

The Gendered Burden: How Rigid Gender Roles Limit Women's Participation in Climate-Smart Agriculture in Baringo South Sub-County, Kenya.

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ABSTRACT

Women play a crucial role in agricultural production in Kenya's arid and semi-arid regions, including Baringo South Sub-County, yet their participation in Climate-Smart Agriculture (CSA) remain limited. This limitation is largely driven by rigid and deeply entrenched gender roles that assign women disproportionate roles. Women have the triple roles which include the reproductive roles such as caregiving and domestic chores, the productive roles such as tilling of subsistence farms and the running of small businesses to get money and the community development roles such as organizing for weddings burial ceremonies and other ceremonies to mark rights of passage. In Baringo South, cultural norms often confine women to unpaid household labour and low-value farming activities, reducing the time, mobility, and autonomy required to engage in climate-smart practices such as conservation agriculture, agroforestry, improving livestock management and water harvesting technologies. This research employed a correlation research design whereby a study sample size of 128 women participants was selected using a simple random sampling procedure. 15 Key informants, who included one (1) agricultural extension officers, four (4) cooperative leaders, and ten (10) women leaders in groups focusing on agricultural value chains. were also interviewed totaling to 143 respondents. The gendered expectations further limit women's access to land, climate information, credit and, and farmer training programs, which are often targeted at men as household heads. As climate variability intensifies, the unequal burden placed on women undermines household resilience, food security and sustainable adoption efforts. Quantitative data were analyzed using descriptive and inferential statistics, specifically correlation and regression analysis. Qualitative data were analyzed thematically. Gender roles had a coefficient of $B = 0.395$, which rejects the null hypothesis (H_0). Gender roles have a strong and significant influence on the adoption of climate-smart agriculture among women smallholder farmers. Addressing gender-based constraints such as multiple gender roles, limited access to decision-making, mobility restrictions and traditional gender norm is therefore essential for improving women's climate resilience and ensuring equitable participation in CSA initiatives. For instance, gender roles can be addressed by farm mechanization, income formation of agricultural cooperatives, access to information and the use of champion farmers who act as role models to other farmers. This paper examines how rigid gender roles act as a structural barrier to women's meaningful participation in climate-smart agriculture in Baringo-South Sub-County.

Keywords: Gendered Burden, Gender roles, Limit, Participation, Climate-Smart Agriculture.

INTRODUCTION

Gender roles, which are socially constructed expectations about the behaviors, responsibilities, and power dynamics associated with men and women in society, can significantly influence the adoption of innovative agricultural practices, including Climate-Smart Agriculture (CSA) (Bashir *et al.*, 2021). In many rural areas, traditional gender roles place disproportionate burdens on women, particularly in terms of household responsibilities, labor, and decision-making, which can hinder their ability to engage with and adopt CSA practices. This literature review explores how gender roles shape women's ability to adopt CSA and highlights the most recent research that links gendered expectations with the barriers and opportunities for women in agriculture.

In rural settings, women often carry the majority of household responsibilities, including cooking, childcare, fetching water, and cleaning, in addition to their agricultural duties. These gendered expectations of labor leave women with limited time and energy to engage in activities that require additional labor, such as adopting climate-smart practices that may be labor-intensive or require time for learning and adaptation.

A major barrier to adopting CSA is the heavy workload that rural women face due to traditional gender roles (Udo *et al.*, 2025). Studies have found that women spend significantly more time than men on unpaid domestic labor, which limits the time they can devote to farming or adopting new agricultural technologies. For instance, a study in Uganda found that women's domestic responsibilities, including caring for children and fetching water, left them with insufficient time to experiment with and implement CSA practices such as crop diversification or agroforestry (Schiavone *et al.*, 2023). As a result, many women prioritize immediate household needs over long-term investments in sustainable agricultural practices.

Some CSA practices are labor-intensive, requiring additional time and effort to implement and maintain. For example, agroforestry, which involves planting trees alongside crops to improve soil fertility and water retention, requires significant physical labor. Women, who often perform most of the agricultural labor in rural areas, may be deterred from adopting such practices if they are already burdened by household duties. This is particularly the case when men control key household decisions about land use and resource allocation (Bashir *et al.*, 2021).

In many rural communities, gender roles place men as the primary decision-makers in the household and in matters related to land and agriculture. This unequal distribution of decision-making power prevents women from having the autonomy to choose or implement CSA practices, even if they are willing to adopt them. Women often have limited control over land, which is a critical resource for implementing CSA practices. In many countries, land tenure systems are biased toward men, leaving women with limited or no legal control over land. Without the ability to make decisions about land use, women are less able to implement CSA practices such as conservation tillage, crop rotation, or water-efficient irrigation systems. A recent study in Ethiopia found that women, despite being active farmers, had little influence on land management decisions, which severely hindered their ability to engage with CSA (Alston *et al.*, 2023).

Men control over women's income from agricultural products. In many cases, even when women participate in agricultural activities, men often control the income from these activities. This economic power imbalance restricts women's ability to invest in new agricultural practices, as they may not have direct access to the profits from their labor. For example, in rural Kenya, women who contributed to farming but did not have control over the sale of produce were less likely to adopt CSA practices, as they lacked the financial autonomy to invest in the necessary resources for CSA (Mutua *et al.*, 2023).

Traditional gender roles often lead to the segregation of labor and responsibilities, with men and women acquiring different types of knowledge. In many agricultural settings, women are more likely to focus on household management and subsistence farming, while men have greater access to agricultural extension services, training, and innovations, including CSA techniques. Access to agricultural extension services: Studies have found that women often face difficulties accessing agricultural extension services, which provide crucial information about new technologies, practices, and CSA methods. This lack of access is partly due to gender norms that prioritize men's participation in agricultural training, leaving women with fewer opportunities to learn about CSA. In rural India, for example, a study showed that women's limited access to agricultural extension services significantly hindered their ability to adopt CSA practices such as water-saving irrigation or climate-resilient crop varieties (Doss, 2023). These gendered knowledge gaps prevent women from gaining the skills and expertise needed to implement climate-smart practices effectively.

Perceptions of women's roles in agriculture: In many societies, agricultural practices are seen as a male-dominated domain, with women's roles often limited to subsistence farming or home gardening. This gendered perception can discourage women from participating in CSA programs, which are typically framed as modern and scientific. A study in Tanzania revealed that women were less likely to adopt CSA because they were perceived as less capable or knowledgeable about technical farming methods. Men were more likely to attend training and extension services, while women's contributions to agriculture were often undervalued (Mutua *et al.*, 2022).

Social stigma around women's leadership in agriculture exist in many communities especially in Africa. Cultural expectations about women's roles in farming can also contribute to the underrepresentation of women in agricultural innovations. In some communities, women who take the lead in agricultural decisions or adopt new farming practices may face social stigma or be perceived as challenging traditional gender norms.

METHODOLOGY

This study investigated the Socio-economic factors influencing the adoption of CSA among rural women. It also investigated how multiple gender roles affected women's adoption of CSA in Baringo South Sub-County. Liberal feminism theory and the Technology Acceptance Model were used to investigate the study. Correlation survey research design was used in the collection of the data. The study population was 700 women who practiced small-scale farming in the areas. From the study population, a study sample size of 128 women participants was selected using a simple random sampling procedure. The key informants were selected purposively, who comprised (1) agricultural extension officers, four (4) cooperative leaders, and ten (10) women leaders in groups focusing on agricultural value chains. This brought the total number of participants to 143. Data was collected using structured questionnaires for women respondents and Key informant interview schedules for the key informants. Data was collected using structured questionnaires for women respondents and Key informant interview schedules for the key informants. Quantitative data were analyzed using descriptive and inferential statistics, specifically correlation and regression analysis. Qualitative data were analyzed thematically.

RESULTS AND DISCUSSION

Results

Gender Roles on the Adoption of Climate-Smart Agriculture Among Women Smallholder Farmers

The descriptive results reveal that gender roles strongly influence women's adoption of Climate-Smart Agriculture (CSA) practices, as reflected in consistently high mean scores across all statements ($M = 3.55$ to 4.17). Overall, the findings indicate that socio-cultural expectations and gendered divisions of labor significantly constrain women's participation in CSA activities.

The highest mean score ($M = 4.17$, $SD = 1.10$) shows that household responsibilities substantially limit women's time to engage in CSA practices. This suggests that unpaid care work and domestic duties reduce the time available for agricultural innovation and implementation of sustainable practices. Similarly, women report that workload assignments significantly limit effective CSA implementation ($M = 3.98$, $SD = 1.13$), further reinforcing the burden of time poverty among women farmers.

Gender roles are also perceived to directly influence the types of CSA practices women can adopt ($M = 3.98$, $SD = 1.13$), indicating that social norms may restrict women to less resource-intensive or less profitable agricultural activities. In addition, gender roles reduce women's participation in CSA-related decision-making ($M = 3.93$, $SD = 1.19$), highlighting limited agency in choosing farming strategies or investing in climate-smart technologies.

Access to land is also shaped by gender inequality, as reflected in the mean score ($M = 3.91$, $SD = 1.15$), suggesting that women's restricted land ownership further limits their ability to adopt CSA practices. Cultural norms that restrict access to extension services and training ($M = 3.70$, $SD = 1.19$) also emerge as a significant barrier, limiting exposure to knowledge and innovation.

Finally, the perception that decisions on CSA adoption are mainly made by men ($M = 3.55$, $SD = 1.29$) highlights persistent patriarchal structures in household and agricultural decision-making.

Table 1 Gender Roles on the Adoption of Climate-Smart Agriculture Among Women Smallholder Farmers

Statement	Mean	Standard Deviation
Household responsibilities limit my time to adopt CSA practices	4.17	1.10

Decisions on adopting CSA practices are mainly made by men	3.55	1.29
Cultural norms restrict women's ability to access CSA training/extension	3.70	1.19
Women's limited access to land affect's ability to adopt CSA practices	3.91	1.15
Gender roles influence CSA practices women can adopt	3.98	1.13
Workload assigned to women limits effective CSA implementation	3.98	1.13
Gender roles reduce women's participation in CSA-related decision-making	3.93	1.19

Regression Results for Gender Roles and Adoption of Climate-Smart Agriculture

The regression results indicate that gender roles have a positive and statistically significant influence on the adoption of Climate-Smart Agriculture (CSA) practices among women farmers. The model summary shows a correlation coefficient ($R = .358$), suggesting a moderate relationship between gender roles and CSA adoption. The coefficient of determination ($R^2 = .128$) indicates that gender roles explain 12.8% of the variation in CSA adoption, while the adjusted R^2 (.121) shows that approximately 12.1% of the variation is explained after adjusting for model complexity. This implies that gender roles are a meaningful but not exclusive determinant of CSA adoption.

The ANOVA results confirm that the model is statistically significant ($F = 19.302$, $p < .001$), indicating that gender roles significantly predict women's adoption of CSA practices. The relatively high F-value demonstrates that the model provides a significantly better fit than a model without predictors, reinforcing the importance of gender dynamics in shaping agricultural behavior.

The coefficients further show that gender roles have a positive and significant effect on CSA adoption ($B = 0.358$, $\beta = .358$, $t = 4.39$, $p < .001$). This implies that for every unit improvement in gender role conditions—such as increased decision-making power, reduced workload burden, and improved access to resources—there is a corresponding increase of 0.358 units in CSA adoption. The standardized beta value (.358) indicates a moderate effect size, confirming that gender roles are a key driver of CSA uptake among women farmers.

The constant term ($B = 1.864$, $p < .001$) represents the baseline level of CSA adoption when gender role influence is absent, suggesting that some adoption may still occur due to other factors such as income, land tenure, or institutional support.

Overall, the findings demonstrate that gender roles are a significant determinant of CSA adoption. However, since a substantial proportion of variation remains unexplained, it is evident that gender dynamics operate alongside other structural and socio-economic factors in influencing women's adoption of Climate-Smart Agriculture practices.

Table 4. 18 Regression Results for Gender Roles and Adoption of Climate-Smart Agriculture

Model Summary^b

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.358 ^a	.128	.121	.48673

Predictors: (Constant), Gender Roles

Dependent Variable: Adoption of Climate-Smart Agricultur

ANOVA^a

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	4.572	1	4.572	19.302	.000 ^b
Residual	29.869	126	.237		
Total	34.441	127			

Dependent Variable: Adoption of Climate-Smart Agriculture

Predictors: (Constant), Gender Roles

Coefficients^a

Model	Unstandardized Coefficients (B)	Std. Error	Standardized Coefficients (Beta)	t	Sig.
(Constant)	1.864	.298		6.26	.000
Gender Roles	.358	.081	.358	4.39	.000

a. Dependent Variable: Adoption of Climate-Smart Agriculture

DISCUSSION

Among the socio-economic factors examined in this study, gender roles emerged as the most influential determinant of climate-smart agriculture adoption among women farmers.

Gender roles shape the distribution of labor, resources, and decision-making authority within households and communities. In many rural agricultural systems, women carry a disproportionate share of domestic responsibilities, including childcare, cooking, and household management. These responsibilities often reduce the time and energy available for agricultural innovation and participation in training programs.

The concept of “time poverty” has been widely used to explain women’s limited participation in agricultural innovation. Women farmers often balance multiple responsibilities that include productive agricultural work, reproductive household labor, and community responsibilities. This combination of responsibilities can significantly constrain their ability to adopt new agricultural practices. This is consistent with observations by Kiptot *et al.* (2023), who argue that women’s “time poverty” caused by unpaid care work remains one of the most persistent barriers to agricultural innovation uptake in sub-Saharan Africa. Similarly, Doss and Meinzen-Dick (2021) highlight that extensive domestic workloads leave women with less flexibility and fewer opportunities to attend trainings or experiment with new farming practices.

Gender roles significantly influence women’s adoption of Climate-Smart Agriculture (CSA) practices by constraining their time, agency, access to resources, and decision-making power. Women suffer from time poverty due to their multiple-gender roles of reproduction, production and community development. The consistently high mean scores observed across all indicators reflect a broader body of evidence showing that gendered divisions of labor and entrenched socio-cultural norms remain key barriers to agricultural innovation among women in Sub-Saharan Africa such as Kenya and Baringo-South Sub-County. Studies by Komatsu *et al.* (2021) and Ragasa and Lambrecht (2022) emphasize that women’s disproportionate responsibility for unpaid domestic and care work results in chronic time poverty, which directly limits their ability to engage in labor-intensive or time-sensitive CSA practices such as soil conservation, agroforestry, and water management.

The highest mean score ($M = 4.17$), indicating that household responsibilities limit women’s participation in CSA, aligns with findings by Quisumbing *et al.* (2022), who argue that unpaid child care and household chores are the most significant but often overlooked constraints to agricultural productivity among rural women. Similarly, UN Women (2023) reports that women in rural farming households spend significantly more hours on domestic and caregiving activities such as child care, caring for the sick and the aged, than men, reducing their availability for productive agricultural engagement and innovation adoption. This reinforces the interpretation that time poverty is a structural barrier to CSA participation rather than a matter of individual choice. Gendered divisions of labour in rural households significantly influence the adoption of climate-smart agriculture practices. Research conducted across several African countries indicates that women farmers often balance agricultural work with heavy domestic responsibilities, which limits their capacity to implement labour-intensive CSA practices such as conservation agriculture, agroforestry, and soil management technologies (Aryal *et al.*, 2023). Quisumbing *et al.* (2023) observed that gendered divisions of labor reduce women’s ability to engage fully in climate adaptation strategies.

The study results indicated that workload assignments and gender roles influence the type of CSA practices women adopt ($M = 3.98$) is also supported by recent empirical studies. Fischer *et al.* (2022) found that women are more likely to engage in low-capital, low-risk agricultural activities due to social norms that prioritize subsistence roles over commercial farming. This limits their access to more profitable and technology-intensive CSA interventions. Similarly, Kabeer *et al.* (2021) highlight that gender norms often channel women into less remunerative agricultural roles, reinforcing inequalities in technology adoption and productivity. These findings were also consistent with that of Kiptot *et al.* (2023) found that women's heavy domestic workload significantly limits their participation in agricultural innovation programs. Additionally, women are often confined to specific agricultural activities that are less resource-intensive, while men tend to control high-value resources such as land, capital, and technology. This limits women's ability to adopt certain CSA practices that require greater financial investment, land control, or labor allocation (Doss *et al.*, 2021; Meinzen-Dick *et al.*, 2022).

The findings of this study found that gender roles reduced women's participation in decision-making ($M = 3.93$) is consistent with evidence showing that intra-household power dynamics significantly shape agricultural investment decisions. The house-hold heads, who were mostly men in many families in the study area, made most of the decisions including those for farming. Doss and Meinzen-Dick (2022) emphasize that even when women contribute labor and income to farming activities, decision-making authority often remains concentrated in male household members, limiting women's autonomy in adopting new technologies. This is further supported by Peterman *et al.* (2021), who demonstrate that women's limited bargaining power within households reduces their ability to independently adopt agricultural innovations, including CSA practices.

Research by Mutenje *et al.* (2022) further highlights that cultural norms and mobility restrictions often prevent women from attending extension services and training sessions, thereby limiting their exposure to information necessary for CSA adoption. Gendered social expectations often limit women's mobility and participation in public agricultural spaces, reducing their exposure to essential information and training needed to adopt CSA. This in turn reduces their uptake of CSA technologies.

Restricted access to land ($M = 3.91$) also reflects continued gender disparities in resource ownership. According to FAO (2023), women are significantly less likely to own or have control over agricultural land, which directly influenced their ability to invest in long-term CSA practices such as agroforestry and soil conservation. Goldstein *et al.* (2023) further show that land ownership is strongly correlated with investment in sustainable agriculture, meaning that gendered land inequality indirectly constrains women's participation in climate adaptation strategies.

The limitation of access to extension services and training due to cultural norms ($M = 3.70$) is similarly well documented. For instance, Ragasa *et al.* (2022) report that women are less likely to access agricultural extension services due to mobility restrictions, time constraints, and bias in service delivery systems. This reduces their exposure to climate information and technical knowledge necessary for CSA adoption. Moreover, FAO (2023) highlights that extension systems in many developing countries are still male-dominated, further marginalizing women farmers. This marginalization affected women even those in CSA. Studies show that extension meetings and farmer field schools are often scheduled at times that conflict with women's household responsibilities, further reducing their ability to access agricultural knowledge and innovations (Tambo & Mockshell, 2023). This situation contributes to a gender gap in access to agricultural information, which subsequently affects the rate at which women adopt climate-smart agricultural technologies.

The perception that men dominate CSA-related decision-making ($M = 3.55$) reflects deeply rooted patriarchal-male dominance- structures in rural agricultural systems. For instance, studies by Johnson *et al.* (2021) and UN Women (2023) confirm that agricultural decision-making remains largely male-controlled in many households, even where women contribute significantly to farming activities. This limits women's agency and reinforces structural inequalities that hinder equitable participation in CSA adoption. Women expressed that certain labor-intensive or "male-associated" CSA activities are less accessible to them due to culturally assigned roles. Okello *et al.* (2021) support this interpretation, noting that women are often guided toward low-risk, low-technology practices, while men dominate more resource-intensive, mechanized, or skill-demanding CSA technologies. Similarly, Doss and Meinzen-Dick (2021) note that gender inequalities in decision-making power and access to resources often limit women's capacity to adopt climate-resilient agricultural practices. Bashir *et al.* (2021)

highlight that in many rural societies, women may have limited authority to make decisions regarding crop selection, land management, and investment in agricultural technologies.

Overall, the findings align closely with recent empirical and policy literature, which consistently demonstrates that gender roles operate as multidimensional hindrance to CSA adoption. These barriers include time poverty, restricted access to resources, limited decision-making power, and reduced exposure to agricultural information. Together, they highlight that improving women's participation in CSA requires not only technical interventions but also transformative approaches that address underlying gender norms and structural inequalities in rural agricultural systems.

CONCLUSION

The study concludes that gender roles are a critical determinant of women's participation in Climate-Smart Agriculture (CSA) practices. High mean scores across all indicators confirm that socio-cultural norms, unpaid care responsibilities, and unequal decision-making power significantly constrain women's ability to adopt and effectively implement CSA technologies. In particular, time poverty, limited access to resources, restricted mobility, and male-dominated household decision-making structures collectively reduces women's agency in agricultural innovation. Overall, the evidence highlights that gender inequality is not only a social issue but also a key barrier to achieving inclusive and sustainable climate-resilient agriculture.

Cultural norms and traditional gender expectations shape the division of labour within households, access to productive resources, and participation in agricultural decision-making processes. Women farmers often carry multiple responsibilities that combine domestic duties with agricultural labour, resulting in limited time for attending training programs and experimenting with new farming practices. Furthermore, male dominance in household decision-making structures restricts women's ability to independently implement agricultural innovations. The study therefore concludes that gender roles remain a fundamental socio-cultural barrier that affects women's participation in climate-smart agriculture and limits their capacity to fully benefit from agricultural development initiatives.

RECOMMENDATIONS

There is a need for gender-transformative policies and interventions that actively address structural inequalities limiting women's participation in CSA. Specifically, governments and development partners should promote shared household responsibilities, strengthen women's decision-making power in agriculture, and ensure equitable access to land, extension services, and climate information. In addition, CSA programs should be designed with flexible training schedules and women-targeted extension approaches to accommodate time constraints and enhance meaningful participation.

Programs aimed at promoting gender equality within agricultural systems should be strengthened. Community-based awareness campaigns should be implemented to challenge cultural norms that limit women's participation in agricultural decision-making. Encouraging shared decision-making within households can improve women's autonomy and participation in climate-smart agriculture initiatives.

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