by the use of plant protection chemicals. Other strategies, such as off farm labour, land fallowing and manuring, migration from farming, increase frequency of irrigation. Majority of farmers (more than 70 percent) were indicated that they are increase animal husbandry because of loss in crop production activity and also only cultivating traditional crop (millets and mustard especially).

CONCLUSION

The present study was an attempt to collect both qualitative and quantitative information about the

farmers' awareness on the climate change and to assess their specific adaptation needs. This study also highlighted some issues concerning climate change impacts perceived or experienced by the farming community. This study is suggested that agriculture scientist, policy maker and other line department need to more in tune with farmers and extension functionaries need to understand of how climate is changing in order to improve adaptation policy, formulation and implementation. Also need of capacity building at local level is vital to enable to adapt to changing climate.

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