International Journal of Agricultural Extension and Rural Development Studies, 13 (1),53-70, 2025
Print ISSN: ISSN 2058-9093
Online ISSN: ISSN 2058-9107
Website: https://www.eajournals.org/
Publication of the European Centre for Research Training and Development -UK

Analysis of Factors Influencing Gender Roles Among Rice Farmers in Southern Agricultural Zone of Plateau State, Nigeria

[1] T.S. Demenongu, [2] S.M. Pakpong, and [3] E.P. Ejembi
[1]National Veterinary Research Institute, Vom, Jos, Plateau State, Nigeria [2]Department of Agricultural Extension and Rural Development, Joseph Sarwuan Tarka University Makurdi, Benue State, Nigerai [3]Department of Agricultural Economics and Extension, Faculty of Agriculture, Shabu-Lafia Campus, Nasarawa State Keffi, Nigeria
Corresponding author email: storjape@gmail.com
doi: https://doi.org/10.37745/ijaerds.15/vol13n15370 Published May 16, 2026

Citation: Demenongu, T. S., Pakpong, S. M. and Ejembi, E. P (2026) Analysis of Factors Influencing Gender Roles Among Rice Farmers in Southern Agricultural Zone of Plateau State, Nigeria, *International Journal of Agricultural Extension and Rural Development Studies*, 13 (1),53-70

Abstract: *The research focused on gender roles in rice farming in the Southern Agricultural Zone of Plateau State, Nigeria. The researcher used structured questionnaires to collect information on gender roles in rice farming. The researcher used the multi-stage sampling technique to select 109 male rice farmers and 92 female rice farmers, totaling 201 respondents for the study. The researcher used descriptive and inferential statistics to analyze the research findings. The research findings revealed that rice farmers were at an appropriate age to participate in rice farming. On average, male rice farmers were 42.9 years old, while their female counterparts were on average 42.5 years old. Though the size of the households of both the male and the female rice farmers was almost similar, while the majority (56.0%) of the male rice farmers had a household size of 6-10 persons, the majority (52.2%) of the female rice farmers had a household size of 6-10 persons. However, the research findings showed that there was a significant difference in the level of educational attainment between the two sexes. While the majority (98.2%) of the male rice farmers had one form of education or another, the majority (91.3%) of the female rice farmers had one form of education or another. The average farm experience was 9-10 years for both males and females, while farm sizes were small with males cultivating larger sizes than female farmers (4.8 ha) compared to their female counterparts (2.6 ha). The result on annual income showed that male farmers earned significantly more than their female counterparts on average (₦976,792) compared to female farmers (₦753,260). More male farmers were in the highest income bracket compared to female farmers, where more were in the lowest bracket. Male rice farmers were always engaged in tilling/land preparation ($\bar{x}$ = 2.60), ridging ($\bar{x}$ = 2.53), herbicide application ($\bar{x}$ = 2.03), pesticide application ($\bar{x}$ = 2.17), harvesting ($\bar{x}$ = 2.63), and milling ($\bar{x}$ = 2.31). The results showed that men dominate in many of the physically demanding and mechanized tasks in rice production like fertilizer application 96.3%, milling 90.8%, and ridging 84.4%. On the other hand, majority (97.8%) of the female respondents were engaged in threshing, 81.5% in parboiling, and 93.5% also join in fertilizer application. The results revealed that male involvement in rice farming was significantly influenced by their marital status (β = -6.227; -3.436), age (β = 1.104), farming experience (β = 2.797), and income (β = 2.813; 1.085), while female involvement in rice farming was significantly influenced by household size (β = -1.991), education (β = -3.439), farming experience (β = 0.424), and income (β = 0.104), indicating a gender difference in*

socio-economic factors influencing their involvement in rice farming. The conclusion drawn was that there are disparities in terms of gender in relation to the use of resources, gender roles, and productivity in rice farming. It was recommended that there should be policy reforms aimed at strengthening land rights for women, gender-sensitive credit services, subsidized farming inputs, enhanced extension services, climate-smart practices, and cooperatives for rice farmers.
Keywords: Assessment, gender roles, factors, rural farmers, rice farming

INTRODUCTION

The term gender is used to denote roles, behaviors, expectations, and identities linked to being male, female, or any other gender. Gender is not based on biology but is shaped by socialization, social institutions, and symbolic meanings. What is critical is that gender is linked to unequal power relations with access to resources, power, and recognition often intersecting with class, race, age, etc., to create inequality (Baxter and Hoffmann, 2019).

Gender roles in rice farming across Nigeria display a well-defined division of labour rooted in social norms and structural disparities. In South eastern Nigeria, men predominantly carry out land preparation, bird scaring, transportation of harvested paddy, harvesting, field clearing, and packaging, while women take on planting, weeding, and fertilizer application (Offor-Ikpendu *et al.*, 2023).
These role divisions mirror broader national trends. In South eastern Nigeria, women contribute between 67% of the agricultural labour force and often tackle ridge formation, planting, weeding, harvesting, processing, and marketing tasks sometimes overlapping with domestic and care duties (Mgbako, 2025). Rice farming in Northern Nigeria is unmistakably male-dominated, with an estimated 81% of practitioners being male farmers**,** while women, despite contributing significantly to food production, are often marginalized, lacking land ownership, financial resources, and access to agricultural inputs and training (Sadiq *et al.*, 2020).
The Southern Agricultural Zone of Plateau State which includes LGAs such as Qua'an-Pan, Shendam, Mikang, Langtang North, Langtang South, and Wase have been repeatedly identified by Plateau Agricultural Development Programme (PADP) and state-level planning documents for its favorable lowland ecologies ideal for rice cultivation, and features prominently in efforts to expand irrigable zones and clustered production ((Adama, 2025).
Despite Plateau State's rating as a key rice-producing state with the Southern Agricultural Zone endowed with favourable lowland ecologies, gender disparities in rice farming roles remain underexplored and potentially counterproductive to productivity and equity. Empirical observations reveal that in Plateau State, women often outnumber men in field labour, engaging tirelessly in tasks such as land clearing, planting, weeding, and harvesting, often completing farm duties while still managing household responsibilities (Adama, 2025). Another study by Akinyemi and Ayoade (2020) examined gender roles among farmers in Nigeria, using rice production in Plateau State as a case study.

Objectives of the Study

The broad objective of this study was to assess the factors influencing gender roles in rice farming in the Southern Agricultural Zone of Plateau State, Nigeria. The specific objectives were to:

i. describe the socioeconomic characteristics of male and female rice farmers in the Southern Agricultural Zone of Plateau State;

ii. identify the specific roles of men and women in rice production activities in the study area;
iii. assess the level of men and women participation in rice farming in the study area;
iv. determine the socioeconomic factors influencing men and women participation in rice farming.

METHODOLOGY

The study was carried out in the Southern Agricultural Zone in Plateau State, which falls under the North-Central geopolitical zone of the country. The Plateau State was formally created in the year 1976, with the administrative headquarters in Jos. The state is located between the latitudes of 8°24′N and 10°38′N, as well as between the longitudes of 8°32′E and 10°38′E. It borders the neighboring states of Kaduna State in the northwest, Bauchi State in the northeast, Taraba State in the east, Nasarawa State in the southwest, and Benue State in the south (Plateau Agricultural Development Programme, 2019). The origin of the name "Plateau State" is traced back to the Jos plateau, as the Jos plateau is responsible for the moderate climatic condition compared to other regions in the country.
The state is characterized by a tropical climatic condition with the presence of both rainy and dry seasons. The rainy season is present between the months of April and October, while the dry season is between the months of November and March. The rainfall is between 1,200 mm and 1,500 mm per annum, which is adequate for different agricultural activities (Plateau Agricultural Development Programme, 2019).

According to the National Population Commission (2024), the state is inhabited by 4,718,712 persons. The cool climatic conditions in the state, along with the availability of fertile soils and cultivable land, encourage the active involvement of the inhabitants in agricultural activities. The main crops grown in the area include rice, maize, Irish potatoes, millet, sorghum, and different types of vegetables, along with livestock rearing.

For the purpose of agricultural development, Plateau State is divided into agricultural zones, with one of the zones being the Southern Agricultural Zone. The Southern Agricultural Zone includes some of the following Local Government Areas: Shendam, Qua'an Pan, Langtang North, Langtang South, Wase, and Mikang. This zone is characterized by low-lying areas compared to the central plateau. It is suitable for crop farming, with rice farming being a dominant activity.

The Southern Agricultural Zone has significant agricultural potential due to its fertile soils, favorable rainfall pattern, and presence of river systems that support both rain-fed and irrigated agriculture. Rice farming is a prominent economic activity in the zone, with both male and female farmers actively involved in various production and post-harvest activities. The predominance of smallholder farmers, combined with traditional and emerging production practices, makes the zone suitable for examining gender roles and resource access in rice farming systems.
Although the state is best known for its mining production, agriculture is the major occupation of the people. Rice is one of the major crops; millets, yams, sorghum, corn (maize), sweet potatoes, Irish, potatoes, cowpeas, Bean, fruits, and vegetables are the staple crops (Plateau State Government of Nigeria, 2020). Data for this study were collected using primary and secondary sources and both descriptive and inferential satsistics were used in the analysis.

The target population for this study included all male and female rice farmers in the Southern Agricultural Zone of Plateau State. These farmers varied in scale, from smallholder to medium-scale producers. The study focused on both household heads and farm workers, ensuring that gender roles and contributions were adequately analysed.

A multistage sampling technique was adopted to select respondents. The selection process followed these stages:

Stage One: Three (3) Local Government Areas (LGAs) out of the six (6) LGAs in the Southern Agricultural Zone was purposively selected for the study due the the high concentration of rice farmers. These are: Langtang South, Mikang and Shendam LGAs.

Stage Two: Simple random sampling was used to select three (3) rice-producing communities from each of the selected LGAs. This gave nine (9) communities that were used for the study.
Stage Three: The researcher carried out a preliminary survey in March 2024 and identified a total of 273 male rice farmers and 230 female rice farmers. The researcher used the simple random sampling technique in selecting 40% of the male rice farmers and female rice farmers in the nine selected communities. The simple random sampling technique resulted in the selection of 109 male rice farmers and 92 female rice farmers. A total of 201 respondents were selected in the study.This is shown in Table 1

Table1: The Sampling Frame for Selected Male and Female Rice Farmers in the Southern Agricultural Zone of Plateau State.

LGAs	Villages	Number of rice farmers		Sample size (40% of registered farmers)	
		Male	Female	Male	Female
Langtang South	Sabo gida	32	27	13	11
	Mabudi	35	25	14	10
	Kereshin	28	23	11	9
Mikang	Garkawa	30	27	12	11
	Lalin	30	24	12	11
	Tunkus	31	25	12	10
Shendam	Shimakar	28	28	11	11
	Yamini	29	23	10	10
	Yelwa	30	28	12	11
Total = 3	**9**	**273**	**230**	**109**	**92**

RESULTS AND DISCUSSION

Socio-economic Characteristics of Respondents

Age: The results according to age of rice farmers shows that most male respondents were in their middle years: 41.3% were aged 31–40 years**,** 34.9% were 41–50 years**,** 16.5% were over 51 years, and only 7.3% fall in the youngest bracket (20-30 years), with an average age of

42.9 years. In contrast, female respondents were more concentrated in the older middle group: 48.9% were aged 41–50 years**,** 26.1% fall in the 31-40 years, 14.1% were 20-30 years, and 10.9% were above 51 years. This suggests that while both male and female were largely in their productive age. In terms of gender roles, this age difference could mean men may take on physically demanding tasks earlier, while women, entering or being active in certain roles at slightly older ages, may bring more experience but possibly face physical constraints in some farm operations. This result agrees with the finding by Jatbong *et al.* (2018) who conducted a study on economic efficiency of male and female Rice farmers in Plateau State, Nigeria and revealed that the average ages for men and women rice farmers were 46 and 42 years respectively.

Marital status: The result of marital status shows that a large majority of rice farmers, both male and female, were married: (66.1%) of male respondents and **(**67.4%) of female respondents. 25.6% of males were divorced and 8.3% were widowers; for females 21.7% were divorced and 10.9% were widows. This suggests that marriage is the predominant household status for both genders in the study area. In terms of gender roles, this high rate of marriage could have several implications: married farmers may benefit from spousal support in farming tasks, decision-making, and shared labour, which could positively affect productivity. Further, gendered expectations in marriage (who does what) may reinforce existing divisions of labour: married men may assume physically heavier or capital-intensive tasks while married women might balance home duties along with farm tasks. Sangotegbe *et al.* (2013) who carried out a study of gender analysis of rice production in Obafemi-Owode Local Government Area of Ogun State and also reported that marital status of the respondents shows that majority of the farmers, male (72.5%) and female (62.5%) were married.

Household size: The result on household sizes shows that for both male and female rice farmers in the study area, the most common household size is 6-10 persons: 56.0% of the male farmers and 52.2% of female farmers fall into this category. About 33.0% of men and around 31.5% of women had smaller households of 1-5 persons, while larger households (more than 11 persons) among women was 16.3% than men 11.0%. The mean household size was 7 persons for both genders. This suggests that family size is generally moderate to large among rice farming households, which has important implications for gender roles: larger households may mean more available family labour, which could reduce reliance on hired help and potentially distribute farm tasks among more members. Onyinyechukwu (2023) also reported in a study of gender differences in agricultural productivity among rice farmers in Anambra State, that Most had an average household size of 7 persons.

Level of education of respondents: The findings according to level of education show that among male rice farmers, nearly half (48.6%) have completed tertiary education, 27.5% had secondary school qualifications, 22.1% primary education, and just 1.8% have no formal education. Female farmers, however, had only 25.0% with tertiary-educated education, with 44.6% attaining secondary education, 21.7% reaching primary level, and 8.7% having no formal schooling. This suggests that male farmers generally have higher educational attainment compared to female farmers in the study area. In the context of gender roles among rice farmers in the study area, the disparity in education may translate into differences in access to

information, adoption of innovations, decision-making authority, and negotiating power. Higher educated male farmers may be better placed to understand and use agricultural extension services, access credit, adopt improved technologies and improved management practices, while female farmers with lower formal education might lag behind in these areas. The result of this study agrees with the finding by Onyinyechukwu (2023) who reported in a study of gender differences in agricultural productivity among rice farmers in Anambra State, Nigeria that majority (86%) of the male and female farmers had one form of formal education or the other

Rice farming experience: A greater proportion (46.8%) of male rice farmers in the study area had 6–10 years of farming experience, 29.4% have between 1–5 years**,** 22.9% fall in the 11–15 years bracket, and a very small proportion (0.9%) have over 16 years**,** giving a male average of about 9.6 years farming rice. Female farmers show a somewhat different spread: 35.9% have 11–15 years of experience, 34.8% have 1–5 years, and 29.3% possess 6–10 years**,** with the average experience for women being around 9 years**.** These findings indicate that although both men and women have reasonablysimilar average years of experience. The implication of this is that relatively high average years of experience among both genders suggests that the farmers were not novices, they likely have accumulated agricultural knowledge, know local conditions, and have had opportunities to try different rice farming practices. Experience can improve efficiency, decision-making, risk management, and innovation uptake. Jatbong *et al.* (2018) in their study of economic efficiency of male and female Rice farmers in Plateau State, also reported that the average years of experience of male and female respondents were 18 and 12 years respectively.

Access to loan: The findings revealed that the majority of both male and female rice farmers did not have access to credit facilities. Specifically, 73.4% of male farmers and 81.5% of female farmers reported no access to loans, leaving only 26.6% of males and 18.5% of females who were able to obtain credit. Among the male farmers who accessed loans, 10.1% sourced funds from cooperative societies, 7.3% from banks, 5.5% from friends, and 1.8% each from neighbours and gifts. In contrast, female farmers who obtained loans relied mainly on neighbours (8.7%), followed by banks (5.4%), cooperative societies (3.3%), and friends (1.1%). In terms of loan size, male borrowers secured an average amount of ₦142,272.73, while female borrowers obtained a lower average of ₦89,130.43. This noticeable difference in both access and loan volume highlights a gender gap in financial inclusion and borrowing capacity among rice farmers. Such disparities may result in unequal investment opportunities, as male farmers are better positioned to purchase improved seeds, fertilizers, hire machinery, or expand their farm size. Female3farmers, on the other hand, may be limited to smaller-scale or less optimal investments due to restricted financial resources.

Cooperative membership: The result in Table 4.1 indicated that only a minority of rice farmers in the study area belonged to cooperative societies: 24.8% of male respondents and 29.3% of female respondents were cooperative members, leaving 75.2% of men and 70.7% of women outside cooperative society membership. Among male members, 15.6% had been in the cooperative society for 1–5 years**,** 6.4% for 6–10 years**,** and 2.8% for 11 years or more**;** among female members, 18.5% fall in the 1–5 years bracket, 8.7% in 6–10 years**,** and 2.2% in 11 years and above**,** with both genders having an overall mean membership duration of about 1.4 years**.** This limited

membership and generally short tenure suggest that cooperatives were underutilized resources for both male and female rice farmers. In terms of gender roles, the relative under-membership may constrain farmers' abilities, particularly women to pool resources, negotiate better input prices, access collective marketing channels, or strengthen their bargaining power. Because cooperatives are known to facilitate access to credit, inputs, extension services, and collective action. The result of finding of this study disagrees with the finding by Ayoola *et al.* (2011) carried out a study of socio-economic factors influencing rice production among male and female farmers in Northern Guinea Savanna Nigeria and reported that greater percentage of the female respondents was involved in associations, about 90 percent and 57 percent respectively for female and male farmers.

Extension contacts: The data show that a majority of rice farmers in the study area have little to no contact with agricultural extension agents: 60.6% of male respondents and 69.6% of female respondents report no contact, leaving 39.4% of men and 30.4% of women who have been visited. Among males who had contact, 16.5% were visited 1–3 times, 14.7% between 4–6 times, and 8.3% had 7 or more visits; for females these figures are 17.4%**,** 8.7%**,** and 4.3%**,** respectively. On average, male farmers received 2 visits, while female farmers received just 1. This uneven extension contact suggests a gender gap in access to agricultural advisory services: men not only are more likely to have any contact but also tend to receive it more frequently. Since extension agents are key agents for dissemination of improved farming practices, new technologies, input use, and decision-making support, the more limited and infrequent contact for women could reduce their ability to adopt innovations or optimize productivity. The result of this study agrees with the finding by Ayoola *et al.* (2011) who carried out a study of socio-economic factors influencing rice production among male and female farmers in Northern Guinea Savanna Nigeria and revealed that majority (89.90%) of the male respondents had no access to extension services and only 10.10% had access to extension services and majority (94.44%) of the female respondents had no access to extension services while only 05.56% of the female farmers having access to extension services.

Rice farm size: Results further revealed that most (92.7%) of male rice farmers in the study area cultivated between 1-5 hectares**,** while 6.4% farmed on 6-10 hectares**,** and just 1.1% operate on farms of 11 hectares or more**,** with a mean farm size of about 4.8 hectares**.** Female farmers similarly cluster in the 1-5-hectare bracket (91.3%**),** with 8.7% having 6-10 hectares; their mean is smaller, about 2.6 hectares**.** This strong concentration of both genders in small to moderate farm sizes suggests that rice farming in the area was largely small-scale, but men tend to manage larger plots on average than women. Farm size differences can influence who does what: larger farms often require more labour, physical work, management of more inputs, higher investment by men, whereas smaller plots might limit women's ability to scale, access mechanization, or generate comparable income. The result further revealed that rice farmers acquired land revealed that among male, 43.1% farm on rented land, 40.4% on government-land holdings, while only 3.7% each farm on purchased or gifted land. Female in contrast slightly farmed on government land (44.6%) followed by rented land (42.4%), with smaller shares using family land (10.9%) or land they bought (2.2%). These imply that both male and female farmers rely heavily on non-owned land, making formal ownership less common, especially among women. The reliance on rented or government-allocated land may affect how secure farmers feel about investing in land improvements, long-term soil fertility, or adopting more capital-intensive or sustainable methods. The finding of this study agrees with the

finding by Jatbong *et al.* (2018) who also reported that male and female rice farmers were small scale farmers with male farmers having an average farm size of 2.3 hectares while the female farmers had an average farm size of 1.1 hectares

Estimated annual rice income: The results show that among male rice farmers, 45.0 % earned between ₦1,000 and ₦500,000 per year, 25.7 % fell in the ₦501,000–₦1,000,000 bracket, and 29.4 % earned ₦1,001,000 or more**,** with an average annual income of ₦976,792.48**.** For female farmers: 56.5 % earn between ₦1,000 and ₦500,000**,** 26.1 % in the ₦501,000–₦1,000,000 range, and 17.4 % in the ₦1,001,000 and above**,** with an average income of ₦753,260.87. Thus, male farmers tend to earn substantially more from rice than female farmers, both in average terms and in the proportion earning in higher income brackets. Higher incomes for men may enable them to reinvest more into their farms, while women, earning less, may be constrained to smaller investments and may find it harder to shift their roles or expand operations. The result of this study disagrees with the finding by Adiel *et al.* (2019) who conducted a study of the effects of socioeconomic and technological characteristics on discontinuance of adoption of improved rice production technologies in Nasarawa and Plateau and reported very low income earned by rice farmers annually. Result of their finding indicated that result shows that a little above forty percent (42.58%) of the respondents in study area realized less than ₦100,000 income from rice farm compared to 32.26 percent that realized between ₦201,000 and ₦300,000. The pooled mean rice income was ₦198,374.

Table:2 Socio-economic Characteristics of Respondents in the Study Are

Variable	Freq.	%	Mean	Freq.	%	Mean
	Male			**Female**		
Age (years)						
20-30	8	7.3		13	14.1	
31-40	45	41.3	42.9 years	244	26.1	42.5 years
41-50	38	34.9		45	48.9	
51 and above	18	16.5		10	10.9	
Marital status						
Married	72	66.1		62	67.4	
Divorced	28	25.6		20	21.7	
widowed	9	8.3		10	10.9	
Household size (No. of persons)	36	33.0	7 persons	29	31.5	7 Persons
1-5	61	56.0		48	52.2	
6-10	12	11.0		15	16.3	
11 and above						
Level of education						
Non-formal education	2	1.8		8	8.7	
Primary education	24	22.1		20	21.7	
Secondary education	30	27.5		41	44.6	
Tertiary education	53	48.6		23	25.0	

Rice farming experience (years)	32	29.4		32	34.5	
1-5	51	46.8	9.6 years	27	29.3	
6-10	25	22.9		33	35.9	
11-15	1	0.9		0	0.0	
16 and above						
Access to loan						
Yes	29	26.6		17	18.5	
No	80	73.4		75	81.5	
Source of loan						
Had no loan	80	73.4		75	81.5	
Friends	6	5.5		1	1.1	
Cooperative society	11	10.1		3	3.3	
Neighbours	2	1.8		8	8.7	
Bank	8	7.3		0	0.0	
Gift	2	1.8		5	5.4	
Amount of loan accessed (₦)						
Had no loan	80	73.4	₦ 142,	75	81.5	₦ 89,130.43
1,000-300,000	9	8.3	272.73	10	10.9	
301,000-600,000	10	9.2		5	5.4	
601,000 and above	10	9.2		2	2.2	
Cooperative membership	27	24.8		27	29.3	
Yes	82	75.2		65	70.7	
No						
Duration of membership (years)						
Non-members	82	75.2		65	70.7	
1-5	17	15.6		17	18.5	
6-10	7	6.4		8	8.7	
11 and above	3	2.8		2	2.2	
Extension contacts						
Yes	43	39.4		28	30.4	
No	66	60.6		64	69.6	
Number of extension contacts (No. of visits)						
Had no contact	66	60.6	2 visits	64	69.6	1 visit
1-3	18	16.5		16	17.4	
4-6	16	14.7		8	8.7	
7 and above	9	8.3		4	4.3	
Method of land acquisition						
Farm freely on family land	10	9.2		10	10.9	
Farm on rented land	47	43.1		39	42.4	
Farm on gov't land	44	40.4		41	44.6	
Farm on purchased land	4	3.7		2	2.2	
Farm on gifted land	4	3.7		0	0.0	

Rice farm size (hectares)						
1-5	101	92.7	4.8 hectares	84	91.3	2.6 hectares
6-10	7	6.4		8	8.7	
11 and above	1	0.9		0	0.0	
Estimated annual rice income (₦)						
1,000-500,000	49	45.0	₦976,792.48	52	56.5	₦753,260.87
501,000-1,000,000	28	25.7		24	26.1	
1,001,000 and above	32	29.4		16	17.4	
Total	**109**	**100.0**		**92**	**100.0**	

Specific Roles of Male and Female in Rice Production Activities

From Table 3, several major findings stand out about how male and female farmers shared specific roles in rice production in the study area: when using the decision rule (mean ≥ 2.0 means always performed that role), male always performed tasks such as tilling/land preparation ($\bar{x}$ = 2.60), ridging ($\bar{x}$ = 2.53), herbicide application ($\bar{x}$ = 2.03), pesticide application ($\bar{x}$ = 2.17), Harvesting ($\bar{x}$ = 2.63) and milling ($\bar{x}$ = 2.31) were among the activities identified. Women, however, performed a different set of tasks, indicating a clear gender-based division of labour. The findings revealed that men predominantly engaged in tilling or land preparation, ridging, herbicide application, pesticide application, harvesting, and milling. In contrast, women were more actively involved in planting, weeding, and post-harvest processing activities such as threshing, parboiling, as well as soil fertility management. It can therefore be induced that men generally dominate physically demanding, large-scale, or machinery-based operations, whereas women tend to concentrate on labour-intensive, less mechanised, and more time-consuming activities, particularly at the post-harvest stage.The result of the finding of this study is in line with the finding of in a study conducted byAkinnagbe and Ayibiowu (2020) whoconducted a study on the division of labor in rice production and processing with regard to gender in Ogun State, Nigeria. The result of the finding of the study revealed that men were more involved in the following rice production activities: clearing of land (90.0%), de-stumping of farmland (98.3%), tilling of land (98.3%), and application of fertilizer (90.0%). Women were more involved in the following rice production activities: planting (52.5%), weeding (50.8%), thinning (50.8%), bird scaring (69.1%), harvesting (74.2%), and heaping/packing of harvested rice (79.2%).

Table 3: Specific Roles of Male and Female in Rice Production Activities

Rice Production Activities	Mean Male	Mean Female
Tilling/land preparation	2.60	1.98
Ridging	2.53	1.59
Planting	1.70	2.11
Weeding	1.70	2.72
Fertilizer application	1.72	2.48
Herbicide application	2.03	1.65
Pesticide application	2.17	1.91
Harvesting	2.63	2.04
Threshing	1.93	2.37
Parboiling	1.86	2.52
Milling	2.31	1.61

Source: Field survey, 2026 Multiple responses
Decision Rule: Any mean ≥ 2.0 implies that respondents always perform specific role in such rice production activity

Socio-economic Factors Influencing Male and Female Participation in Rice Farming Activities

Tables 4(a) and 4(b) presented the ordered logit regression results on the socio-economic factors influencing participation in rice farming activities among male and female farmers in the Southern Agricultural Zone of Plateau State. The model statistics indicated good fit for both genders. The Nagelkerke R^2 value of 0.503 for males shows that 50.3% of the variation in male participation was explained by the included variables, while the value of 0.610 for females indicated a stronger explanatory power (61.0%). This suggested that the socio-economic variables better explained female participation than male participation.

Marital status for male farmers: For male farmers, marital status was statistically significant in two categories. The coefficients for marital status category 1 ($\beta = -6.227$, $p < 0.01$) and category 2 ($\beta = -3.436$, $p < 0.01$) were negative, indicating that belonging to these marital categories reduces the likelihood of higher participation relative to the reference group. The magnitude of the coefficients suggests a strong influence of marital structure on male engagement. This implied that married men or those in specific marital conditions may face increased household and financial responsibilities that limit their time, labour availability, and physical involvement in rice farming activities. Married men may also diversify into alternative income-generating ventures to meet family obligations, thereby reducing their intensity of participation in rice production. The finding of this study was contrary to the study by Garba (2013) reported in a study in Kudan and Giwa Local Government Areas of Kaduna State, who that the coefficient of marital status was found to be positive and statistically significant at 5% level of significance.

Years of rice farming experience for male farmers: Years of rice farming experience was positively significant in one category ($\beta = 2.797$, $p < 0.05$), indicating that increased farming experience increases the likelihood of participation. The positive coefficient suggested that experienced male farmers were more actively engaged in rice farming activities compared

to less experienced farmers. Experience enhances technical competence, farm management skills, risk-handling ability, and familiarity with improved practices. It may also reflect stronger social networks and better access to informal knowledge systems. Consequently, accumulated experience strengthens confidence and productivity, thereby increasing participation levels. Garba (2013), in a study on factors influencing adoption of recommended rice production practices in Kudan and Giwa Local Government Areas of Kaduna State, found that farming experience had a positive and statistically significant coefficient at the 10% level, indicating that greater farming experience increases the likelihood of adopting recommended rice production practices.

Annual rice income for male farmers: Annual rice income was highly significant and positively related to participation. Income category 1 ($\beta = 2.813$, $p < 0.01$) and category 2 ($\beta = 1.085$, $p < 0.01$) both showed positive effects. The relatively large coefficient in category 1 suggested that income exerts a strong motivational and enabling effect on male participation. Higher rice income likely encourages reinvestment in farm inputs, expansion of cultivated area, and hiring of labour, which increases the scale and intensity of production activities. This finding indicated that profitability strengthens men's commitment to rice farming and positions rice production as a viable economic enterprise. Amaza (2016) conducted research on putting nitrogen fixation to work for smallholder farmers in Africa, N2Africa Baseline Report Borno State, Nigeria found that the coefficient of income had positive (0.833) and significant at ($P<0.01$).

Age for male farmers: Age was also positively significant ($\beta = 1.104$, $p < 0.01$), implying that middle-aged male farmers were more actively involved in rice farming activities. This reflected the importance of physical strength, accumulated experience, and economic responsibility among men in the economically active age bracket. Middle-aged men are more likely to control farm resources, make production decisions, and coordinate farm operations, which enhances their participation level. The finding of this study disagrees with the finding by Garba (2013) on factors influencing adoption of recommended rice production practices in Kudan and Giwa Local Government Areas of Kaduna State, Nigeria and found that the coefficient for age was found to be negative and statistically significant at 5% level of significance.

Household size for female farmers: For female farmers, household size was statistically significant and negatively related to participation ($\beta = -1.991$, $p < 0.01$). This indicated that women in certain household size categories are less likely to participate actively in rice farming activities. The negative coefficient suggested that household labour structure and domestic workload significantly affect women's agricultural roles. In smaller households, women may have limited labour support and bear greater domestic responsibilities such as childcare and food preparation, which constrained their time for farming activities. Thus, female participation in rice farming was closely tied to family labour availability and household role distribution. This result aligns with the findings of Amaza (2016), who reported that household size had a positive and statistically significant effect, indicating that both male and female farmers benefit from increased household labour availability.

Level of education for female farmers: Education was significant in one category ($\beta = -3.439$, $p < 0.01$) and negatively related to participation. The relatively large negative coefficient suggested that women with this educational level are less likely to engage intensively in rice farming activities.

Print ISSN: ISSN 2058-9093

Online ISSN: ISSN 2058-9107

Website: https://www.eajournals.org/

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Education may enhance women's access to alternative employment opportunities, petty trading, agro-processing, or salaried jobs. As a result, more educated women may diversify away from labour-intensive rice production. This finding indicated that education influences occupational mobility among female farmers more strongly than among males. Amaza (2016), in a study on putting nitrogen fixation to work for smallholder farmers in Africa (N2Africa Baseline Report, Borno State), reported that the coefficient of education for both male and female farmers was statistically significant. This implies that higher educational attainment among men and women positively affects income-earning capacity and efficiency in managing household food resources.

Years of Rice Farming Experience for Female Farmers: Years of rice farming experience showed a positive and significant effect ($\beta = 0.424$, $p < 0.01$), indicating that experience enhances female participation, similar to the male results. Although the magnitude is smaller compared to that of male farmers, the positive sign confirms that accumulated knowledge, skill acquisition, and familiarity with rice production processes increase women's involvement. Experience may also improve women's bargaining power within the household and strengthen their contribution to farm decision-making. Garba (2013), in a study on factors influencing adoption of recommended rice production practices in Kudan and Giwa Local Government Areas of Kaduna State, found that farming experience had a positive and statistically significant coefficient at the 10% level, indicating that greater farming experience increases the likelihood of adopting recommended rice production practices.

Annual Rice Income for female farmers: Annual rice income significantly influences female participation ($\beta = 0.104$, $p < 0.05$), indicating that higher income enables women to strategically shift to supervisory, processing, or marketing roles, enhancing their productive engagement and management within rice farming systems. Increased income may also enable women to hire labour or focus more on household welfare responsibilities. Amaza (2016) conducted research on putting nitrogen fixation to work for smallholder farmers in Africa, N2Africa Baseline Report Borno State, Nigeria found that the coefficient of income had positive (0.833) and significant at ($P<0.01$).

The comparative results revealed clearly the gender differentials in the determinants of participation in rice farming activities in the study area. For male farmers, participation was significantly influenced by marital status ($\beta = -6.227$; -3.436), age ($\beta = 1.104$), farming experience ($\beta = 2.797$), and annual rice income ($\beta = 2.813$; 1.085), indicating that demographic positioning and economic strength played central roles in shaping male engagement. In contrast, female participation was significantly influenced by household size ($\beta = -1.991$), education ($\beta = -3.439$), farming experience ($\beta = 0.424$), and annual rice income ($\beta = -0.104$), showing that women's involvement was more closely linked to household labour structure and socio-economic mobility factors. Notably, while farming experience and income positively influenced participation for both genders. This divergence suggests that men and women were likely to reinvest income into production expansion.

Table 4 (a): Socio-economic Factors Influencing Male Participation in Rice Farming Activities

Parameter Estimates				
95% Confidence Interval				
		Estimate	**Std. Error**	**Wald**
Threshold	[Dependent variable = 1.00]	5.487	3.401	8.602
	[Dependent variable = 2.00]	2.495	3.352	.554
Location	[Marital status=1]	-6.227	1.703	3.377***
	[Marital status =2]	-3.436	1.434	5.741***
	[Marital status =3]	-2.026	1.452	1.947
	[Marital status =4]	0[a]	.	.
	[Household size=1]	-.639	.572	1.247
	[Household size=2]	0[a]	.	.
	[Education =0]	-.697	1.732	.162
	[Education =1]	-1.778	1.458	1.486
	[Education =2]	-.849	.622	1.865
	[Education =3]	0[a]	.	.
	[Years rice farming experience=1]	2.797	1.975	2.006**
	[Years rice farming experience =2]	.200	.808	.061
	[Years rice farming experience =3]	0[a]	.	.
	[Annual rice income=1]	2.813	.691	6.578***
	[Annual rice income =2]	1.085	.594	3.336***
	[Annual rice income =3]	0[a]	.	.
	[Years of cooperative society membership=0]	.087	.816	.011
	[Years of cooperative society membership =1]	2.111	1.605	1.729
	[Years of cooperative society membership =2]	.298	.844	.125
	[Years of cooperative society membership =3]	0[a]	.	.
	[Amount of credit accessed=0]	-2.132	1.560	1.264
	[Amount of credit accessed =1]	1.120	1.469	.582
	[Amount of credit accessed =2]	1.070	1.242	.743
	[Amount of credit accessed =3]	0[a]	.	.
	[number of extension visit=0]	-3.238	1.160	1.248
	[number of extension visit =1]	-2.297	1.987	1.336
	[number of extension visit =2]	0[a]	.	.
	[Age=1]	.908	1.448	.393
	[Age=2]	1.104	.686	2.587***
	[Age=3]	0[a]	.	.
	[Farm size=0]	24.289	.000	.
	[Farm size =1]	0[a]	.	.
	[Farm size =0]	0[a]	.	.
	[Number of extension visits=1]	-.903	.939	.925
	[Number of extension visits =2]	.025	1.029	.001
	[Number of extension visits =3]	-1.581	.975	1.631
-2 Log Likelihood = 161.744				
Nagelkerke = 0.503				

Link function: Logit.

Note: This parameter is set to zero because it is redundant

Dependent variable: Level of participation in rice farming (low participation = 1, moderate participation = 2, and high participation = 3

*** Significant at 1%, ** significant at 5%

Table 4(b): Socio-economic Factors Influencing Female Participate in Rice Farming Activities

Parameter Estimates				
95% Confidence Interval				
		Estimate	**Std. Error**	**Wald**
Threshold	[Dependent variable = 1.00]	14.741	3.307	19.867
	[Dependent variable = 2.00]	12.399	3.313	14.011
Location	[Marital status=1]	.225	1.990	.013
	[Marital status =2]	.929	1.809	.264
	[Marital status =3]	.706	1.858	.144
	[Marital status =4]	0[a]	.	.
	[Household size =1]	-1.991	.824	5.833***
	[Household size =2]	0[a]	.	.
	[Education = 0]	-2.518	2.061	1.492
	[Education = 1]	5.698	1.892	.220
	[Education = 2]	-3.439	.823	7.452***
	[Education = 3]	0[a]	.	.
	[Years of rice farming experience=1]	1.630	2.036	.641
	[Years of rice farming experience=2]	.424	1.081	3.154***
	[Years of rice farming experience==3]	0[a]	.	.
	[Annual rice income=1]	.666	.803	.688
	[Annual rice income =2]	.104	.750	2.019**
	[Annual rice income =3]	0[a]	.	.
	[Years of membership of cooperative society=0]	1.851	1.237	1.237
	[Years of membership of cooperative society =1]	2.217	1.975	1.260
	[Years of membership of cooperative society =2]	3.624	1.448	.261
	[Amount of credit accessed=0]	1.110	3.472	.102
	[Amount of credit accessed =1]	-.107	1.950	.003
	[Amount of credit accessed =2]	2.645	1.810	1.136
	[Amount of credit accessed =3]	0[a]	.	.
	[Number of extension visit=0]	-14.867	.979	.720
	[Number of extension visit =1]	-14.589	.000	.
	[Number of extension visit =2]	0[a]	.	.
	[Age=1]	.544	1.742	.097
	[Age=2]	.344	.857	.161
	[Age=3]	0[a]	.	.
	[Farm size = 1]	-.529	1.284	.170
	[Farm size =2]	.960	1.428	.452
	[Farm size =3]	-1.472	1.484	.984
	[Farm size it=4]	.107	1.265	.007
-2 Log Likelihood = 108.077				
Nagelkerke = 0.610				

Link function: Logit.

Print ISSN: ISSN 2058-9093

Online ISSN: ISSN 2058-9107

Website: https://www.eajournals.org/

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Note: This parameter is set to zero because it is redundant
Dependent variable: Level of participation in rice farming (low participation = 1, moderate participation = 2, and high participation = 3
*****=** Significant at 1%, ****** significant at 5%

CONCLUSION

Based on findings of this study, it was concluded that gender roles in rice production were distinctly differentiated. Men predominantly handled physically demanding and mechanised tasks such as land preparation, ridging, fertilizer and pesticide application, harvesting, and milling. Women, on the other hand, were more engaged in planting, weeding, threshing, parboiling, and other post-harvest processing activities, showing their strong involvement in the value-addition stages of production. The regression analysis showed that for male participation in rice farming was significantly influenced by marital status, farming experience, and income, while female participation was significantly affected by household size, education, farming experience, and income, showing clear gender differences in socio-economic drivers of participation.

Both male and female farmers faced range of production constraints. Among men, inadequate capital, climate variability, insufficient extension contacts, high labour cost, and lack of credit facilities were dominant constraints. For women, insecure land tenure, high cost of inputs, and limited access to capital and labour were particularly severe. These findings highlighted the persistence of gendered inequalities in access to productive resources, income, and decision-making roles within the rice sector.

Recommendations

Based on findings on constraints faced by male and female rice farmers in the study area, the following recommendations were made:

1. Since land tenure was the most severe constraint for female farmers, policy reforms are needed to ensure women have legal, secure, and enforceable rights to land use, control or ownership. Government and local authorities should streamline and simplify procedures for women to obtain land use certificates or permits; also customary land practices should be reviewed to make them more gender inclusive.
2. Given that many farmers reported few or no visits by extension agents, boosting extension delivery is critical. Extension organization in Plateau State should hire/train more extension agents, reducing agent: farmer ratios, improving transport and logistics for agents, and using varied communication channels such as group meetings, one-to-one visits, radio, SMS, to suit gender preferences. Use of ICT or mobile platforms could help reach more farmers at lower cost.
3. Extension organizations should promote climate-smart agricultural practices such as drought- or flood-tolerant rice varieties, improved water management, training in weather forecasting and climate information services, and crop diversification. Extension services should also include modules on climate risk management.
4. Extension agents should encourage formation or strengthening of cooperatives can help farmers pool resources, gain economies in input purchase, and increase bargaining power for credit and markets. Cooperative membership can help reduce constraints related to cost of inputs, access to credit, and infrastructure.

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Print ISSN: ISSN 2058-9093

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