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Women's access and control over farm resources: Determinants of decision-making power in climate smart agriculture

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Abstract

CSA is essential for economic development, food security, environmental sustainability, and conservation of ecosystems in developing countries. CSA has three main attributes: enhanced agricultural productivity and income; improved farm resilience against climate change, and decreased GHG emissions from agriculture. CSA refers to several practices and technologies intended to enhance this "triple win". Different practices like crop rotation, cover crops, intercropping, new seed varieties, agroforestry, conservation tillage, livestock manure, and water conservation are commonly adopted CSA strategies at the farm level. In the changing climate scenario, women's decision-making dynamics in agriculture are very complex and influenced by various critical factors in CSA adaptation. Women play a crucial role in agriculture worldwide contributing significantly to food production, food and nutritional security and household income. The study investigated how the level of women's access and control over farm resources influences their decision-making power regarding Climate Smart Agriculture adaptation in Cooch Behar district of West Bengal. The study employed a multistage purposive cum random sampling design for selecting an appropriate number of women farmer respondents. A total sample size of 232 was enumerated based on Krejcie and Morgan (1970) formula. Data were collected using a structured interview schedule. The data were processed using various statistical tools like mean, frequency, percentage, standard deviation, correlation and regression. The relational analysis implies that the variables age, educational qualification, farming experience, land holding, annual household income, mass media exposure, extension contact, economic motivation, scientific orientation, risk orientation, information seeking behavior and management orientation had a strong positive bearing upon the dependent variable the level of women's access and control over farm resources influences their decision-making power regarding Climate Smart Agriculture adaptation.

Keywords: Adaptation, climate smart agriculture, climate change decision making power, farm women

Introduction

Agriculture in developing countries like India is progressively influenced by the dual challenges of climate change and gender inequality. Women represent a substantial portion of the agricultural workforce; however, their access to and control over essential farm resources like land, finance and agricultural equipment continue to be restricted (Shahbaz *et al.*, 2022; Barman *et al.*, 2019) ^[9, 1]. These structural inequalities frequently hinder their involvement in the decision-making process, especially concerning climate smart agriculture (CSA) adaptation strategies that improves farm resilience and agricultural productivity and income (Tsige *et al.*, 2020; Mishra *et al.*, 2009; Ekeogu *et al.*, 2025) ^[11, 5, 12]. One fundamental resource affecting women's negotiating power in homes and communities is access to land. However, legal restrictions and cultural standards usually prevent women from inheriting or owning land, which limits their capacity to decide on their own how much to produce (Barman *et al.*, 2019; Tsige *et al.*, 2020) ^[1, 11]. Many women farmers lack access to cash and institutional credit to invest in CSA-

relevant seeds, irrigation systems, and low-emission technologies (Borah *et al.*, 2018; Niemann *et al.*, 2024) ^[2, 6]. Furthermore, gendered constraints on farm equipment and extension services marginalize women, increasing their dependence on male household members and decreasing their adaptability (Kavyashree *et al.*, 2021) ^[4]. Thus, analyzing women's climate adaptation decision-making ability requires understanding their access and control over farm resources. These dimensions show how gendered agricultural resource allocation is and how empowering women can speed the adoption of sustainable and climate-resilient farming methods (Pradhan *et al.*, 2017) ^[7]. This study examines how land, financing, and equipment differences affect women's decision-making in climate-smart agriculture, affecting policy, gender equality, and rural development.

Materials and Methods

The research was conducted in the Cooch Behar district of West Bengal, multistage purposive cum random sampling used. The state West Bengal and Cooch Behar district were

selected purposively. Cooch Behar has 12 development blocks. In the Cooch Behar district, two blocks- Cooch Behar II and Dinhata II were selected by simple random sampling out of 12 blocks based on climate vulnerability. Gopalpur, Khagribari and Singimari villages from Cooch Behar II block and Durganagar village from Dinhata II block were selected randomly. Appropriate number of women farmer respondents has been taken as sample. Total 232 number of accessible sample size (farm women) were selected on the basis of the following criteria: married, unmarried, divorced and wives of migrants and it was

enumerated based on the formula given by Krejcie and Morgan (1970). Data collection was conducted through personal interview method with women farmers by using a structured interview schedule. Data collected were categorized and analyzed to meet the study objective. Data were processed into several statistical tools like correlation of coefficient and regression analysis by using the SPSS online open access software.

Results and Discussion

Table 1: Coefficient of correlation among level of women's access and control over farm resources influences their decision-making power regarding CSA adaptation and 14 casual variables

Variables	Coefficient of Correlation (r)
Age (X ₁)	-0.166*
Education (X ₂)	0.283**
Family Size (X ₃)	-0.098
Farming Experience (X ₄)	-0.191**
Land Holding (X ₅)	0.257**
Annual HH income (X ₆)	0.217**
Material Possession (X ₇)	0.123
Mass media exposure (X ₈)	0.210**
Extension contact (X ₉)	0.371**
Economic Motivation (X ₁₀)	0.316**
Scientific orientation (X ₁₁)	0.223**
Risk Orientation (X ₁₂)	0.452**
Information seeking behavior (X ₁₃)	0.435**
Management Orientation (X ₁₄)	0.349**

* <0.05 significant at 5%

** < 0.01 significant at 1%

From the Table 1, it revealed that the correlation analysis of level of women's access and control over farm resources influences their decision-making power regarding CSA adaptation indicated that positive and significant relationship at a percent level with education, land holding,

annual household income, mass media exposure, extension contact, economic motivation, scientific orientation, risk orientation, information seeking behavior, management orientation. The variable age and farming experience are negatively and significantly associated.

Table 2: Multiple regression analysis of level of women's access and control over farm resources influences their decision-making power regarding CSA adaptation and 14 casual variables

Variables	Standardized regression coefficient(β)	Unstandardized regression coefficient (b)	Standard error of 'b'	't' value
Age (X ₁)	0.188	0.270	0.224	1.208
Education (X ₂)	-0.069	-0.235	0.290	-0.810
Family Size (X ₃)	-0.088	-0.547	0.351	-1.558
Farming Experience (X ₄)	-0.169	-0.246	0.226	-1.089
Land Holding (X ₅)	0.500	6.033	2.061	2.926*
Annual HH income (X ₆)	-0.336	-0.321	0.162	-1.979
Material Possession (X ₇)	-0.018	-0.074	0.245	-0.302
Mass media exposure (X ₈)	-0.160	-1.190	0.643	-1.850
Extension contact (X ₉)	0.201	1.685	0.543	3.102*
Economic Motivation (X ₁₀)	0.131	0.955	0.460	2.075
Scientific orientation (X ₁₁)	0.030	0.161	0.429	0.374
Risk Orientation (X ₁₂)	0.223	0.955	0.317	3.016*
Information seeking behavior (X ₁₃)	0.302	1.297	0.353	3.669**
Management Orientation (X ₁₄)	0.096	0.364	0.263	1.383

R² = 0.398

The TABLE 2 presents the multiple regression analysis of the variable level of women's access and control over farm resources influences their decision-making power regarding CSA adaptation and 14 casual variables. The results shows that the variables land holding, extension contact, risk

orientation and information seeking behavior are positively and significantly contributing towards characterizing the variable level of women's access and control over farm resources influences their decision-making power regarding CSA adaptation.

The R^2 value being 0.398, it is to infer that the sixteen predictor variables put together have explained 39.80% variation embedded with the predicted variable level of women's access and control over farm resources influences their decision-making power regarding CSA. Still 60.20% embedded with the predicted one remains unexplained. Thus, it would be suggested that inclusion of some more contextual variables, could have increased the level of explicability.

Discussion

The favorable impact of young age women with less farming experience are more information seeking behavior and innovative in nature suggests that women frequently benefit from increased social legitimacy and bargaining power within the household, enabling them to exert greater influence over resource distribution and farm-level adaptation decisions. This finding aligns with research that associates their access and control over land, finance and equipment with women's involvement in farm decision-making (Shukla *et al.*, 2025) ^[10]. Similarly, increased exposure to mass media and consistent extension contact seem to improve women's awareness, material possession and confidence in assessing and implementing CSA practices, consistent with evidence that information and advisory services serve as vital mechanisms for women's empowerment and climate-resilient agriculture. Simultaneously, the favorable associations of economic motivation, scientific orientation and risk orientation with women's access to and control over farm resources which influences their farm decision making for climate smart agriculture adaptation, aligning with research that connects aspirations, risk preferences and rational, evidence-based perspectives with CSA adoption. Women who are more economically focused, scientifically inclined and prepared to undertake calculated risks are better equipped to negotiate for essential resources and to invest in climate-resilient technologies and practices. Robust information-seeking behavior and a management-oriented approach further facilitate this process by empowering women to proactively seek pertinent knowledge, organize and coordinate agricultural activities, and convert resource control into tangible climate-smart decisions at the household level. Collectively, these findings indicate that efforts to enhance CSA adoption among women should extend beyond mere resource provision and concurrently focus on improving access to information, strengthening extension linkages and fostering the socio-psychological capacities that underpin women's agency and decision-making power for climate smart agriculture in agriculture.

Conclusion

The study shows that women's decision-making authority on climate-smart agriculture (CSA) adaptation depends on their access to and control over land, financing and agricultural equipment. Ownership and control of these resources increase autonomy, involvement and confidence in sustainable agriculture. The results also show that socio-psychological and communication factors like marital status, mass media exposure, extension contact, economic motivation, scientific orientation, risk orientation, information-seeking behavior, and management orientation

positively and significantly affect women's CSA adoption decisions. These findings demonstrate that farm women can better adapt to climate change with equal access to productive resources, focused extension services, capacity-building efforts and enhanced communication channels. Thus, gender-responsive agricultural development and inclusive decision-making frameworks are necessary to improve livelihood resilience and climate-smart agriculture.

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