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Original Article

Gender-based differentials in cocoa bean production in Ondo State, Nigeria

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ABSTRACT

This study investigated gender-based differences in cocoa bean production in Ondo State, Nigeria, using descriptive statistics, budgetary techniques, and a multiple regression model for the data analysis. The research employed primary data collected from 120 randomly selected cocoa farmers with the use of a structured questionnaire. The study revealed significant socio-economic disparities between male and female farmers. Male farmers, with an average age of 44, exhibit higher productivity due to greater access to resources and farming experience. The findings further showed that male farmers earned a net farm income of ₦ 74,954,180 while the return on investment was estimated to be 2.83. The female farmers earned a net farm income of ₦ 23,140,340, and the return on investment was estimated to be 2.06. This finding confirmed that cocoa production is a profitable enterprise in the study area. Results of multiple regression analysis highlighted that age, marital status, family size, secondary occupation, and education level significantly impacted male farmers' productivity, while only marital status and education level were significant for female farmers. Female farmers, although actively involved in cocoa farming, face substantial barriers such as limited access to credit, inputs, and extension services, leading to lower productivity and profitability. The study underscores the need for targeted interventions to address these gender disparities, enhance access to resources for female farmers, and improve overall productivity in the cocoa sector. Addressing these challenges is crucial for promoting gender equity and sustainable development in cocoa production in the area.

HIGHLIGHTS

- Significant socio-economic disparities between genders.
- Cocoa production is a profitable enterprise for both males and females.
- Female farmers earn more but face barriers limiting productivity.
- Targeted interventions are needed for gender equity.

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1. Introduction

Cocoa, the primary ingredient in chocolate, is of substantial economic importance worldwide (Afoakwa, 2016; Beg et al., 2017; Gutiérrez-Macías et al., 2021; Cadby and Araki, 2021). In Nigeria, it is particularly crucial, significantly contributing to foreign exchange earnings and employment, especially in rural areas. Cocoa is Nigeria's second-largest non-oil foreign exchange earner, primarily grown in eight key states including Ondo, Cross River, Akwa Ibom, Ekiti, and Delta. According to the International Cocoa Organization (ICCO), Nigeria produced about 245,000 metric tons of cocoa in the 2019/2020 season. In 2021, Nigeria exported $779 million worth of cocoa beans, making it the fourth-largest exporter globally. That year, cocoa beans were Nigeria's fourth most exported product, with major markets being the Netherlands ($316M), Malaysia ($143M), Indonesia ($69.1M), the United States ($53.6M), and Canada ($38.1M) (OEC, 2021). Cocoa significantly boosts the economies of Ghana, Ivory Coast, Nigeria, and Cameroon, contributing between 60-90% of the income for producers in West and Central Africa. Africa accounts for around 76% of global cocoa production, with Côte d'Ivoire and Ghana contributing approximately 36-42% and 18-21%, respectively, over the past decade (ICCO, 2017). Additionally, cocoa supports livelihoods in other sectors such as manufacturing and services.

Cocoa is categorized under permanent crop production and many gender issues are associated with the production of permanent crops, especially in developing countries of Africa, particularly in Nigeria where cocoa production is intensively done. These gender issues in access to production resources may impact the productivity, profitability, and sustainability of cocoa farming, as well as the well-being of both male and female farmers and their families due to the significant contribution of women in farming. Gender in agriculture examines the dynamics between men and women regarding roles, resource access and control, labour division, and needs. In agricultural production, women often face greater constraints in accessing production resources compared to men. This disparity is evident in women's limited access to information, technology, inputs, and credit, leading to lower productivity compared to their male counterparts (Ojo and Baiyegunhi, 2023). The gender yield gap primarily arises from differences in the intensity of input application—such as labour, manure, and fertilizer—on plots managed by men and women,

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rather than differences in input use efficiency (Doss, 2015; Karamba and Winters, 2015).

In Nigeria, cocoa farming is predominantly carried out by smallholder farmers, who cultivate small plots (FAO, 2021 cited in Adebayo et al., 2022). The industry faces challenges like low productivity and poor quality, stemming from ageing cocoa trees, poor soil fertility, inadequate input access, and poor agricultural practices (Thomas et al., 2022). The study of Njuki et al. (2023) highlights the crucial role of gender considerations in agriculture, impacting productivity, food security, nutrition, poverty reduction, and empowerment. Doss (2018) found that female-owned plots and female-headed households in Africa, including Nigeria, consistently experience low productivity. Female farmers encounter numerous obstacles, including limited access to production resources such as farm equipment and capital, which restricts their involvement in household farming decisions (Msosa, 2022). In Nigeria, cultural norms and gender labour divisions prevent women from owning land and place them in subordinate roles to men. Even in agricultural areas where women are primary processors, male dominance in household decision-making persists despite significant female labour contributions. Unfortunately, female farmers often lack a voice in shaping agricultural policies. A study by Ekemhonye et al. (2023) revealed that women cocoa farmers face significant barriers in accessing credit, inputs, and extension services, limiting their ability to increase yields and income. The study also found that women are less likely than men to participate in cocoa cooperatives and access markets, further restricting their earning potential.

Despite women's active involvement in cocoa farming, their contributions often go unrecognized, and they face numerous barriers that limit their productivity and engagement in the cocoa value chain. This problem statement aims to highlight the key issues surrounding gender disparities in cocoa bean production in Nigeria and emphasize the need for targeted interventions to address these inequalities. Women's participation in decision-making processes related to cocoa production is frequently limited, and they are underrepresented in cocoa-producer organizations. This lack of representation and leadership opportunities further restricts women's ability to influence policies and practices that impact their livelihoods.

Although there is growing awareness of the importance of gender in agriculture, significant knowledge gaps remain regarding gender differences in cocoa bean production, particularly in Nigeria. One major gap is the lack of detailed information on specific gender roles and responsibilities in cocoa production. While studies have shown that women play a critical role, there is a need to understand the specific tasks and responsibilities of both men and women in cocoa farming. Another gap is the limited data on gender differences in access to productive resources like land, finance, and extension services. While it is known that women face significant barriers, more comprehensive data is needed to understand the extent of these disparities.

Overall, more comprehensive research on the gender dynamics of cocoa production is essential to better understand the challenges faced by both women and men and to inform policy and programmatic interventions aimed at promoting gender equity and enhancing productivity in the cocoa sector.

In light of this background, the study empirically analysed the gender differences in cocoa bean production in Ondo State, Nigeria. The specific Objectives of this study are to ascertain the socio-economic characteristics of cocoa farmers on a gender basis; estimate the costs and returns of male and female farmers; determine factors affecting cocoa bean production in the area; and identify significant constraints to cocoa bean production in the area.

2. Methodology

2.1. Description of Study Area

The research was conducted in Ondo State (Figure 1), Nigeria, which was formed from the former Western State. Globally, cocoa production reaches approximately 3 million tons, with Ondo State being Nigeria's largest producer (Kehinde and Ogundeji, 2022). About 60% of Nigeria's cocoa output originates from Ondo State (Oladoyin and Aturamu, 2022; Akinbola, 2023). Known as the cocoa belt or the land of cocoa farmers, Ondo State borders Ekiti

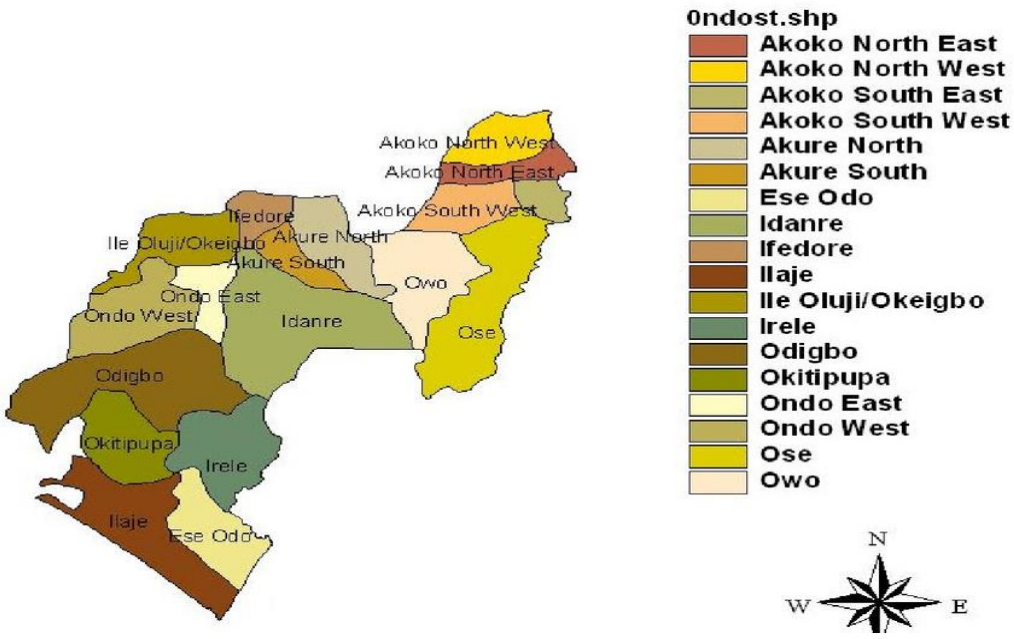

Figure 1. Map of Ondo State Local Government Areas

and Kogi States to the north, Edo State to the east, Delta State to the southeast, Osun and Ogun States to the west, and the Atlantic Ocean to the south. The Ondo East Local Government Area is a significant Yoruba cultural sub-group located in the northeastern part of Yoruba land. This area extends from Ondo State to Edo State in southwest Nigeria, with the Akoko subgroup comprising 20.3% of Ondo State's population across its 18 Local Government Councils.

The ecological zone, formerly a rainforest, is gradually transitioning to a derived savannah due to erratic rainfall patterns attributed to climate change (Agbeja et al., 2020). This zone experiences two distinct seasons: the rainy season from April to September and the dry season from September to March. The area receives an average annual rainfall of 1250 mm, with temperatures ranging between 18°C and 35°C (Omonijo et al., 2023).

2.2. Source of Data, Collection, and Sampling Techniques

Primary data were utilized for this study, gathered through the distribution of questionnaires to cocoa farmers. Information was collected using a direct, structured questionnaire designed to obtain relevant data for the research. The questionnaire was administered to 120 selected cocoa farmers, seeking general information on their socio-economic characteristics, including age, farming experience, household size, and farm size.

A multistage sampling technique was employed to select cocoa farmers. In the first stage, a purposive sampling method was used to choose Idanre, Ile-Oluji/Okeigbo, and Ondo East Local Government Areas (LGAs) known for their significant cocoa production. The second stage involved a simple random selection of four communities from each LGA, totalling twelve communities. In the third stage, ten cocoa farmers were randomly chosen from each community, resulting in a total of 120 farmers, comprising 71 males and 49 females were used for the study. The data collected were analyzed using descriptive statistics, budgetary techniques, and multiple regression analysis.

2.3. Model Specification

Budgetary techniques involved the method of calculating the gross margin, profit, and Return on Investment (ROI) of cocoa bean production in the study area. The gross margin analysis was employed to estimate the costs and returns of cocoa bean production in the study area. Gross Margin (GM) is defined as the difference between total revenue and total variable cost.

Mathematically, it is usually expressed as;

$$GM = TR - TVC$$

where TR is the total revenue on vegetable production (₦) and TVC is the total variable cost incurred on vegetable production (₦)

Total Revenue (TR) is the product of output and the price of cocoa beans while the Total Variable Cost (TVC) is the aggregation of the costs of land preparation, planting materials, weeding, harvesting, and other costs incurred in the production. Return on Investment was obtained by dividing the total revenue (TR) by the total cost.

Again, the production function was estimated using the Ordinary Least Square Regression Techniques. The Multiple regression analysis was used to identify socio-economic factors that affect cocoa bean production among male and female farmers. The two functional forms were tried for the production function and the one that best satisfy the theoretical, statistical, and economic criteria was selected as lead equation. The functional forms were Linear and Exponential. The regression model in implicit form is given as:

$$Y = X_1 \times X_2 \times X_3 \times X_4 \times X_5$$

Explicitly, the models were represented as follows.

Linear function:

$$Y_i = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + U_i$$

Exponentials:

$$logY_i = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + U_i$$

where β_0 is the intercept, β_1 is the slope of the regression coefficient, U_i is the stochastic term and Y is the output in Kg (dependent variable). The parameter X_1 is the age (years), X_2 is the marital status (married =1 and 0, otherwise), X_3 is the other occupation (yes = 1 and 0, otherwise), X_4 is the educational level (Number of years spent in school), X_5 is the family size (numbers).

3. Results and Discussion

3.1. Socioeconomic Characteristics of the Male and Female Respondents

Table 1 shows that 9.9% of cocoa farmers were aged 30-40 years, 22.5% were aged 41-50 years, 39.4% were aged 51-60 years, and 28.2% were over 60 years old. The mean age of male respondents was approximately 44 years, indicating that the male cocoa farmers are in their economically productive years. Similarly, 8.2% of the respondents were under 30 years, another 8.2% were aged 30-40 years, 30.6% were aged 41-50 years, 30.6% were aged 51-60 years, and 32.6% were over 60 years old. The mean age of female respondents was approximately 42 years, indicating that female cocoa farmers are also in their economically productive years.

Results indicate that 2.8% of male respondents were single, 87.3% were married, 4.2% were separated, and 5.7% were divorced, as shown in Table 1. This suggests that the majority of male cocoa farmers were married. This corroborates the findings of Abidogun et al. (2019) who stated that 89.5% of cocoa farmers were married. In Nigeria, marital status often influences household size, as married farmers typically have household members who assist with farming activities. Similarly, 6.1% of female respondents were single, 67.4% were married, 6.1% were separated, and 20.4% were divorced, as shown in Table 5. This shows that most female cocoa farmers were also married, aligning with findings by Oluyole et al. (2017), Oseni et al. (2018), and Akinbola (2023) that the majority of the rural workforce is married. Additionally, 75% of respondents were literate, indicating that most cocoa farmers in the study areas had some level of education.

Results of the analysis revealed that 39.4% of male respondents had a family size of 1-5 members, while 60.6% had a family size of 6-10 members. This indicates that most male cocoa farmers had large families, which affects the availability of family labour for farming activities and can signify the size of an individual's cocoa farm. In contrast, 57.1% of female respondents had a family size of 1-5 members, and 42.9% had a family size of 6-10 members, indicating smaller family sizes for female cocoa farmers. This smaller family size might allow female farmers to focus more on strategizing and contributing significantly to cocoa production development in the study area.

Table 1. Distribution by the Gender Comparison of the Socioeconomic Characteristics of the Respondent

Variable	Male		Female	
	Frequency	Percentage	Frequency	Percentage
Age				
< 30years	-	-	4	8.2
31-40years	7	9.9	4	8.2
41-50years	16	22.5	15	30.6
51-60years	28	39.4	16	32.6
> 60years	20	28.2	10	20.4
Marital Status				
Single	2	2.8	3	6.1
Married	62	87.3	33	67.4
Separated	3	4.2	3	6.1
Divorced	4	5.7	10	20.4
Family size				
1-5	28	39.4	28	57.1
6-10	43	60.6	21	42.9
Secondary Occupation				
Farming	49	69.0	6	12.2
Artisan	11	15.5	11	22.4
Civil Servant	5	7.0	16	32.7
Traders	6	8.5	16	32.7
Level of Education				
No formal education	19	26.8	6	12.2
Primary education	25	35.2	10	20.4
Secondary education	20	28.2	13	26.6
Tertiary education	7	9.8	20	40.8
Total	71	100.0	45	100.0

The various secondary occupations of male cocoa farmers, detailed in the Table, highlight their economic resilience strategies. About 69% engaged in additional farming activities, showing a preference for diversifying within agriculture. Furthermore, 15.5% were involved in artisanal work, and 7% held civil service positions, indicating strategic diversification beyond agriculture. A notable 8.5% of female cocoa farmers engaged in trading activities, reflecting an entrepreneurial mindset. For female cocoa farmers, secondary occupations also reveal economic resilience strategies. About 12.2% engaged in additional farming activities, 22.4% were involved in artisanal work, and 32.7% were employed in civil service roles. Additionally, 32.7% of female cocoa farmers participated in trading activities, indicating entrepreneurship. Otaokpukpu et al. (2023) emphasize the importance of market integration in providing farmers with access to information and resources, positively impacting their agricultural productivity. Engaging in trade not only supplements income but also enhances market understanding and network expansion, which are vital for modern agricultural practices. The findings indicate that most female cocoa farmers were primarily traders and civil servants as their secondary occupations in the study area.

Regarding education, 26.8% of male respondents had no formal education, 35.2% had primary education, 28.2% had secondary education, and 9.8% had tertiary education. This indicates that most male cocoa farmers were semi-literate. Despite this, their level of education can positively contribute to cocoa production, as noted by Akinbola (2023) who found that educated cocoa farmers are better able to adopt production technologies and acquire the necessary knowledge for farm maintenance.

In contrast, 12.2% of female respondents had no formal education, 20.4% had primary education, 26.6% had secondary education, and 40.8% had tertiary education. This shows that most female cocoa farmers were literate and held tertiary certificates. The high literacy level among female cocoa farmers provides them with opportunities to understand and adopt modern farming practices more readily than their male counterparts. These findings, consistent with Akinbola (2023) suggest that educated cocoa farmers can effectively adopt new production technologies and maintain their farms adequately.

3.2. Cost and Return of Cocoa Production

The budgetary analysis for male cocoa bean farmers in the study area revealed that fixed costs, including expenses for land, cutlass, spray pump, "go-to-hell" tool, and Knapp sprayer, constituted 84.2% of the total production costs (Table 2). The remaining 15.8% accounted for variable costs, which included fungicides (₦ 976,224), herbicides (₦ 1,500,910), insecticides (₦ 657,342), pesticides (₦ 482,024), and labour (₦ 2,852,000), summing up to a total variable cost of ₦ 6,468,500. The net farm income for male cocoa bean farmers from cocoa production was calculated to be ₦ 74,954,180. To determine the profitability of cocoa production, the gross margin was computed by subtracting the total variable cost from the total revenue, resulting in ₦ 109,367,300. Additionally, the ROI was found to be ₦ 2.83, indicating that for every 1 naira invested in cocoa production, there is a return of ₦ 2.83. This suggests that cocoa farming is profitable in the study area, with male cocoa farmers achieving substantial profits.

For female cocoa bean farmers in the study area, the budgetary analysis showed that fixed costs, including land, cutlass, spray pump, "go-to-hell" tool, and Knapp sprayer, made up 82.2% of the total costs. Variable costs accounted for 17.8%, with expenses on fungicides (₦ 700,450), herbicides (₦ 407,831), insecticides (₦ 710,021), pesticides (₦ 250,323), and labour (₦ 1,790,975), totalling ₦ 3,859,600. The net farm income for female cocoa bean farmers from cocoa production was found to be ₦ 23,140,340. The gross margin, calculated by subtracting the total variable cost from the total revenue, was ₦ 40,977,700. The ROI for female cocoa bean farmers was ₦ 2.06, indicating that for every

Table 2. Costs and Returns for Male and Female Respondents

Variable item	Male		Female	
	Cost (₦)	Percentage	Cost (₦)	Percentage
Variable cost				
Fungicide	976, 224	2.39	700, 450	3.2
Herbicide	1, 500, 910	3.7	407, 831	1.8
Insecticide	657, 342	1.6	710, 021	3.2
Pesticide	482, 024	1.2	250, 323	1.2
Labour	2,852,000	6.9	1, 790, 975	8.2
(A) Total Variable Cost	6, 468, 500	15.8	3, 859,600	17.8
Fixed Cost				
Land	28, 658,250	70.1	14, 623, 213	67.4
Cutlass	1,021, 223	2.5	900, 234	4.1
Spray pump	2, 752, 847	6.7	780, 364	3.6
Go-to-hell	1,330, 570	3.3	580, 943	2.7
Knapp sprayer	650, 230	1.6	952, 606	4.3
(B) Total Fixed Cost	34,413,120	84.2	17, 837, 360	82.2
(C)Total Cost (TC)	40, 881, 620	100.0	21,696, 960	100.0
(D)Total Return	115,835,800		44, 837,300	
(E) Net farm income	74, 954, 180		23, 140, 340	
Gross margin (D-A)	109, 367, 300		40, 977, 700	
ROI (D/C)	2.83		2.06	

1 naira invested, there is a return of N2.06. Although female cocoa farming is profitable, it is less so compared to their male counterparts, resulting in lower profits for female cocoa farmers in the study area. The profitability of cocoa production, whether male or female farmers, was also reported in several studies in the literature such as Oseni et al. (2018), Oladoyin and Aturamu (2022), and Akinbola (2023).

3.3. Modelling Factors Influencing Cocoa Bean Production

To assess the factors influencing male farmers in cocoa bean production, a comprehensive regression analysis was conducted, examining variables such as age, marital status, family size, secondary occupation, and education level, categorized into low, moderate, and high impacts as presented in Table 3. The R^2 value of 0.949 indicates that these factors explain 94% of the variations in male cocoa bean farmers' productivity. The age of male cocoa farmers (X_1) showed a significant positive correlation of 86%, indicating a high impact on cocoa production in the study area. This suggests that older male cocoa farmers, who likely have more years of experience, tend to have higher cocoa productivity. This

Table 3. Modelling of factors affecting Cocoa bean production

Variable	Variable letter code	Male		Female	
		Linear	Exponential	Linear	Exponential
Constant	coefficient	22.060	14.438	5.206	10.906
	T-value	6.252	3.802	1.562	4.645
	P-Value	0.000	0.000	0.126	0.000
Age	X_1	0.251	0.861	0.814	0.740
		0.688	3.051	0.755	0.275
		0.751	0.001**	0.531	0.385
Marital Status	X_2	0.503	2.378	4.956	0.776
		2.312	-2.436	2.063	1.936
		0.023**	2.329	0.045	0.063
Family Size	X_3	7.009	-0.463	0.642	0.913
		-3.705	-2.436	0.423	0.636
		0.003**	0.012	0.542	0.562
Secondary occupation	X_4	2.842	0.536	0.783	0.898
		0.574	3.977	0.355	0.562
		0.977	0.000	0.231	0.321
Education Level	X_6	2.654	-0.492	0.524	0.578
		2.155	-2.376	4.517	2.266
		0.035**	0.013**	0.000	0.022
R square	.949	.925	.641	.503	
Adj R^2	900	856	586	.253	
F- ratio	81.7	63.4	5.56	2.36	

Table 4. Distribution by the main constraints faced by male and female cocoa farmers in the study area

Items	Male						Female					
	SA F(%)	A F(%)	SD F(%)	D F(%)	Mean ($\bar{x}$)	Rank	SA F(%)	A F(%)	SD F(%)	D F(%)	Mean ($\bar{x}$)	Rank
Lack of access to affordable and quality inputs	26 (36.6)	24 (33.8)	11 15.5	10 14.1	3.57	1st	10 20.4	23 46.9	5 10.2	11 22.4	2.34	1st
Climate change and unpredictable weather patterns	29 (40.8)	33 (46.5)	4 5.6	5 7.0	3.55	2nd	23 46.9	23 46.9	3 6.1	- -	1.59	9th
Pests and diseases	26 (46.6)	35 (49.3)	5 7.0	5 7.0	3.44	3rd	20 40.8	20 40.8	5 10.2	4 8.2	1.85	8th
Limited access to credit and financial resources	14 (19.7)	29 40.8	20 28.2	8 11.3	3.30	4th	16 32.7	14 28.6	9 18.4	10 20.4	2.22	3rd
Inadequate access to modern farming technologies and practices	19 (26.8)	35 49.3	7 9.9	10 14.1	3.11	5th	15 30.6	21 42.9	7 14.3	6 12.2	2.26	2nd
Lack of knowledge and information on best farming practices and post-harvest handling	20 28.2	35 49.3	10 14.1	6 8.5	3.02	6th	16 32.7	20 40.8	6 12.2	7 14.3	2.08	6th
Limited access to extension services and technical support	27 38.0	28 39.4	10 14.1	6 8.5	2.92	9th	13 26.5	21 42.9	8 16.3	7 14.3	2.08	7th
Market price fluctuations and lack of market information	22 31.0	37 52.1	5 7.0	7 9.9	2.95	8th	15 30.6	21 42.9	5 10.2	8 16.3	2.18	4th
Limited access to transportation and infrastructure	14 19.7	41 57.7	9 12.7	7 9.9	3.12	7th	20 40.8	20 40.8	7 14.3	2 4.1	2.12	5th

finding is supported by Akinnagbe and Ajayi (2010), who noted that cocoa farmers generally have extensive farming experience, which is crucial for effective cocoa production. Marital status (X_2) showed a moderate impact of 50% on cocoa bean production. Family size (X_3) had a significant influence with both negative and positive coefficients at -46% and 70%, respectively, indicating that a larger family size contributed to both low and moderate impacts on cocoa productivity in the study area. The analysis found that secondary occupation had a significant but low impact (53%) on cocoa bean production. This low impact may be due to divided attention between cocoa farming and other occupations. Educational background, represented by years of schooling ($X_{5)}$, positively affected cocoa productivity, showing both low and moderate impacts. Education enables cocoa farmers to access and utilize new information, adopt advanced agricultural technologies, and make informed financial decisions. Thus, age, marital status, family size, secondary occupation, and education level are key factors influencing cocoa production among male farmers in the study area. This corroborates the findings of Oseni et al. (2018), Olutumise et al. (2020), and Oladoyin and Aturamu (2022).

For female cocoa bean farmers, a similar regression analysis was conducted with variables such as age, marital status, family size, secondary occupation, and education level, categorized into low, moderate, and high impacts. The R^2 value of 0.503 suggests that these factors explain 50% of the variations in female cocoa bean farmers' productivity. The age of female cocoa farmers (X_1) showed a positive correlation but was not statistically significant for cocoa production in the study area. This implies that older female cocoa farmers, who likely have more experience, are associated with higher productivity. However, Doss (2018) noted that lower productivity is common in female-owned plots and female-headed households in Africa, including Nigeria, due to constraints like limited access to production resources and capital, restricting their contributions to household farming decisions. Family size (X_2) had a significant positive influence with a coefficient of 49%, indicating a low impact on cocoa bean productivity. This aligns with Maduka et al. (2023), who found that men typically undertake production activities such as farm clearing, planting, and chemical application. Marital status was not statistically significant in influencing cocoa productivity among female farmers. Secondary occupation also showed no significant impact on cocoa bean production. Educational background, indicated by years of schooling (X_5), had a moderate positive impact (52%) on cocoa productivity. Education enhances a farmer's ability to access and apply new information, adopt advanced agricultural technologies, and make informed financial decisions. Therefore, the analysis shows that marital status and education level significantly influence female cocoa production, while age, family size, and secondary occupation do not have significant impacts in the study area.

3.4. Constraints Faced by Cocoa Farmers

The constraints faced by male cocoa bean farmers, as outlined in Table 4, present a complex array of challenges. The most significant constraint, indicated by a mean score of 3.57%, is the lack of access to affordable and quality inputs, such as seeds and fertilizers. Climate change and unpredictable weather patterns also pose substantial challenges, with a mean score of 3.55. Climate change represents a permanent shift in climate patterns, diverging from historical averages.

Pests and diseases are another major constraint, affecting 3.44% of male cocoa farmers, and threatening crop yields and farm income. Effective management of these issues often requires substantial investment in quality inputs, a challenge further complicated by limited access to credit. Moreover, 3.30% of male

farmers struggle with restricted access to financial resources, hindering their ability to expand their farms.

Inadequate access to modern farming technologies and practices, reported by 3.11% of respondents, also limits productivity. Modern equipment typically requires significant capital investment, which is a challenge for male cocoa farmers in the study area. Lack of knowledge and information on best farming practices and post-harvest handling, cited by 3.02% of male farmers, restricts their ability to improve crop yields. Additionally, limited access to extension services and technical support, reported by 2.92% of respondents, is a significant constraint. Market price fluctuations and lack of market information, cited by 2.95% and 3.12% of respondents respectively, along with limited access to transportation and infrastructure, further negatively impact the ability of cocoa farmers to reach markets and sell their produce, affecting productivity in Nigeria.

Female cocoa bean farmers face a similarly complex set of challenges, as detailed in Table 4. The lack of access to affordable and quality inputs, such as seeds and fertilizers, is a major constraint, with a mean score of 2.34. Climate change and unpredictable weather patterns, with a mean score of 1.59, also pose significant challenges, representing a permanent shift in climate patterns. Pests and diseases are major constraints for female farmers as well, with a mean score of 1.85, directly threatening crop yields and farm income. Effective management requires investment in quality inputs, which is complicated by limited access to credit. Additionally, 2.22% of female farmers struggle with restricted access to financial resources, hindering farm expansion.

Inadequate access to modern farming technologies and practices, cited by 2.26% of respondents, further limits productivity. Modern equipment usually requires significant capital, posing a challenge for female cocoa farmers. Lack of knowledge and information on best farming practices and post-harvest handling, reported by 2.08% of female farmers, restricts their ability to improve crop yields. Furthermore, limited access to extension services and technical support, with a mean score of 2.08, is a significant constraint. Market price fluctuations and lack of market information, with mean scores of 2.18 and 2.12 respectively, along with limited access to transportation and infrastructure, negatively impact female farmers' ability to reach markets and sell their produce, affecting productivity in Nigeria. The results of this study shared similar view with the findings of Akinnagbe and Ajayi (2010), Oseni et al. (2018), and Akinbola (2023) that were conducted in Southwest, Nigeria.

Conclusion

This study provides an in-depth analysis of the gender-based differentials in cocoa bean production in Ondo State, Nigeria. The findings reveal significant disparities in production and profitability between male and female cocoa farmers. Male farmers tend to achieve higher productivity and profitability, attributed to better access to resources, farming experience, and support systems. Conversely, female farmers face numerous challenges, including limited access to credit, inputs, and extension services, which significantly hinder their productivity and income. The regression analysis underscores the importance of factors such as age, marital status, family size, secondary occupation, and education level in cocoa production. For male farmers, these factors collectively explain a substantial portion of productivity variations. In contrast, for female farmers, only marital status and education level were significant, highlighting the additional barriers women face in this sector. Based on the main findings of this study, it could be recommended that the government should develop targeted credit schemes for female farmers to improve their access to financial resources. The availability of affordable and quality agricultural inputs such as seeds, fertilizers, and pesticides to female farmers should be guaranteed for improved productivity. The government through the extension agents should implement training programs focused on modern farming techniques and post-harvest handling practices to enhance productivity. Thus, strengthening extension services to provide technical support and disseminate best practices, with a special focus on female farmers should be encouraged and promoted. Improve transportation networks to facilitate market access for cocoa farmers. The storage facilities should be developed to reduce post-harvest losses and stabilize the market supply. Lastly, the government should formulate and implement policies that address the specific needs of female cocoa farmers, promoting gender equity in resource allocation and decision-making.

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