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Socio-economic profile and adoption of climate-smart agricultural practices among women farmers

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Abstract

The present study entitled “Socio-Economic Profile and Adoption of Climate-Smart Agricultural Practices among Women Farmers” was conducted to assess the socio-economic characteristics, adoption of climate-smart agricultural practices and constraints faced by women farmers in Satna district of Madhya Pradesh. The study considered 15 independent variables related to socio-economic, farm, institutional and empowerment characteristics. Primary data were collected from selected women farmers through a pre-tested interview schedule and analyzed using frequency, percentage, mean, standard deviation and chi-square test. The findings revealed that most respondents had medium levels of education, farming experience, annual income, social participation, awareness and knowledge of climate-smart practices, decision-making participation and empowerment. The adoption level was medium among 50.83% of women farmers, followed by high (25.00%) and low (24.17%) adoption. The major constraints were financial limitations (75.83%), heavy household workload (69.17%), lack of timely climate information (65.83%), limited credit and institutional support (63.33%) and inadequate training and extension services (60.00%). The study concludes that strengthening women-oriented extension services, training, climate information, institutional credit and access to climate-resilient technologies is essential for enhancing the adoption of climate-smart agricultural practices among women farmers.

Keywords: Women farmers, climate-smart agriculture, adoption, empowerment, decision-making, extension services, constraints

Introduction

Agriculture remains a major source of livelihood in rural India and women make a substantial contribution to crop production, livestock management, post-harvest operations and other farm activities. However, women farmers often have limited access to land, credit, extension services, improved inputs and agricultural information. According to the FAO (2023) ^[5], women account for a significant share of the agricultural workforce globally, yet continue to face gender-based gaps in access to productive resources and services. Climate variability has further increased the vulnerability of small and marginal farming households through irregular rainfall, rising temperatures, drought and other production risks. The IPCC (2022) ^[6] identified South Asia as highly vulnerable to climate change impacts, particularly in agriculture. In this context, Climate-Smart Agriculture (CSA) has gained importance as an approach that seeks to increase productivity, strengthen resilience to climate change and, where possible, reduce greenhouse-gas emissions (FAO, 2013) ^[4]. Practices such as crop diversification, drought-tolerant varieties, water conservation, mulching, integrated nutrient management and conservation agriculture can help women farmers manage climatic risks and sustain farm productivity.

Women farmers are therefore important stakeholders in

promoting climate-resilient agricultural systems. Evidence suggests that improving women's access to agricultural resources, information and decision-making can contribute substantially to farm productivity and household welfare. The FAO (2023) ^[5] estimated that closing gender gaps in agricultural productivity and wages could increase global GDP by nearly \$1 trillion and reduce food insecurity for millions of people. Similarly, the World Bank (2022) ^[9] emphasized that climate-smart practices can improve the resilience and productivity of smallholder farming systems when supported by appropriate technology, finance and extension services. In Madhya Pradesh, where many farming households depend strongly on rainfall, adoption of climate-smart practices is particularly relevant. However, factors such as small landholdings, limited income, inadequate irrigation, lack of technical knowledge and restricted extension contact may constrain adoption among women farmers. Therefore, the present study entitled “Socio-Economic Profile and Adoption of Climate-Smart Agricultural Practices among Women Farmers” was undertaken to examine the socio-economic and farm characteristics of women farmers, document the climate-smart agricultural practices adopted by them and identify the major constraints affecting their adoption. The findings may provide useful direction for strengthening gender-

responsive extension programmes and promoting climate-resilient agriculture.

Material and Methods

The study considered 15 independent variables covering the socio-economic, farm, institutional and empowerment characteristics of women farmers. These included education, age, marital status, family type, occupation, landholding, farming experience, annual income, social participation, major crops grown, irrigation facility, training exposure, awareness and knowledge, participation and empowerment. The practices adopted by women farmers were considered the dependent variable. These variables were selected to understand the factors influencing the adoption of climate-smart agricultural practices among women farmers.

Primary data were collected through a well-structured and pre-tested interview schedule developed in accordance with the objectives of the study. The schedule was pre-tested among a small group of women farmers to ensure clarity, reliability and suitability. Personal interviews were conducted with selected respondents after explaining the purpose of the study and establishing rapport. Secondary information was collected from government reports, research publications, journals and other relevant sources related to climate-smart agriculture and women's participation in farming.

The collected data were systematically classified, tabulated and analyzed using frequency, percentage, mean, standard deviation and chi-square test. Frequency and percentage were used to describe the distribution of respondents, while mean and standard deviation were used to summarize the data and measure variation. The chi-square test was employed to examine the association between selected independent variables and the adoption of climate-smart agricultural practices. These statistical techniques facilitated systematic interpretation of the findings and helped in drawing meaningful conclusions regarding the adoption of climate-smart practices among women farmers.

Results and Discussion

The study considered 15 independent variables, namely education, age, marital status, family type, main occupation, size of landholding, farming experience, annual income, social participation, major crops grown, irrigation facility, training exposure, level of awareness and knowledge, extent of participation and level of empowerment of women farmers. The adoption of climate-smart agricultural practices by women farmers was considered as the dependent variable (Table 1).

Socio-economic profile of the farmer

The data presented in Table 1 reveal that the majority of women farmers had a medium level of socio-personal and educational characteristics. Regarding education, the highest proportion had high-school education (25.83%), followed by middle-level education (22.50%). The majority of respondents were middle-aged (55.83%), while 20.83 per cent were young and 23.34 per cent were old. A substantial majority (90.00%) were married and 60.00 per cent belonged to nuclear families. Farming was the main occupation of 48.33 per cent of women farmers, followed by agricultural labour (25.83%) and livestock rearing (17.50%).

With respect to farm characteristics, 35.00 per cent of respondents had marginal landholdings, followed by small holdings (31.67%) and semi-medium holdings (22.50%). Farming experience was predominantly medium (47.50%), while 50.83 per cent of women farmers had a medium level of annual income. Social participation was also mainly medium (53.34%). Regarding crop diversity, 49.17 per cent of respondents cultivated 3-4 major crops, indicating a moderate level of crop diversification. Irrigation facilities were available to 43.33 per cent of respondents, while 30.83 per cent had partial irrigation and 25.84 per cent depended on rainfed conditions.

The findings further indicate that 38.33 per cent of women farmers had participated in agricultural training 2-3 times, followed by 24.17 per cent who had attended training more than three times. Awareness and knowledge regarding climate-smart agricultural practices were predominantly medium (51.67%), followed by high (27.50%) and low (20.83%). Similarly, participation in agricultural decision-making was mainly medium (54.17%), while 22.50 per cent had low and 23.33 per cent had high participation. These results indicate that a considerable proportion of women farmers had moderate exposure to climate-smart agricultural knowledge and training.

Regarding empowerment, nearly half of the respondents (48.33%) had a medium level of empowerment, while 25.84 per cent had high and 25.83 per cent had low empowerment. Overall, the findings suggest that women farmers possessed moderate levels of education, farm experience, income, social participation, climate-smart awareness, decision-making participation and empowerment. Strengthening women-oriented extension programmes, practical training, access to irrigation and climate-resilient technologies could further enhance their participation and adoption of climate-smart agricultural practices.

The findings of the present study are supported by earlier research. Doss (2018) ^[3] reported that women make substantial contributions to agricultural production but continue to face limitations in access to productive resources and decision-making. Meinen-Dick *et al.* (2014) ^[8] emphasized that improved access to information, training and institutional support strengthens women's capacity to adopt agricultural technologies. Similarly, FAO (2023) ^[5] highlighted that women farmer face persistent gaps in access to land, finance, extension and productive resources. Aryal *et al.* (2020) ^[2] found that access to extension services, education and farm resources influenced farmers' adoption of climate-smart practices. Jost *et al.* (2016) ^[7] also reported that women's participation and access to agricultural information are important for strengthening climate-change adaptation strategies.

The climate smart agricultural practices adopted by women farmers

The data indicate that the majority of women farmers (50.83%) had a medium level of adoption of climate-smart agricultural practices, followed by 25.00% with a high level and 24.17% with a low level, indicating moderate adoption overall. The finding is supported by Jost *et al.* (2016) ^[7], who reported that women farmers adopted various climate-change adaptation practices but faced resource and information constraints. Aryal *et al.* (2020) ^[2] also found

that access to extension services, information and farm resources influenced the adoption of climate-smart practices. Similarly, Abdullah *et al.* (2022) ^[1] observed that women farmers generally showed moderate adoption of climate-resilient agricultural practices, with training and

institutional support improving adoption. These studies support the present finding that women farmers require improved access to knowledge, training and resources to enhance climate-smart agricultural practices.

Table 1: Distribution of women farmers according to selected socio-personal, socio-economic and agricultural characteristics (N = 120)

S. No.	Variable	Category	f	%	Category	f	%	Category	f	%
1.	Educational level	Illiterate	18	15.00	Primary	22	18.33	Middle	27	22.50
		High school	31	25.83	Graduate/Postgraduate	22	18.34	—	—	—
2.	Age	Young	25	20.83	Middle	67	55.83	Old	28	23.34
3.	Marital status	Married	108	90.00	Unmarried	12	10.00	—	—	—
4.	Family type	Nuclear	72	60.00	Joint	48	40.00	—	—	—
5.	Main occupation	Farming	58	48.33	Agricultural labour	31	25.83	Livestock rearing	21	17.50
		Others	10	8.34	—	—	—	—	—	—
6.	Landholding	Marginal	42	35.00	Small	38	31.67	Semi-medium	27	22.50
		Medium	10	8.33	Large	3	2.50	—	—	—
7.	Farming experience	Low	29	24.17	Medium	57	47.50	High	34	28.33
8.	Annual income	Low	35	29.17	Medium	61	50.83	High	24	20.00
9.	Social participation	Low	28	23.33	Medium	64	53.34	High	28	23.33
10.	Major crops grown	Low (1-2)	28	23.33	Medium (3-4)	59	49.17	High (5 or more)	33	27.50
11.	Irrigation facility	Irrigated	52	43.33	Rainfed	31	25.84	Partially irrigated	37	30.83
12.	Training exposure	Never	18	15.00	Once	27	22.50	2-3 times	46	38.33
		More than 3 times	29	24.17	—	—	—	—	—	—
13.	Awareness & knowledge of climate-smart practices	Low	25	20.83	Medium	62	51.67	High	33	27.50
14.	Participation in agricultural decision-making	Low	27	22.50	Medium	65	54.17	High	28	23.33
15.	Empowerment	Low	31	25.83	Medium	58	48.33	High	31	25.84
16.	Practices adopted (Dependent variable)	Low	29	24.17	Medium	61	50.83	High	30	25.00

Note: f = Frequency; % = Percentage.

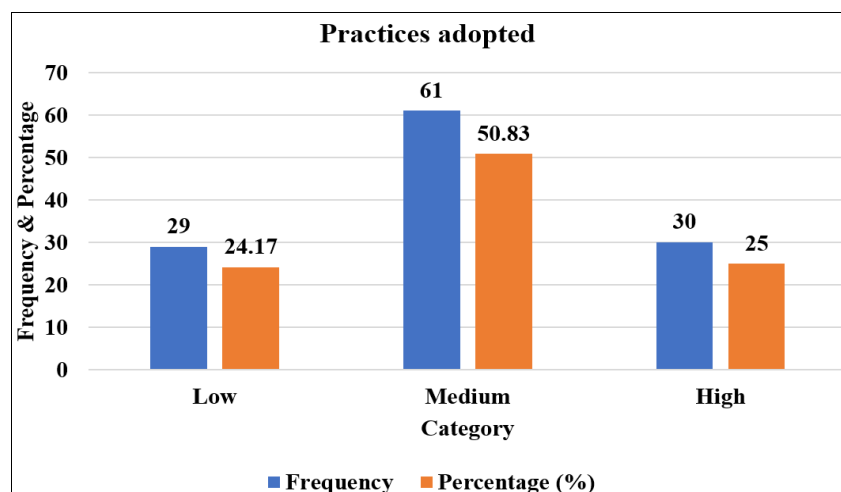


Fig 1: Distribution of women farmers according to practices adopted

Constraints faced in adopting climate-smart agriculture and participating in decision-making

The findings revealed that financial constraints (75.83%) were the major barrier to adopting climate-smart agricultural practices, followed by heavy household workload (69.17%), lack of timely climate information (65.83%), limited access

to credit and institutional support (63.33%) and inadequate training and extension services (60.00%). Other constraints included lack of resource ownership (56.67%), inadequate awareness (52.50%), social and cultural barriers (51.67%) and limited family support (45.00%).

Table 2: Distribution of women farmers according to constraints faced in adopting climate-smart agriculture and participating in decision-making (N = 120)

S. No.	Constraints	Yes f (%)	No f (%)	Rank
1	Lack of awareness about climate-smart agricultural practices	63 (52.50)	57 (47.50)	VII
2	Limited access to training and extension services	72 (60.00)	48 (40.00)	V
3	Lack of access to timely climate and weather information	79 (65.83)	41 (34.17)	III
4	Financial constraints for adopting new technologies	91 (75.83)	29 (24.17)	I
5	Lack of ownership or control over land and resources	68 (56.67)	52 (43.33)	VI
6	Limited access to credit and institutional support	76 (63.33)	44 (36.67)	IV
7	Heavy household workload restricting participation in farming decisions	83 (69.17)	37 (30.83)	II
8	Low mobility and restricted access to markets and institutions	71 (59.17)	49 (40.83)	VI
9	Lack of support from family members in decision-making	54 (45.00)	66 (55.00)	IX
10	Social and cultural barriers restricting women's participation in agriculture	62 (51.67)	58 (48.33)	VIII

Conclusion

The study concluded that women farmers in Satna district had predominantly medium levels of awareness, participation, empowerment and adoption of climate-smart agricultural practices, with 50.83% falling under the medium adoption category. However, adoption was constrained mainly by financial limitations (75.83%), heavy household workload (69.17%), inadequate climate information (65.83%), limited credit and institutional support (63.33%) and insufficient training and extension services (60.00%). Strengthening women-focused extension programmes, climate information services, training, credit facilities and access to climate-resilient technologies can substantially enhance women farmers' participation and adoption of climate-smart agricultural practices.

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