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Socioeconomic characteristics of farmers of Satpura range agro climatic zone of Madhya Pradesh and their constraints in employing adaptation strategies to climate change

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Abstract

Climate change is one of the fundamental risks in the agriculture sector. In India, it affects the severe and affects the likelihood of the farmers in a greater manner by dampening the agricultural production and, thereby, the livelihood of the farmers. The Madhya Pradesh state, which depends on rain-fed for production with low socioeconomic development, is also affected by climate change. These adaptation strategies facilitate preventing crop damage and agricultural production and helping cope with climate change. Farmers, on the other hand, face numerous challenges in implementing adaptation strategies, including socioeconomic, credit, irrigation access, and a lack of timely reliable information. Thus, a farmers' level study was conducted in Chhindwara district of MP state on an assessment of constraints in the adaptation of strategies to cope with climate change. The hypothesis states that there is a relationship with socioeconomic factors and constraints in employing adaptation strategies to cope with climate change. The findings underscore that the majority of the farmers are facing constraints in employing adaptation strategies with respect to climate change; lack of information about long-term climate change; and no subsidies on planting materials. Furthermore, the study recommended that weather forecast information be published and provided in real time through social media (TV and radio) and made available to farmers through agricultural extension agents. Impart training on how to improve agricultural production under vulnerable climatic conditions. An improvement in the educational level enables one to avoid vulnerability.

Keywords: Climate change, constraints, adaptation strategies, irrigation, socioeconomic

Introduction

Climate change is one of the fundamental risks in the agriculture sector. In India, it affects the severe and affects the likelihood of the farmers in a greater manner by dampening the agricultural production and, thereby, the livelihood of the farmers. Climate change has an impact on agriculture in both direct and indirect ways, influencing the emergence and distribution of crop pests and livestock diseases, exacerbating the frequency and distribution of adverse weather conditions, reducing water supplies for irrigation, and increasing the severity of soil erosion (IPCC 1998).

The Madhya Pradesh state, which depends on rain-fed for production with low socioeconomic development, is also affected by climate change. Agricultural farming is the predominant activity in the state since 50% of its residents depend on it for their livelihood. The farming community is facing a lot of issues with respect to agricultural production, among which climate change is one of the biggest challenges to improving agricultural production. The adverse climatic events made manifest by increases in the temperature, erratic rainfall, droughts and floods affected the agricultural production in India. The adaptive potential of farmers brings the ability of the farming system to mitigate climate change and to moderate the potential damage to the agricultural production system.

These adaptation strategies facilitate preventing crop damage and agricultural production and helping cope with climate change. However, widespread adaptation strategies are employed by the different farmers according to their suitability with respect to soil and climatic conditions over the various periods to mitigate climate change. Farmers, on the other hand, face numerous challenges in implementing adaptation strategies, including socioeconomic, credit, irrigation access, and a lack of timely reliable information.

The preceding indicates that the uncertain weather conditions, inadequate government support, lack of access to weather information, high cost of input, inadequate extension officers, lack of formal education, and poor soil fertility were the constraints. However, some of them grouped the constraints into public, institutional, and labour constraints as well as religious beliefs (Otitoju and Enete, 2016; Fagariba *et al.*, 2018) [3, 2]. It is difficult to fine-tune interventions to overcome constraints encountered by farmers at the farm level in the absence of such regional-oriented studies. By keeping this as important, a farmer-level study was conducted on an assessment of constraints in the adaptation of strategies to cope with climate change. The hypothesis states that there is a relationship with socioeconomic factors and constraints in employing adaptation strategies to cope with climate change.

Methodology

Madhya Pradesh is a state with about 70% of the population depending on the agricultural sector for their livelihood. Climate variability and climate change have potential threats to the agriculture sector in Madhya Pradesh state. The sector is most vulnerable to climate change, which supports a large chunk of the rural population. The present study was carried out in the agro-climatic zone of the Satpura range, *viz.*, Betul, Chhindwara, and Seoni districts. The Chhindwara was selected because it comes under a high vulnerability index in the midcentury (2050) from medium vulnerability in the base period. The multistage random sampling technique employed for the present study selected 40 farmers from each block, for a total of 240 respondents. The selected respondents were interviewed personally with the help of a well-structured and pre-tested interview schedule. This study therefore identified the constraints encountered by the farmers in the selection of adaptation strategies in the study area. The data gathered through a well-structured interview schedule was analysed using frequency, percentage, and mean statistics.

Results and Discussions

1. Socioeconomic characteristics

The socioeconomic characteristics of the respondents significantly influence the farmers in overcoming the constraints encountered by the farmers.

The socioeconomic characteristics of the farmers are depicted in table 1. The results reveal that the age of the respondents reveals that the majority of the heads of the households (40%) belong to the middle age group (38-57 years). This implies that middle-aged farmers could perceive the climatic conditions and their willingness to adapt the adaptation

strategies to combat climate change. The educational attainment of the respondents shows that at an educational level, 30.42% of the respondents lie under middle school as against 23.33 and 22.20% of them coming under high school level and primary school respectively. About 43.33% of them belong to the medium farming experience category.

Occupations with respect to farmers about 30% of the respondents practise agriculture and non-agriculture with 23.33% of the total respondents, and 42 respondents practise agriculture + dairy with 17.50% of the total respondents.

The source of irrigation The findings infer that most respondents have tube wells and canals as more reliable sources of irrigation as compared to other sources of irrigation. The mass media utilisation implies that respondents utilise the mass media in searching and gathering information with respect to combating climate change in the study area. The extension participation of respondents lies under the high category. This implies that respondents actively participated in the various extension activities, which enables them to meet their felt needs and, in turn, helps to determine farmers' needs and priorities in combating climate change.

2. Constraints

The constraints faced by farmers in employing adaptation strategies with respect to climate change are tabulated in Table 4.33. The findings reveal that the majority of farmers faced problems due to employing adaptation strategies to climate change due to a lack of information about long-term climate change, a reduction in subsidies on planting materials, and a lack of information about adaptation strategies to cope with the changing climate. These statements secured the 1st position with a mean score of 2.38 and ranked I.

It was also observed that the respondents encountered difficulty working in the field due to severe temperature, higher cost of the agricultural inputs and low price for the produce in the market. These were ranked II with a mean score of 2.21. Furthermore, with a mean score of 2.11 and ranking III, one of the constraints faced by the farmer was a lack of timely inputs. The lack of access to improved crop varieties and the absence of processing units in the village resulted in a mean score of 1.82 and a ranking of IV.

The respondents' least-favorable constraints in employing adaptation strategies to combat climate change in the study area were a lack of knowledge about post-harvest technology and a lack of water management technology, with mean scores of 1.66 and 1.49, and ranked as V and VI, respectively. The findings are in line with Negash (2011) [6]; Philip *et al.* (2013) [7]; and Deepa and Shiyani (2016) [8].

Table 1: Distributions of farmers based on socioeconomic characteristics

S. No	Characteristics	Categories	Frequency	Percentage
1.	Age	Young (18 – 35 years)	82	34.17
		Middle (36 - 55 years)	96	40.00
		Old (> 55 years)	62	25.83
2.	Educational attainment	Functional literate	14	5.83
		Primary school	55	22.92
		Middle school	73	30.42
		High school	56	23.33
		Graduate	42	17.50
3.	Farming Experience	0 - 15 years of experience	73	30.42
		16 -30 years of experience	104	43.33
		> 30 years of experience	63	26.25
4.	Occupations	Only Agriculture	72	30.00
		Agriculture + Dairy	42	17.50

		Agriculture + Other Agricultural allied activities	40	16.67
		Agriculture + non- agriculture	56	23.33
		Agriculture + Small ruminants + poultry	8	3.33
		Agriculture + dairy + Non- agriculture	22	9.17
5.	Sources of Irrigation	Tube well	82	34.17
		wells	18	7.50
		Canal	120	50.00
		Pond	20	8.33
6.	Mass media Utilizations	Low (0 - 2)	77	32.09
		Medium (3 - 5)	101	42.08
		High (6 - 8)	62	25.83
7.	Extension participation	Low (0 - 4)	54	22.51
		Medium (5 - 9)	77	32.08
		High (10 - 14)	109	45.42
8.	Scientific orientations	Low (5 - 11)	42	17.50
		Medium (12 - 18)	140	58.33
		High (19 - 25)	58	24.17

Table 2: The constraints faced by the farmers in employing adaptation strategies to climate change

S. No.	Constraints	SA	%	A	%	DA	%	Mean score	Rank
1.	Lack of information about long term climate change	148	61.67	36	15.00	56	23.33	2.38	I
2.	Difficult to work in the field due to severe temperature	116	48.33	58	24.17	66	27.50	2.21	II
3.	Higher cost of the agricultural inputs	110	45.83	70	29.17	60	25.00	2.21	II
4.	Less subsidies on planting materials	140	58.33	52	21.67	48	20.00	2.38	I
5.	Non-availability of timely inputs	105	43.75	58	24.17	77	32.08	2.11	III
6.	Low price for the produce in the market	120	50.00	50	20.83	70	29.17	2.21	II
7.	Lack of access to improve crop varieties	71	29.58	56	23.33	113	47.08	1.82	IV
8.	Absence of processing units in the village	72	30.00	54	22.50	114	47.5	1.82	IV
9.	Absence of water management technology	39	16.25	41	17.08	160	66.67	1.49	VI
10.	lack of knowledge about post-harvest technology	50	20.83	58	24.17	132	55.00	1.66	V
11.	Lack of information about adaptation strategies to cope up with the changing climate	120	50.00	92	38.33	28	11.67	2.38	I

Conclusion

Agricultural farming is the predominant activity in the state since 50% of its residents depend on it for their livelihood. The farming community is facing a lot of issues with respect to agricultural production, especially climate change, which is one big challenge to improving agricultural production. The adverse climatic events made manifest by increases in the temperature, erratic rainfall, droughts and floods affected the agricultural production in India.

The adaptive potential of farmers brings the ability of the farming system to mitigate climate change. Thus, farmer level assessment of the constraints encountered by farmers in adopting the adaptation strategies has the objective of understanding socioeconomic characteristics' influences and constraints on choice of adaptation strategies.

Our study underscores that the majority of farmers are facing constraints in employing adaptation strategies with respect to climate change. There is a lack of information about long-term climate change; there are no subsidies for planting materials. The other constraints are the higher cost of agricultural inputs and the low price of produce in the market. Furthermore, the study recommended that weather forecast information be published and provided in real time through social media (TV and radio) and made available to farmers through agricultural extension agents. Impart an increase in educational level that allows one to avoid vulnerability should be pursued.

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