

**Gendered Constraints to the Adoption of Sustainable Land Management Practices In
Southeast Nigeria**

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Abstract

Although sustainable land management (SLM) practices can offer environmental, economic, and food security opportunities for farmers, the successful adoption of these practices faces several constraints, some of which are gendered. Using a case study of 480 randomly sampled farmers in Southeast Nigeria, this study aims to investigate whether the constraints to the adoption of SLM practices are different for male-and female-headed households. Qualitative and quantitative data were collected using a questionnaire survey, in-depth interviews and focus group discussions. Quantitative data were analysed using Logistic regression (logit) models. Thematic analysis was used to analyse qualitative data. The study findings suggest that constraints reflecting economic and financial concerns and land property rights were more likely to be found for female-headed households rather than for male-headed households. Based on this finding, the study recommends that development interventions and institutions promoting SLM practices should advocate and take measures designed to tackle inequalities based around gender.

Introduction

In Sub-Saharan Africa (SSA) countries, agricultural productivity, particularly crop yield, is largely dependent on the sustainability of agricultural landscapes and other natural resources. Consequently, preventing and reversing land degradation constitute the major challenges to food production and sustainable agricultural development in the region (Kirui & Mirzabaev, 2014). Sustainable land management (SLM) practices are proposed as a sustainable way to tackle the challenges of the degradation of agricultural land and maximise the economic and social benefits from the land resource. According to Framework for the Evaluation of Sustainable Land Management (FESLM) "sustainable land management combines technologies, policies and activities aimed at integrating socio-economic principles with environmental concerns so as to simultaneously: - maintain or enhance production/services (Productivity) - reduce the level of production risk (Security) - protect the potential of natural resources and prevent degradation of soil and water quality (Protection) - be economically viable (Viability) - and socially acceptable (Acceptability)" (Smyth et al., 1993; p.12).

Despite the knowledge of the significant benefits associated with investment in SLM practices and the substantial efforts to promote its uptake, SLM practices continue to be underutilized by farmers, especially in developing countries (Nkonya et al., 2016). Scholars report a multitude of factors standing in the way and preventing farmers' investment in SLM practices, including lack of finance, labour shortages, the high cost of SLM inputs, insufficient operational policy support, lack of access to technical information from extension agents, socio-cultural barriers, lack of economic incentives, weak credit institutions, poor infrastructural support and lack of tenure security (Arslan et al., 2014; Autio et al., 2021; Rahman et al., 2017; Thierfelder et al., 2013; Ward et al., 2016). These barriers experienced by farmers ultimately result to delay, discourage, and/or make it difficult for them to implement or continue using SLM practices.

Other research further suggests that the constraints to the adoption of SLM practices are not gender neutral (Tsigie et al., 2020). The success in the uptake of SLM practices are contested by already existing gendered based inequalities in the rights to key production farm inputs, that subsequently limits the extent to which females are able to implement SLM practices. As suggested by scholars, compared to males, females are less likely to have opportunities to training and information, access to agricultural credit, access to land and tenure security (Abebaw & Haile, 2013; Mudege et al., 2016; Mukasa & Salami, 2016). Differences between male and female's access to market, off-farm opportunities and technological resources such

as improved seed varieties, and farming equipment, have also been reported in other parts of SSA (Peterman et al., 2014).

Several studies have investigated the gender differences in the adoption of SLM practices (Megersa, 2020; Ndiritu et al., 2014). However, there are limited studies that have investigated the gender differences in the constraints to the adoption of SLM practices. Therefore, this study aims to fill this gap in literature. The objective of this research is to investigate whether the constraints to the adoption of SLM are different for male- and female-headed households, using a case study of 480 randomly sampled farmers in Imo and Anambra states in southeast Nigeria. The study uses the gender of the household head as a proxy for studying gender differences that may be present in the constraints to the adoption of SLM practices. The findings of this study would be useful for policy that seeks to achieve a gender balanced SLM outcomes.

The rest of the paper is organized in the following manner. The methodology adopted for the study is presented in section 2. Results and discussion are presented in section 3. Section 4 concludes with the key findings and policy implications of the study.

2. Methodology

2.1 Study area and Sampling

The study was conducted in Imo and Anambra states in Southeast Nigeria. Multistage random sampling method was employed to select 480 farming households for the study- 240 farming households in Imo state, 240 farming households in Anambra state. To illustrate, in the first stage, Anambra and Imo states were purposively selected from the five states in the Southeast region of Nigeria. In the second stage, two local government areas (LGAs) were randomly selected from each of the three senatorial zones in Anambra and Imo states, giving a total of twelve LGAs. The third stage involved the random selection of four autonomous communities from each of the selected twelve LGAs, giving a total of forty-eight autonomous communities. In the last stage, 10 farmers were randomly selected in each of the selected communities to make a total of 480 respondents. Furthermore, the participants for the interviews and focus group sessions were recruited with the help of the extension agents in each of the states.

2.2 Data collection

Both qualitative and quantitative data were collected for the study. Qualitative data were collected through in-depth interviews with 5 males and 5 female farmers, and six focus group sessions- three mixed-gender and three gender-separated focus groups. Quantitative data was collected through questionnaire survey. The questionnaire instrument collected information

on social, economic and plot-level variables. Additional questions were asked to measure the farmers' attitude towards risk by responding to the statements: 'I am someone who generally is fully prepared to take risk' on a five-point Likert scale ranging from strongly disagree=1 to strongly agree= 5. In the data analysis, farmers' who selected options 1 and 2 were categorised as risk-averse farmers, otherwise 0. Also, questions were asked to measure the farmers attitude towards SLM practices by responding to the statements: "Do you believe that SLM practices improve and/or maintain soil fertility" based on a binary response scale- 1= yes, 0= No. The questionnaire also contained 17 statements capturing potential constraints to the adoption of SLM practices. These statements were informed from the review of literature and the qualitative interviews. Farmers were asked to rate the level of constraint faced when adopting or considering adopting SLM practices and the questions were administered on a Likert 4-point scale ranging from '1 = very low extent' to '4 = very great extent. Informed consent was obtained from all study participants before data collection exercise.

2.2.1 Estimation of the indices of the constraints to SLM adoption

The indices of the constraints to adoption of SLM practices was used as the dependent variable in the logit regression model, i.e., 1 = constrained and 0 = otherwise. These variables were constructed from the 17 statements investigating the constraints to the adoption of SLM practices using Principal Component Analysis (PCA) analysis. The PCA grouped the constraints into four major component factors. The sample adequacy for PCA was confirmed based on a Kaiser-Meyer-Olkin (KMO) value of 0.88 and a statistically significant Bartlett test of sphericity ($p=0.000$), (Kissi et al., 2017). The composite reliability score obtained from all the four components range from 0.705 to 0.923, and were above the recommended levels of 0.7, thus indicating acceptable levels for the reliability of constructs (Hair Jr et al., 2014). Six different statements that capture the financial and economic challenges to investing in SLM are loaded into Factor 1 labelled Economic/financial constraints. Five statements about the nature of the risks, uncertainties and temporal delays associated with implementing certain SLM practices were loaded into Factor 2 labelled Constraints related to the issues associated with certain SLM practices. Three statements that indicate the extent to which the farmer have access to credit and access to technical assistance on the correct way to implement SLM practices were loaded into Factor 3 labelled Technical constraints. Factor 4 labelled Constraints related to land property rights was measured from three statements that indicate the land access challenges and tenure security. The next step of analysis was to calculate the prorated mean score of the items for each of the 4 main constraints factors for each farmer. For example, to derive the mean score for Factor 1 with 6 items, the total score

of the items were calculated and then divided by 6. Next the farmers were classed as “constrained” and “not constrained” using a cut-off point of 2.5 for the mean scores. Consequently, a farmer is classed as “constrained” if their mean score is greater than or equal to the mean of the response values (2.5), and “not constrained” if otherwise. The gain in calculating the constraints to the adoption of SLM practices this way is that it restricts the values between zero and one, therefore enabling comparison between two groups.

2.3 Data analysis

Analysis of the qualitative data obtained from the interviews and focus group discussions was done using Thematic analysis. The analysis of the quantitative data was done using binary logit regression analysis. The logit model was estimated to analyse the influence of the gender of the household head on the constraints to the adoption of SLM practices, while controlling for other determinants of the constraints to the adoption of SLM practices. Four separate logit models were estimated for each of the four indices of the constraints to SLM adoption. Logit regression analysis is an appropriate estimation method for equations with dichotomous dependent variables. The constraints to the adoption of SLM practices are dichotomous dependent variables coded as 1= if farmer is constrained by the factors impeding the adoption of SLM practices and 0= if farmer is not constrained by same factors. The logistic regression model is estimated as follows:

$$\text{logit}(p) = \text{natural log (odds)} = \ln\left(\frac{\pi}{1-\pi}\right) = \beta_0 + \beta_1x_1 + \beta_2x_2 + \dots + \beta_kx_k \quad \text{--- equation 1}$$

Where, β_0 = the intercept, β_1 - β_k = coefficient of each independent variable. The independent variables in the logit models were selected based on the review of literature (e.g., Thinda et al., 2021; Lamichhane et al., 2022).

3. Results and Discussion

This section presents the binary logistic regression results. Based on the significance of the likelihood ratio chi-square test in all of the four models estimated, this study infers that all the models had good fit to the data. The significance of the gender of the HH in the models is of particular interest to this study based on the study objective, and as such the discussion of the result heavily focus on the gender variable.

3.1 Gender of the HH and Economic and financial constraints to the adoption of SLM practices

The empirical results presented in Table 1 indicates that the gender of the HH is a significant predictor of the likelihood of farmers being constrained by economic and financial reasons ($b = 0.483$, $p < 0.01$). In other words, female-headed households (FHHs) are more likely than male-headed households (MHHs) to face economic and financial constraints to the adoption of SLM practices.

Table 1: Results of logistic regression model 1- Dependent variable: Economic and financial constraints.

Variables	Coefficient estimate	Standard error	P value
Gender of the HH (MHHs=1; 0 otherwise)	-0.48	0.28	0.080*
Household size (number of persons)	0.08	0.04	0.076*
Age of farmer	0.02	0.01	0.083*
Years of schooling	0.02	0.03	0.551
Farm experience (number of years)	-0.00	0.01	0.782
Credit constrained =1; 0 otherwise	-0.22	0.23	0.339
Tenure security of farm (if farmer acquired farmland through inheritance or purchased= 1, 0 otherwise)	-0.26	0.23	0.262
Farm income (log value)	-0.12	0.06	0.038**
Plot fragmentation (number of plots owned by the farmer)	0.15	0.06	0.010***
Access to training on SLM practices =1; 0 otherwise	-0.23	0.29	0.418
Membership of social organisation =1; 0 otherwise	-0.35	0.25	0.156
Access to remittance =1; 0 otherwise	-0.92	0.23	0.001***
Constant	1.64	0.88	0.062
(LR) Chi-square	517.20		0.001

*, **, and *** indicate statistical significance at $p < 0.1$, $p < 0.05$ and $p < 0.01$ respectively.

The result of the qualitative findings corroborates this finding. During the focus group discussion with women farmers, they complained that as a result of their smaller scale of

production and their lack of access to other productive resources (including land) relative to males, they are unable to generate enough income to afford the cost associated with investing in SLM practices. This is consistent with the study findings Olumba and Alimba (2022) who reported that men farmers earn more farm income compared to women.

According to one woman farmer interviewed:

“As a woman, the only problem I have is the lack of money to buy those inputs I need to implement these sustainable practices”.

Also, as gathered from the interviews with the female farmers, because of the differences in the physical strength between men and women and the limited time that females have due to household caring responsibilities, males are able to combine other off-farm jobs with farming. For example, one woman farmer interviewed stated that:

“males they are very stronger than females, so they can go for extra work and get money which they use to finance their farming business. So, it is easier for males because they get extra money, but we don't”.

Consequently, males have additional source of income which could explain their lesser likelihood of being faced with economic and financial constraints to the adoption of SLM compared to the females. Consistent with this assertion Eger et al. (2018) show that compared to females, males are more likely to diversify into non-farming activities. In terms of the other variables in the model, the result shows that the regression slope for age of the farmer ($b = 0.019, p < 0.05$), household size ($b = 0.275, p < 0.05$) and plot fragmentation ($b = 0.152, p < 0.01$) are positive and statistically significant indicating that the probability of a farmer to face economic and financial constraints was higher for those who are older, have larger number of persons in the household and operate on fragmented plots. The regression slope for the farm income ($b = 0.118, p < 0.05$), and access to remittance ($b = 0.924, p < 0.01$) was negative and statistically significant indicating that farmers with increased farm income and access to remittance are less likely to face economic and financial constraints to the adoption of SLM practices.

3.2 Gender of the HH and constraints related to the issues associated with certain SLM practices.

The empirical results presented in Table 2 indicates that gender of the HH is not a significant predictor of the likelihood of farmers being constrained by the issues associated with certain SLM practices ($b = 0.163, p < 0.01$).

Table 2: Results of logistic regression model 2- Dependent variable: Constraints related to the to the issues associated with certain SLM practices.

Variables	Coefficient estimate	Standard error	P value
Gender of the HH (MHH=1; 0 otherwise)	-0.16	0.41	0.692
Household size (number of persons)	0.15	0.06	0.021**
Age of farmer	0.00	0.02	0.932
Years of schooling	0.01	0.05	0.863
Farm experience (number of years)	-0.03	0.02	0.162
Credit constrained	1.07	0.35	0.002***
Tenure security of farm (if farmer acquired farmland through inheritance or purchased= 1, 0 otherwise)	0.39	0.37	0.287
Farm income (log value)	-0.10	0.06	0.060*
Membership of social organisation =1; 0 otherwise	0.14	0.37	0.705
Access to training on SLM practices =1; 0 otherwise	1.02	0.39	0.008***
Access to remittance =1; 0 otherwise	0.62	0.35	0.081*
Farmer operates on registered plot =1; 0 otherwise	-2.43	0.78	0.002**
Positive belief in SLM practices =1; 0 otherwise	-1.00	0.48	0.035**
Farmers risk attitude (risk averse= 1;0 otherwise)	1.30	0.37	0.001***
Awareness of climate change =1; 0 otherwise	-0.45	0.46	0.323
Constant	-1.66	1.20	0.190
(LR) Chi-square	249.20		0.000

*, **, and *** indicate statistical significance at $p < 0.1$, $p < 0.05$ and $p < 0.01$ respectively.

In terms of the other variables in the model, the result further shows that large household sizes ($b = 0.148$, $p < 0.05$), access to remittance ($b = 0.617$, $p < 0.1$), access to training ($b = 1.019$, $p < 0.01$), risk averse farmers ($b = 1.304$, $p < 0.01$), and lack of access to credit ($b = 1.072$, $p < 0.01$) were associated with an increased likelihood of farming being constrained by the issues associated with certain SLM practices. This finding indicates that the probability of a farmer to face this adoption constraint was higher for those with large household size, who have access to remittance, who have access to training on SLM practices, who are avoid risk, and who are credit constrained. Furthermore, the result in Table 2 shows that, increasing farm income ($b = 0.103$, $p < .1$), operating on plot with documentation to attest to ownership ($b = 2.427$, $p < .01$), and positive believe in SLM

practices ($b = 1.003$, $p < .05$), were associated with a reduction in the likelihood of farmers being constrained by the peculiar characteristics of certain SLM practices. This finding indicates that the probability of a farmer to face this adoption constraint was lesser for those with high farm income, who cultivate on registered plot, and have positive attitude towards SLM practices.

3.3 Gender of the HH and Technical constraints to the adoption of SLM practices.

The empirical results presented in Table 3 indicates that the gender of the HH is not a significant predictor of the likelihood of being constrained by technical constraints to the adoption of SLM practices.

Table 3: Results of logistic regression model 3- Dependent variable: Technical constraints.

Variables	Coefficient estimate	Standard error	P value
Gender of the HH (MHH=1; 0 otherwise)	-0.10	0.25	0.670
Household size (number of persons)	0.06	0.04	0.123
Age of farmer	0.02	0.01	0.067*
Years of schooling	0.02	0.03	0.538
Farm experience (number of years)	-0.03	0.01	0.013**
Tenure security of farm (if farmer acquired farmland through inheritance or purchased = 1, 0 otherwise)	-0.08	0.20	0.695
Farm income (log value)	-0.07	0.04	0.074*
Membership of social organisation =1; 0 otherwise	-0.36	0.21	0.086*
Access to remittance =1; 0 otherwise	-0.16	0.21	0.453
Farmer operates on registered plot =1; 0 otherwise	-0.31	0.24	0.194
Constant	-0.16	0.70	0.824
(LR) Chi-square	611.57		0.000

* and ** indicate statistical significance at $p < 0.1$, $p < 0.05$ and $p < 0.01$ respectively.

In terms of the other variables in the model, the result shows that the regression slope for age of the farmer ($b = 0.018$, $p < 0.1$), is positive and statistically significant indicating that the probability of a farmer to face technical constraints was higher for those who are older. The regression slope for the farm income ($b = 0.068$, $p < 0.1$), farming experience ($b = 0.028$, $p < 0.05$), and membership of social organisation ($b = 0.362$, $p < 0.1$) was negative and statistically significant indicating that farmers with increased farm income and

who have more years of farming experience and farmers who belong to a social organisation are less likely to face technical constraints to the adoption of SLM practices.

3.4 Gender of the HH and Land property right constraints to the adoption of SLM practices

The empirical results presented in Table 4 indicates that gender of the HH is a significant predictor of the likelihood of farmers being constrained by land property right ($b = 0.437, p < 0.1$). This suggests a greater propensity for land property right constraints to the adoption of SLM practices among FHHs than among MHHs.

Table 4: Results of logistic regression model 4- Dependent variable: Land Property right constraints.

Variables	Coefficient estimate	Standard error	P value
Gender of the HH (MHH=1; 0 otherwise)	-0.44	0.25	0.086*
Household size (number of persons)	0.05	0.04	0.216
Age of farmer	-0.01	0.01	0.267
Years of schooling	-0.06	0.03	0.032**
Farm experience (number of years)	0.01	0.01	0.378
Credit constrained =1; 0 otherwise	-0.14	0.24	0.562
Tenure security of farm (if farmer acquired farmland through inheritance or purchased = 1, 0 otherwise)	-1.12	0.22	0.001***
Farm income (log value)	0.02	0.05	0.710
Membership of social organisation =1; 0 otherwise	0.01	0.24	0.981
Access to remittance =1; 0 otherwise	-0.24	0.23	0.307
Farmer operates on registered plot =1; 0 otherwise	-0.93	0.29	0.002***
Constant	0.86	0.81	0.288
(LR) Chi-square	515.15		

*, **, and *** indicate statistical significance at $p < 0.1$, $p < 0.05$ and $p < 0.01$ respectively.

This finding is consistent with studies that report land access challenges and the lack of tenure security of plot for FHHs than for MHHs (Bernier et al., 2013; Chigbu, 2019). Similarly, Kpoor's (2019) study in Ghana found that MHHs have greater economic assets compared to FHHs ones. Interviews with farmers in the study areas revealed that the prevailing practice of customary inheritance rights and traditional land tenure systems exclude and/or make it more difficult for women to gain access to land. According one female farmer interviewed:

"It is not easy for me to get land. During communal land allocation, men get more from community than women".

Another female farmer stated that:

"I farm on my husband's farmland; I do not have mine. His family can easily take it from me. But most men farm on their own lands. It's almost impossible for the land to be taken from them".

Consistent with this study findings, Dzanku (2019) analysis on the differences in characteristics of MHHs and FHHs found that land-related constraints are significantly more prevalent among FHHs than it is among MHHs in four out of the six countries understudied. Regarding other variables in the model, this study result shows that the regression slope for education qualification of the farmer ($b = 0.063, p < 0.05$), tenure security ($b = 1.118, p < 0.01$), farmer operating on registered plot ($b = 0.931, p < 0.01$), is negative and statistically significant. This result indicates that the probability of a farmer to face land property right constraints was higher for those who are less educated, lack tenure security of their plots and operate on unregistered plots.

Conclusion

Using farming household survey data for 480 farming households in southeast Nigeria, this article has analysed the gender differences in the constraints to the adoption of SLM practices. The study finds that constraints reflecting economic and financial concerns and land property rights were more likely to be found for FHHs rather than for MHHs. However, no gender differences were found in the Technical constraints and Constraints related to the issues associated with certain SLM practices. Nevertheless, our study suggests that the constraints to the adoption of SLM practices are not gender neutral.

These findings suggest that much work remains to be done in addressing gender-based challenges in the adoption of SLM practices in Nigeria. While targeted policy efforts toward promoting the adoption of SLM practices seems critical for addressing agricultural land

degradation, it is important that such efforts are gender sensitive so that they address the differentiated needs of the male and female farming households. Additionally, there is an urgent need for increased advocacy and interventions geared towards tackling gender based inequalities embedded in the norms of the society.

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