Sustainability Science and Resources, Vol. 9:2, 2025, pp. 18 - 38

Gender Analysis of Land Fragmentation among Farming Households in Saki-East Local Government Area Oyo State, Nigeria

Muibat Omolara Ganiyu

Department of Agricultural Economics, Faculty of Agricultural Sciences, Ladoke Akintola University of Technology, Ogbomoso, Nigeria.
Email: moganiyu@lautech.edu.ng
https://orcid.org/0000-0002-3126-9876

Received: 3 June 2025 Accepted: 2 December 2025 Published: 4 December 2025

Abstract

Land fragmentation is still incessant among smallholder farmers in Nigeria and its unwarranted practice creates a gap in cropland productivity. Perhaps, the issue of gender inequality instigates fragmentation of agricultural lands as against land consolidation policy, its considerably a further research concern. In view of this, the current research investigates the gendered effect of land fragmentation among farming households in Saki-East Local Government Area of Oyo State, Nigeria. Primary data were collected from 110 farmers consisted of 55 each of men and women respondents with designed questionnaire. Descriptive statistics, Simpson index and fractional logit regression were analytical techniques. The analysis showed that the mean age was 52.85 and 49.65years, the farm experience of 22.13 and 17.89 years and on-farm income of ₦5405000 and ₦1264619 for both sexes respectively. The spatial farm distance was found to be 5.09 and 4.49km^2, while farm size cultivated was 4.29 and 2.14 hectares on the average for male and female rural households. Majority of men acquired farms through rented land while most women relied on inherited lands for farming. A Simpson index of 0.332 and 0.446 derived from men and women data respectively explained the extent of land fragmentation within farming households. Fractional logit regression revealed that land fragmentation is exogenously determined by on-farm income, cost of land preparation, land rent, land tenure security and the location of farm sites in case of males. However, only cost of land preparation and land rented significantly driven fragmentation of agricultural land among female counterparts. Also, the statistical t-test signified a variance in means between the two groups. It was recommended that the investments on land should be incentives for smallholder farmers to lessen fragmentation of holdings and also land tenure patterns should be reformed for aggregation of all small parcels into a large holding as well as a productive land use.

Keywords: gender analysis, agricultural lands, land fragmentation, farming households, land consolidation, policy**.**

Introduction

Land is an indispensable resource that is constantly demanding for all agricultural activities worldwide. For example, in several developing countries, land is the primary means of production where agriculture is a predominant occupation for majority like Nigeria.

Given the available croplands, agriculture is central in the process of food production; besides it contributes greatly to the development of the country by providing raw materials for agro-allied industries, providing employment opportunities for the populace, earning foreign currency, contributing to environmental protection, and adding significantly to the gross domestic product thus, shaped the Nigerian economic system (Adegbite, 2021).

Generally, most of rural lands has been considerably occupied with farm establishments among smallholders or grabbed by commercial land users. But the main concern is that the agricultural land is subjected to a numerous scattered small land holdings or fragmented plots in developing nations inclusive Nigeria. This phenomenon is known as land fragmentation, an uneconomical practice which creates a gap in cropland productivity, and further reducing the gross expectation from farm outputs. According to Oyebanjo *et al.,* (2023); Mwendwa *et al.,* (2024) land fragmentation has triggered low productivity with high production costs resulting from scattered farm plots. Deininger *et al.,* (2017) indicated that land fragmentation is often considered as the source of inefficiencies in crop productivity which is associated with high production costs due to inefficient resource allocation and sub-optimal usage of production inputs. According to Rakhshanda, *et al.* (2020) defined land fragmentation as existence of separate number of plots cultivated by the same farmer at different location and this is a constraint for agricultural mechanization, technological advancement and economic growth.

Moreover, the virtue of being males or females gendered is permanent as destined by the creator, and both genders are blessed with higher intelligence quotient to think as well as make certain decisions. Therefore, the aspects of gender disparity and exclusion in farmland occupancies and possessions call for further debates because women participation in agriculture cannot be underscored. There are growing evidence or literatures on the potential contribution towards agriculture through women endeavors (World Bank, IFAD and FAO 2009, Raidimi, 2014).

Notwithstanding the contributions of women to agriculture, they lack access to land which consequently led to the crisis of land dispute and further fragmentation of agrarian lands. Perhaps, the challenge of gender inequality is seemly causing fragmentation of agricultural lands as against land consolidation policy, its considerably a numerous research concern. This scenario motivated the execution of the on-going research work with the main objective of investigating gendered effect of land fragmentation among farming households in rural communities.

Gender issue, particularly women's limited access to land ownership and control, exacerbate land fragmentation, perpetuating inequalities and hindering sustainable development (FAO, 2018). The enormity of the unequal access of men and women to agricultural land and other resources limits women's efforts to exploit land-based livelihood strategies, and undermine overall inclusive socio-economic development. Otaha, (2013) opined that reducing gender inequality and recognizing the contribution of women to agriculture is critical to achieving global food security, there is consistent and compelling evidence that when the status of women is improved, agricultural productivity increases.

Women's land rights are often compromised due to patriarchal norms, cultural biases, and discriminatory laws, leading to reduced landholdings and compromised livelihoods (UN Women, 2020). Land fragmentation, resulting from inheritance, sales, or conflict, further marginalizes

women, limiting their participation in decision-making processes and access to credit and markets (IFAD, 2017). At the moment, it becomes more glaring that the gender imbalance has triggered the problem of land fragmentation by excessive splitting of the land into even smaller pieces (Harrington and Chpra, 2010), thus the scenario should not be oversighted for the progress of agriculture.

As a matter of facts, the several studies have been conducted on land fragmentation effect on crop productivity, farm revenue and efficiency level however, research is lagged behind in gender differences and land fragmentation practice in rural settlements. Against this background, this study attempts to address the following research questions:

i. what are the socio-economic characteristics of farming households by gender?

ii. what is the land fragmentation index among the respondents by gender?

iii. what factors determine land fragmentation on a gender basis?

Moreover, this study logically argued that no significant difference exists in land fragmentation indices of both genders, the report of which is going to be discussed in next section. The essence of undertaken this research is vital to bridging the gaps created by gender differences and small parcels distribution of land holdings in several Nigerian farms and make farmers far from reaching efficient and sustainable land use.

Materials and Methods

Study area and population sampled

This study was carried out in Saki-East Local Government Area of Oke-Ogun zone, Oyo state Nigeria, which started in January 2024 and ends currently in March 2025. Saki east is mapped in the Northwestern part of Oyo State. It lies within the tropics between Longitude 3° 20' E and

Latitude 8° 40' N of the Greenwich Meridian. It has an estimated population of 153,100 according to the updated 2016 population figures.

It has been noticed that its agrarian nature, contribute to the highest percentage of the food production from the region. The region's agricultural landscape supports a variety of crops as well as cash crops such as cashew, shear-butter trees and fruit trees, livestock production (poultry, cattle, sheep and goat) which significantly contribute to the local economy. There is biannual rainfall pattern that is dry and wet seasons with conducive vegetation belts.

Different ethnic groups live in the region and co-exist with harmony except the herder-farmer conflict that is creating serious fear in people in the last one decade. Several economic activities such as schools, agriculture, trade, art and craft dominate the works of people both the indigenes and strangers. The population of this study comprised all farm household heads both men and women in Saki-east local government area, Oyo State, Nigeria.

This study employed a multi-stage sampling procedure to select 110 respondents which includes 55 sample size each of male and female farm households across Saki east L.G.A, Oyo State, Nigeria. First, Saki east LGA is purposively chosen for this study because of its agrarian nature while at the second stage, six wards were randomly selected from the Local Government Area. Then, at the third stage, a list of registered farming household heads was obtained from the Local Government Agriculture Office and Agricultural Development Project Office stationed in the region and a simple random sampling was used to select fifty-five (55) each of male and female farming household heads in their recorded list proportionately. This results into a total of 110 sample size included male and female respondents.

Method of Data Collection and Analysis

This study used questionnaire combined with the interview schedule as instrument for data collection. Primary data were collected through a structured questionnaire administered to both male and female farming households. The questionnaire solicited information on farmers socio-economic characteristics (like gender, age, household size, farm experience, access to credit, extension), farm size, land ownership, area farmed, total land size, agricultural activities, farm distance from homestead as well as other social and institutional factors.

Descriptive statistics like frequency distribution, percentage, mean and standard deviation were used to analyze the socio-economic characteristics of both male and female famers, land fragmentation index such as Simpson Index (SI) was adapted to compute the degree of fragmentation of farmland among male and female farmers. The statistical t-test and fractional regression analysis were employed to test whether or not a significant difference exists in land fragmentation and analyze the key determinants of land fragmentation on gender basis.

Measuring land fragmentation index and its determinants

Land fragmentation is a situation where a farming household cultivated several plots which is often scattered over a wide area. King and Burton (1982) cited six factors that are relevant in the measure of land fragmentation index. These factors include holding size; number of parcels belonging to the holding; size of each parcel; shape of each parcel; the spatial distribution of parcels; and the size distribution of parcels.

Simmons (1964) proposed a land fragmentation index (FI) which considered the number of parcels in a holding, relative sizes of each parcel (a), and the number of plot (n). Land fragmentation includes plot size, shape, distances from buildings, and distance between plots as well as the size of each plot (Ciaian *et al.,* 2018). Thus, assessments of the economic consequences of land

fragmentation have a long history in agricultural economics and related disciplines (Knippenberg *et al.,*2020).

The Simpson's index is estimated based on the number of plots, plot size, and farm size. The range of Simpson's index is between 0 and 1 with the larger index referring to the more fragmented farm. SI is one of the best alternative measures of land fragmentation degree as previously adopted in the past studies Tran and Vu, (2019); Ayoola *et al*, (2022). Its mathematical expression is given in the formula:

$$Simpson's\ index\ = \frac{\sum A^2}{A^2} = \ \ldots\ldots\ldots\ldots\ldots (1)$$

As alternative, Januszewki Index (JI) is a popular type of land fragmentation computation index. Like Simpson index, JI values also range between 0 and 1, but as its value tending towards 1 it indicates a lower degree of land fragmentation which is in contrast to Simpson index.

Fractional regression analysis: The model was employed to examine some determining factors of land fragmentation among male and female farmers in the study area. The dependent variable that takes on values ranging from 0 to1 of course, is a probabilistic in nature and therefore can be estimated with the fractional logit regression. Fractional logit regression is a statistical technique used to analyze data with dependent variables that are fractions or proportions, typically ranging between 0 and 1. Unlike traditional logistic regression, which deals with binary outcomes, the fractional logit model is suitable for dependent variables that represent continuous proportions or rates. It extends the logistic regression framework by allowing the dependent variable to take fractional values, making it applicable in various fields such as economics, epidemiology and social sciences. The model estimates the relationship between independent variables and the fractional outcome, taking into account the underlying distributional assumptions and addressing

issues related to heteroscedasticity and over-dispersion (Wooldridge, 2011). The model is generally expressed as:

$$yi = XiBi \ldots\ldots\ldots\ldots\ldots\ldots\ldots (2)$$

Where y_i = degree of land fragmentation among farmers which takes on values between1 and 0. X_i = covariates of land fragmentation index, and B_i = all estimated coefficients.

Results and Discussions

Socio-economic characteristics of respondents by gender

For the males, the highest percentage (30.91%) falls within the 41-50 age group, while 29.09% are aged 51-60. A significant portion (29.09%) is also over 60. For the females, the largest group is over 60 (36.36%), followed by 31-40 (21.82%). The data suggests an aging farming population, particularly among females. This trend may indicate potential challenges in sustaining agricultural productivity as older farmers may be less able to engage in physically demanding tasks or adopt new technologies, with both men and women farmers having average ages of 52.85 and 49.65years.

For males, 81.82% are married, while the same percentage applies to females. Single individuals make up 3.64% of males and 5.45% of females. The prevalence of marriage in both genders suggests that farming may be a collective family endeavor, potentially impacting labor dynamics and resource sharing within households. This strong marital presence may also influence decision-making processes in agricultural practices.

Among males, 41.82% have secondary education, while 21.82% have no formal education. In contrast, females show a higher percentage (32.73%) with primary education, but only 14.5% have tertiary education. This disparity in education levels may affect farmers' ability to adopt innovative agricultural practices and improve productivity. The lower educational attainment among females

indicates a need for programs aimed at enhancing educational opportunities for women in agriculture, which could lead to better farm management and increased yields. All female respondents reported having farm sizes of ≤5 acres, while 30.91% of males manage 6-10 acres, while farm size cultivated was 4.29 and 2.14 hectares on the average within male and female farming households.

This stark contrast suggests gender disparities in land ownership and access, which may restrict women's economic potential and agricultural productivity. Addressing these disparities through policies that improve land access for women could enhance their contribution to agricultural output.

The majority of males (80%) are engaged in farming occupations, while 32.73% of females identify farming as their primary occupation. The reliance on non-farming jobs among males may indicate diversification of income sources, which can provide financial stability in uncertain agricultural conditions. For females, a higher engagement in farming underscores their significant role in agricultural production, highlighting the need for support services tailored to their specific needs.

The largest proportion of males (60%) has over 20 years of farming experience, while 36.36% of females fall into this category. This extensive experience among males suggests a wealth of knowledge that can be beneficial for mentoring younger farmers. The lower experience levels among females may indicate barriers to entry or support in the agricultural sector, emphasizing the need for targeted training programs to build their capacities. The mean value of farm experience of 22.13 and 17.89 years respectively for both sexes.

A majority of both males and females (70.91%) have farms located within 5 km. This proximity may facilitate easier access to markets and resources, which can enhance productivity for both

genders. However, those with farms farther away may face logistical challenges that could hinder their operations, highlighting the importance of infrastructure development in rural areas. The spatial farm distance accounted to be 5.09 and 4.49km^2,

A significant portion of males (69.09%) belongs to associations, compared to only 40% of females. This discrepancy suggests potential barriers to female participation in agricultural associations, such as social norms or lack of awareness. Membership in these associations can enhance access to resources, information, and collective bargaining power, so increasing female participation is crucial for empowering women in agriculture.

The distribution shows that 49.09% of males and 52.73% of females have had contacts with extension services. Access to extension services is crucial for improving agricultural techniques and productivity. The relatively high contact rates among females are encouraging, but there is room for improvement to ensure that all farmers receive the support they need. Expanding extension services to reach more farmers could lead to better outcomes in agricultural practices.

Modes of land acquisition by gender

Table 2 indicates significant modes of land acquisition by gender among the respondents interviewed for this study. For males, the majority (72.73%) of respondents acquired land through leasing, while females representing 67.27% also used leased land. The similarity in trends between genders suggests that financial factors and limited land availability affect both males and females equally, highlighting the need for supportive policies that enhance access to land for all.

Additionally, for males and females representing 10.91% and 16.36% acquired land through purchase, and a small percentage (3.64%, 1.82%) for male and female engaged in squatting.

For males, 67.27% of respondents reported inheriting land, this indicates a strong tradition of land inheritance among males, suggesting that family lineage plays a crucial role in land ownership.

However, the fact that a significant portion does not inherit land could point to social or economic factors that limit access to family resources. For females, a higher percentage (80.00%) reported inheriting land, compared to male counterparts. This trend indicates that women are increasingly being recognized in inheritance practices, which could enhance their economic security and decision-making power regarding land use. The disparity between genders in inheritance may reflect changing societal norms that favour women in land rights.

Among males, 74.55% reported farming on rented land, whereas 70.91% of females depended on it. This high percentage reinforces the idea that renting is a common practice, likely due to economic constraints or a preference for flexibility in land use.

Extent of land fragmentation on a gender basis

The result presented in the Table 3 regarding the extent of land fragmentation on a gender basis in Saki-east Local Government Area, Oyo State, focuses on the Simpson diversity index for both female and male landholders. The Simpson Index (SI) is a commonly used measure to quantify land fragmentation. It ranges from 0 to 1, where values closer to 0 indicate greater fragmentation (more land parcels) and values closer to 1 indicate less fragmentation (fewer, larger land parcels). The female Simpson index shows a mean value of 0.466, suggesting a moderate level of land fragmentation among female landholders. The range of 0.262 to 0.556 indicates that some female landholders have relatively consolidated land holdings, while others experience significant fragmentation. The standard deviation of 0.074 indicates that there is some variability in the fragmentation levels among female landholders, but it is relatively low, suggesting that most values are close to the mean (0.466). The male Simpson index, with a mean of 0.323, indicates a higher level of fragmentation compared to females and it is comparable with the index of land fragmentation computed by Obayelu *et al*, (2019). The range of 0.125 to 0.625 demonstrates

significant variability, with some male landholders experiencing very high fragmentation (0.125) and others having more consolidated holdings (0.625). The standard deviation of 0.109 is higher than that of the female index, indicating greater variability in land fragmentation levels among male landholders. This implies that the mean Simpson index for female landholders (0.466) is significantly higher than that for male landholders (0.323). This suggests that, on average, female landholders experience less fragmentation compared to their male counterparts, indicating a potential advantage in land consolidation or access to larger, contiguous parcels of land. In consonance, Phan, *et al.,* (2022) encouraged land consolidation reform and increase farm size among farmers.

Fractional logit regression for determinants of land fragmentation

The findings from Table 4 outlined the key determinants of land fragmentation using fractional regression for both genders. The coefficient of the total on-farm income is -0.397, with a p-value of 0.000. This negative coefficient indicates a strong inverse relationship between income and land fragmentation, meaning that as income increases, land fragmentation decreases. The statistical significance at the 1% level suggests that this relationship is robust. Kalantari and Abdollahzadeh, (2008); Obayelu *et al.,* (2019) reported that an appreciated annual farm income would cause a decline in the degree of land fragmentation. The result was tandem to Ayoola *et al.,* (2022). The coefficient for farm size is -0.033, indicating that larger farms may experience less fragmentation. It corroborated with the finding by Ayoola *et al.,* (2022) with a significant effect. However, this result is not statistically significant, suggesting that while there is a trend towards less fragmentation with increasing farm size, the evidence is not strong enough to confirm this relationship definitively. This finding may imply that other factors, such as land management

practices or socio-economic conditions, could play a more significant role in determining fragmentation levels.

The positive coefficient associated with investment in land and capital (like cost of land preparation) indicates that increased investments are related to greater land fragmentation, with statistical significance at the 5% level. This suggests that as farming households' cost of sustaining farmland grows, it is likely for them to keep their farms on contiguous small plots. For example, farmers might acquire smaller plots for diverse crop production or specific agricultural practices, which, while potentially beneficial for diversification, can inadvertently lead to fragmented land holdings. The negative coefficient of land rented signifies that higher rental costs are associated with reduced fragmentation, with statistical significance at the 1% level. This relationship suggests that as land rent increases, farmers may opt to consolidate their landholdings to maximize efficiency and minimize costs. The economic pressure of higher rental expenses on farmland encourages farmers to seek contiguous plots, thereby reducing fragmentation and promoting more sustainable land use practices. This result disagreed with the Obayelu *et al.,* (2019); Ayoola *et al.,* (2022) works.

The negative coefficient for land tenure security also, statistically significant at the 5% level, indicates that secure tenure arrangements are associated with less fragmentation. Farmers who have confidence in their land rights are more likely to invest in larger, contiguous plots rather than fragmenting their holdings. This finding underscores the importance of secure land tenure in promoting stability and encouraging consolidation, which can lead to better agricultural outcomes. It is in line with *a priori expectation* and conformed to the result found by Obayelu *et al.,* (2019). The coefficient for farm distance is 0.033, with a p-value of 0.144. Although this positive coefficient suggests that greater farm distances may be associated with increased fragmentation,

the result is not statistically significant ($p > 0.05$). This indicates that while there may be a tendency for farms located farther away from central areas to be more fragmented, the evidence is insufficient to confirm this relationship conclusively. The finding by Agboola *et al.,* (2022) also revealed farm distance from homestead is positively related to degree of land fragmentation which also agreed with *a priori expectation.*

The positive coefficient indicating that certain farm locations may be associated with increased fragmentation is marginally significant ($p<0.1$). This suggests that either economic, geographic or environmental factors could influence land fragmentation patterns, possibly reflecting variations in land use practices or accessibility to resources. This finding is also justified for the facts that those farm sites sharing boundaries within any economic setting are bound to be fragmented due to increased demand for land resource in the area. The model includes 55 observations and shows a highly significant Wald chi-squared statistic, suggesting that the model as a whole is statistically significant ($p< 0.01$). However, the Pseudo R^2 value of 0.0213 indicates that the model explains only a small proportion of the variance in land fragmentation. This suggests that while the included variables are important, other factors not captured in the model may also significantly influence land fragmentation.

Hypothesis testing using a two-sample t-test

The results presented from the two-sample t-test between Simpson index for male respondents and Simpson index for female respondents provide significant insights regarding the differences in means between the two groups as shown in Table 5. The negative difference of -0.1428 implies that the mean of Simpson index for male respondents is significantly lower than that of Simpson index for female respondents. This suggests that land fragmentation index among male respondents is associated with lower values compared to fragmentation index among female

counterparts. Also, the t-statistic of -8.0470 is very large in absolute value, indicating a substantial difference between the two means. The p-value of 0.0000 provides strong evidence to reject the null hypothesis (Ho), confirming that the means are significantly different at 95% confidence interval and showcase the gap that exists in agricultural fragmentation of land holdings among smallholder farmers.

Conclusion

The study emphasized on measuring the extent of land fragmentation, evaluating the significant differences in land fragmentation indices by genders and determining the basic drivers of land fragmentation on a gender basis. The Simpson index indicated that female farmers fragment farmlands into small plots more than the male counterparts, additionally t-test conducted using a two-sample means proven that there is significant variance in degree of land fragmentation among them. Further finding revealed that on-farm revenue, secured land holdings, locations of farm sites coupled with other land investments accounted for agricultural land fragmentation for men whereas land investments in terms of expenses on land preparation and land rent charged strongly enacted farmland fragmentation among women. Conclusively, the study empirically deduced that female respondents are dominant in agricultural land subdivisions into smaller and smaller sizes as compared to male counterparts.

In view of this study, it can be recommended that secure land tenure system is strongly encouraged to support both men and women, whose main livelihood activities are dependent on farming. Thus, implement policies that prioritize women's land rights and secured ownership is germane and also legal reforms should be enacted to enhance women's access to land and resources**.** Explore land consolidation initiatives to reduce fragmentation, facilitating the management of larger,

contiguous parcels of land. Overall, the land reform approach can enhance agricultural productivity and reduce operational costs, ultimately benefiting the agricultural sector.

Also, the study underscores the urgent need for gender-sensitive policies that recognize women's contributions to agriculture and enhance their access to land and other resources. Supportive and incentive facilities on agricultural land investments are necessary to encourage farms consolidation at large. Addressing some of these problematic gender perspectives is relevant for development of economy.

Acknowledgments

A profound acknowledgement goes to both students and agricultural extensionists in their capacities to provide valuable data and other essential resources to complete this publication.

References

Ayoola J.B, Dzever D.D, Abu G.A, Biam C.K, Ayoola G.B and Sani R.M (2022). Factors affecting land fragmentation and willingness to exchange land among rice farmers in Gombe and Borno States. *European Journal of Agriculture and Food Science* 4(6) 62-71.

Adegbite, O (2021). "Resources and Opportunities for Competitive Industrial Systems in Nigeria's Agro-allied and Forest–based Industries," *Advances in African Economic, Social and Political Development,* in: Perspectives on Industrial Development in Nigeria, chapter 0, pages 105-152, DOI: 10.1007/978-3-030-84375-5_5

Ciaian, P., Guri, F., Rajcaniova, M., Drabik, D., Paloma, S.G. (2018). Land fragmentation and production diversification: A case study from rural Albania. Land Use Policy 2018, 76, 589–599.

Deininger. K, Monchuk. D, Nagarajan, H. K. and Singh, S. K. (2017). Does Land Fragmentation Increase the Cost of Cultivation? Evidence from India. The Journal of Development Studies, 53(1), pp. 82-98

Harrington, A., and Chopra, T. (2010). Denying Kenya's women access to land rights. Justice for the poor research report, (2).

IFAD (2017). Gender Equality and Women's Empowerment in Rural Areas. International Fund for Agricultural Development.

King, R. and Burton, S. (1982). Land fragmentation: Notes on a fundamental rural spatial problem. Progr. Hum. Geogr. 6(4), pp. 475-494. 162

Knippenberg, E., Jolliffe, D., and Hoddinott, J. (2020). Land fragmentation and food insecurity in Ethiopia. American Journal of Agricultural Economics, 102(5), 1557-1577.

Mamun, M. (2021). Farmers' Perception Towards Harmful Effects of Land Fragmentation on Crop Productivity.

Mwendwa B.K, Mugalavai E.M and China, S.S (2024). Assessing the Impact of Land Fragmentation on Agricultural Productivity and Rural Development in Vihiga County, Kenya. 5(3) 2024, pp. 1339-1350 *African Journal of Empirical Research* https://ajernet.net ISSN 2709-2607

Nwandu, P. I. (2022). Gender Analysis of Rural Small-Scale Arable Crop Farming in Delta State, Nigeria. Nigerian Journal of Agriculture and Agricultural Technology, 2(2), 12-20.

Obayelu, A. E., Afolami, C. A., and Adegbola, A. T. (2019). The impact of land fragmentation on agricultural productivity in Nigeria. *Nigerian Journal of Agricultural Economics,* 12(1), 123-139.

Otaha I. J, (2013). Food Insecurity in Nigeria: Way Forward. *An International Multidisciplinary Journal, Ethiopia Vol. 7 (4), Serial No. 31, September, 2013:26-35* DOI: http://dx.doi.org/10.4314/afrrev.7i4.2

Oyebanjo, M, Adesoji C. Ologbon, Omolara M. Dada Effect of Land Fragmentation and Socioeconomic Factors on Food Crop Productivity in Ogun State, Nigeria *Euro-economical* Issue 1(42)/2023 156-163

Phan, N.T, Lee, J.Y., Kien, N.D. (2022). The Impact of Land Fragmentation in Rice Production on Household Food Insecurity in Vietnam. Sustainability 2022, 14, 11162. https://doi.org/10.3390/ su141811162

Rakhshanda, K.. M, Sohail, A. M, Raza. U, Aqeela, Saghir; Sohaib, Usman and Tahira, Sadaf (2020). Empirical Investigation of Impact of Land Fragmentation on Crop Productivity in Punjab, Pakistan, 36(1), pp. 217- 223.

Simmons, A. J. (1964). An Index of Farm Structure, with a Nottinghamshire Example. East Midlands Geogr. 3, pp. 255-261.

Singh, K. (2018). Land fragmentation, household characteristics, and agricultural productivity.

Tran, T. Q. and Van Vu, H. (2019). Land fragmentation and household income: First evidence from rural Vietnam. Land use policy, 89, 104247.

UN Women (2020). Women's Land Rights and Gender Equality. United Nations Entity for Gender.

World Bank, FAO, and IFAD, (2009). Gender in Agriculture. Agriculture and Rural Development. Source book. The International Bank for Reconstruction and Development/The World Bank. The World Bank. FAO.IFAD.

Appendixes

Tables

Table 1: Distribution of respondents based on socio-economic characteristics

Socio-economic variables	Male Frequency	Percentages	Female Frequency	Percentages
Age of farmers				
≤30	2	3.64	3	5.45
31-40	4	7.27	12	21.82
41-50	17	30.91	9	16.36
51-60	16	29.09	11	20.00
> 60	16	29.09	20	36.36
Marital status				
Single	2	3.64	3	5.45
Married	45	81.82	45	81.82
Widowed/widower	4	7.27	5	3
Divorced	4	7.27	2	3.64
Educational status				
No formal education	12	21.82	7	12.73
Primary education	12	21.82	18	32.73
Secondary education	23	41.82	18	32.73
Tertiary education	8	14.5	12	21.82
Farm size				
≤5	38	69.09	55	100.00
6-10	17	30.91	0	0.00
Primary occupation				
Non -farming	11	20.00	18	32.73
Farming	44	80.00	37	67.27
Farm experience				
≤5	-	-	3	5.45
6-10	8	14.54	12	21.82
11-15	4	7.27	9	16.36
16-20	10	18.18	11	20.00
>20	33	60.00	20	36.36
Farm distance				
≤5	39	70.91	39	70.91
6-10	15	27.27	15	27.27
>10	1	1.82	1	1.82
Farmers association				
Yes	38	69.09	22	40.00
No	17	30.91	33	60.00
Extension contacts				
Yes	27	49.09	29	52.73
No	28	50.91	26	47.27

Source: Field Survey, 2024

Table 2: Distribution of respondents based on modes of land acquisition (n=110)

Modes of land acquisition	Male		Female	
	Frequency	Percentage	Frequency	Percentage
Purchased land	6	10.91	9	16.36
Leased land	40	72.73	37	67.27
Squatting	2	3.64	1	1.82
Inherited land	37	67.27	44	80.00
Rented land	41	74.55	39	70.91

Source: Field Survey, 2024 *Hint: Multiple responses**

Table 3: Distribution of extent of land fragmentation based on gender (n=55 each)

Fragmentation index	Min	Max	Mean	Standard Deviation	Remarks
Female (SI)	0.262	0.556	0.466	0.074	The mean value of 0.466 indicates a moderate level of diversity in the female population, with relatively low variation (SD = 0.074), suggesting consistency in species distribution.
Male (SI)	0.125	0.625	0.323	0.109	The mean value of 0.323 reflects lower diversity in the male population compared to females, with a higher standard deviation (SD = 0.109), indicating greater variability in distribution and potential imbalance.

Source: Field Survey, 2024 *Hint: SI=Simpson Index**

Table 4: Analysis of factors determining land fragmentation using fractional logit model

Independent variables	Male		Female	
	Coefficients	Z-values	Coefficients	Z-values
On-farm income	-0.397***	-3.61	0.132	1.24
Farm distance	0.033	1.46	-0.006	-0.49
Farm size	-0.033	-1.61	-0.059	-1.11
Cost of land preparation	0.373**	2.04	0.174*	1.80
Land rent	-0.227***	-4.59	-0.801***	-5.09
Land tenure security	-0.130**	-2.30	0.014	0.43

Farm location	0.269*	1.83	-0.065	-1.01
Constant	1.174	0.40	-3.308	-1.99
Number of obs	55		55	
Wald chi2(7)	121.66		95.64	
Prob > chi2	0.0000		0.0000	
Pseudo R2	0.0213		0.0105	

Source: Field survey, 2024