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Socioeconomic and psychological determinants of awareness on climate resilient technologies among small and marginal farmers

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Abstract
Climate change poses a significant threat to the sustainability of agriculture, particularly for small and marginal farmers who often lack access to resources. This is exacerbated in highly vulnerable areas, such as the Marathwada region, located in the central region of Maharashtra state, characterised by a semiarid agroecosystem. Within this region, Parbhani and Hingoli districts are highly vulnerable to climate variability, facing erratic rainfall, frequent droughts, and depleting groundwater resources (Adhav *et al*., 2021) [1]. Agriculture is dominated by soybean, cotton, sorghum, and pulses, cultivated mainly under rainfed conditions. To tackle climate vulnerability, climate-resilient agricultural technologies were introduced. However, the awareness of these technologies is largely determined by farmers' socio-economic and psychological characteristics. The present study aims to study the relationship between the awareness of small and marginal farmers on climate resilient technologies and their socioeconomic and psychological profile which includes age, education, size of landholding, farming experience, annual income, occupation, source of irrigation, social participation, extension contact, source of information, mass media exposure, economic motivation, innovativeness, risk orientation, and institutional support. A total of 120 respondents were selected through a multistage random sampling method. The data were collected using a structured and pretested interview schedule under an ex post facto research design. Pearson's correlation coefficient was employed to determine the relationship. The findings revealed that education, occupation, size of landholding, annual income, social participation, extension contact, source of information, mass media exposure, economic motivation, innovativeness, and risk orientation exhibited a positive and significant correlation with awareness of climate-resilient technologies. Among these, the size of landholding and risk orientation exhibited a significant relationship. In contrast, age and farming experience showed a significant but negative correlation, indicating that younger and less experienced farmers were more aware of such technologies. Source of irrigation and institutional support were found to be non-significant.

Keywords: Awareness, socioeconomic profile, psychological profile, climate resilience, climate resilient technologies, correlation

Introduction
Agriculture in the semiarid regions of the Marathwada region of Maharashtra state is highly vulnerable to climate change. Parbhani and Hingoli districts are representative examples of this vulnerability, where farmers depend primarily on agriculture for their livelihood, yet face persistent risks of climate variability. Previous vulnerability assessments have identified these districts among the most vulnerable areas in Maharashtra (Adhav *et al*., 2021) [1]. Climate-resilient agricultural technologies are promoted to help farmers adapt to risks like droughts, erratic rainfall, and high temperatures etc. However, the awareness of these technologies largely depends on various factors, such as the awareness of the farmers. Awareness serves as a first step toward adoption, and it enables the farmers to recognise and understand the relevance and benefits of these technologies. Socioeconomic and psychological characteristics determine the level of awareness in farmers. Variables such as age, education, income, social participation, risk orientation, and extension contact shape how farmers can access and interpret agricultural information, in this case, climate-resilient agricultural technologies. Earlier studies show that education, income, landholding, farming experience, innovativeness, extension contact, media exposure, risk risk-taking ability are important factors that significantly influence the awareness

levels and adoption of climate resilient technologies. (Islam et. al., 2015, Jasna 2015, Anseera 2018, Mahesh 2022) [3, 4, 2, 5].
This study was therefore undertaken to analyse the relationship between the socioeconomic and psychological determinants of small and marginal farmers in Parbhani and Hingoli districts, with their awareness. Understanding these relationships is crucial for designing location-specific interventions that strengthen the resilience, adaptive capacity and livelihoods of small and marginal farmers in drought-prone regions like the Marathwada.

Methodology

The present study was conducted in Parbhani and Hingoli districts, which are among the highly climate-vulnerable districts of the Marathwada region in Maharashtra state. A total of 120 respondents were randomly selected through multi-stage sampling. The respondents were primarily soybean growers from twelve villages across four tehsils. An ex post facto research design was adopted, and the data were collected through a structured interview schedule. Pearson's Correlation Coefficient was employed to determine the relationship between socioeconomic and psychological profiles and levels of awareness of small and marginal farmers regarding climate-resilient technologies.

Results and Discussion

Table 1: Coefficient of correlation between the profile of respondents with their awareness about climate-resilient technologies (N=120)

S. No.	Independent Variables	Pearson's Correlation coefficient (r)
1	Age	-0.253*
2	Education	0.449**
3	Farming experience	-0.264**
4	Source of irrigation	0.126^{NS}
5	Occupation	0.258**
6	Size of landholding	0.569**
7	Annual income	0.434**
8	Social participation	0.414**
9	Extension contact	0.418**
10	Source of Information	0.359**
11	Mass media exposure	0.407**
15	Institutional Support	0.956^{NS}
12	Economic motivation	0.276**
13	Innovativeness	0.216*
14	Risk orientation	0.553**

(**significant at 1%, *significant at 5%, ^{NS}non-significant)

The correlation analysis, as shown in Table 1, revealed the relationship between several socioeconomic and psychological factors of respondents and their awareness of climate-resilient technologies.
Age showed a negative and significant correlation with awareness (r = -0.253*), indicating that younger farmers were relatively more aware than older ones. A similar observation was reported by Mahesh (2022) [5]. In contrast, education exhibited a strong positive correlation (r = 0.449**), suggesting that higher education levels enhanced farmers' ability to understand and access information on climate-resilient practices, as also noted by Anseera (2018) [2] and Mahesh (2022) [5].
Farming experience was negatively correlated with awareness (r = -0.264**), implying that farmers with longer experience tended to rely more on traditional practices and were less receptive to newer technologies. Comparable findings were reported by Mahesh (2022) [5].
The source of irrigation showed a positive but non-significant correlation ($r = 0.126^{NS}$), indicating limited influence on awareness, consistent with Islam *et al*. (2015) [3]. Occupation was positively and significantly associated with awareness (r = 0.258**), with farmers engaged mainly in agriculture being more aware of climate-resilient practices.
Landholding size showed the highest positive correlation (r = 0.569**), suggesting that larger landholders were significantly more aware, as reported by Jasna (2015) [4], Islam *et al*. (2015) [3], and Mahesh (2022) [5]. Similarly, annual income was positively correlated with awareness (r = 0.434**), reflecting that higher income farmers had better access to information and training opportunities (Islam *et al*., 2015) [3].
Social participation (r = 0.414**), extension contact (r = 0.418**), and sources of information (r = 0.359**) were all significantly and positively related to awareness, highlighting the role of social networks, institutional linkages, and information channels in enhancing awareness (Anseera, 2018) [2]. Likewise, mass media exposure (r = 0.407**) had a positive and significant effect, showing that frequent access to television, radio, newspapers, and mobile advisories increased awareness (Mahesh, 2022) [5].
Institutional support showed a positive but non-significant correlation ($r = 0.956^{NS}$), suggesting that while institutional mechanisms such as credit and insurance have the potential to enhance awareness, inconsistent access and service delivery may limit their impact (Anseera, 2018) [2].
Among psychological factors, economic motivation (r = 0.276**), innovativeness (r = 0.216*), and risk orientation (r = 0.553**) were significantly and positively correlated with awareness. This implies that farmers who are motivated to improve their livelihoods, open to new ideas, and willing to take risks were more likely to be aware of climate-resilient technologies, supporting the findings of Mahesh (2022) [5].

Conclusion

The study concludes that socioeconomic and psychological characteristics significantly influence the awareness of small and marginal farmers about climate-resilient technologies. Education, occupation, landholding size, annual income, social participation, extension contact, information sources, media exposure, economic motivation, innovativeness, and risk orientation were positively correlated with awareness. Age and farming experience showed a negative association. Institutional support and source of irrigation were found to be non-significantly related. These findings suggest that programs promoting climate-resilient technologies should prioritise strengthening education, extension services, and information dissemination, while also encouraging social participation, innovativeness, and risk-taking abilities among farmers. Targeted interventions that focus on small and marginal farmers in vulnerable regions like Marathwada are essential to enhance awareness, resilience, and adaptive capacity, considering the threats posed by climate change.

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