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GENDER DIFFERENTIALS AND PROFITABILITY ANALYSIS OF PEPPER (CAPSICUM SPECIES) PRODUCTION, KADUNA STATE, NIGERIA

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ABSTRACT

This study analyzed gender differentials and profitability of pepper (Capsicum species) production in Kaduna State, Nigeria. Multi-stage sampling technique was adopted. One hundred pepper farmers were selected. Primary sources of data were employed with the aid of well-designed and well-structured questionnaire. The results show that 66% of pepper farmers were between 21 to 50 years. Pepper production was profitable in the study area. Gender differentials in average costs and returns in pepper production revealed that gross margin were 137, 556.51 Naira per hectare for male pepper farmers, higher than that at 109,711.77 Naira per hectare for female pepper farmers respectively. Gender differentials in factors influencing output of pepper produced shows that age (X_1),and fertilizer input (X_4), were significant factors influencing output of pepper produced by male farmers at 1% probability levels, while age (X_1), labour input (X_3), and fertilizer input (X_4), were significant factors influencing output of pepper produced by female farmers at 1% probability levels respectively. The return to scale(RTS) of pepper production was estimated at 2.798 for male farmers, which signifies increasing return to scale. The return to scale (RTS) was calculated for female pepper farmers at 0.033, which implies decrease return to scale. Major constraints faced by pepper farmers were: lack of fertilizers, pest and disease infestations, and inadequate capital. The study recommends that women pepper farmers should be giving more access to farm inputs and credit facilities at low interest rate to increase productivity.

INTRODUCTION

Pepper (*Capsicum species*) is a highly valued, varied and widely grown spice crop for food and cash by farmers all over the world (Aliyu et al., 2012). Pepper ranks second (2nd) after tomatoes in the world as the most important fruit vegetable. Pepper constitutes about 40% of human vegetable consumed and it's the world's most commonly used spice (Adeoye et al., 2014). Pepper is the most widely produced type of colouring food and spice flavouring crop and its excellent source of natural colours and anti-oxidants compound. Nigeria has good soil and weather conditions that can support growth and productivity of pepper. Nigeria is one of the major producer of pepper in the world, and it accounted for 50% of Africa's production (Mohammed et al., 2013). Nigeria produces 762, 174 tonnes of chillies and pepper, green in 2020 which is 0.27% increase over that of 2019 which was 760, 114 tonnes (FAO, 2020). The average yield of chillies and pepper green in 2020 was 2 to 2.5 tonnes per hectare (FAO, 2020) The area under chillies and pepper, green production was 101, 350 hectares in 2020, the yields of chillies and pepper green was 75, 202 hg/ha (FAO, 2020). The production of chillies and pepper, dry in 2020 was 62,556 tonnes which was 0.32% increase over the production in 2019 which was 62, 356 tonnes (FAO, 2020). The area and yields of chillies and pepper, dry in 2020 were 36, 605 ha and 17,089 hg/ha respectively (FAO, 2020). Pepper is medicinal and nutritional which has potentials to generate foreign exchange, reduce unemployment, and its use in pharmaceuticals, culinary and confectionary purposes has been on the increase. According to Dipeolu and Akinbode (2007) pepper contains vitamins A, B, C, B_1, B_2 and B_3. All varieties of peppers are good excellent sources of vitamins A, and C,

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potassium, fibre and folic acid. Most of the Nigerian's pepper is produced by small scale, resource-poor, smallholder farmers who sell their produce to middlemen or traders who re-sell the products to processors (Adeoye et al., 2014). Pepper is widely cultivated throughout Nigeria especially Northern Nigeria, the yields obtained by resource-poor farmers are still low (Ogunbo, 2015). Production constraints include: lack of farm inputs, lack of credit facilities, low soil fertility, pests and diseases, weeds, and poor management practices (Dennis & Kentus, 2018; Ogunbo, 2015). High potential pepper producing areas of Nigeria are Kaduna, Kano, Jigawa, Sokoto, Plateau, and Bauchi States. Pepper grown in Nigeria is in high demand because of it pungency and good flavor (Dennis & Kentus, 2018).

Gender refers to the social opportunities and attributes associated with being female or male and the relationships between men and women (World Bank, 2003). Gender plays a significant role in the agricultural sector where both women and men are involved in the agricultural value chain activities that complement each other (Adam et al., 2018). Women make up 60 to 80 % of agricultural labour force in Nigeria (World Bank, 2003). In sub-Saharan Africa, Nigeria inclusive, women are known to be involved in agricultural activities than men. About 73% of African women were involved in cash crops, arable and vegetable gardening, 16% were involved in post-harvest activities, while 15% of African women were involved in agro-forestry activities (Ajibade et al., 2021). Women in Nigeria have practically taken over the processing and production of arable crops, they are responsible for as much as 80% of staple foods (Afolabi, 2008; Ogunlela & Mukhtar, 2009). Despite the high percentage of women in agriculture in Nigeria, productivity is lower for female farmers when compared to their male counterparts (Olakojo, 2017). Women tends to have lower access to agricultural productive resources than men due to gender specific constraints (FAO, 2020). Productive resources include: access to credit facilities; access to extension services; ownership of land, crop and livestock; access to farm inputs; access to education, skills and knowledge related to agriculture; and management of agricultural resources (Moore et al., 2015). Women also had problem of access to agricultural information, when adequate information are available to women farmers, experiences can be shared, sources of financial aids, best practices, and new markets will be made known to women. In order to improve agricultural production and attained agricultural sustainable development, information on agriculture is crucial for any nation (Lawal et al., 2017). Women productive capacity in the agricultural sector remains lower than their male counterparts, and thereby impacting adversely on overall productivity (Olakojo, 2017). Male and female farmers have equal productive efficiency especially when inputs, credit and market access as well as physical and human capital are adequately controlled (Olakojo, 2017)

Objectives of the Study

This study analyzed gender differentials and profitability analysis of pepper (*Capsicum species*) production in Kaduna State, Nigeria. Specifically, the objectives were to:

(i) Determine the socio-economic characteristics of pepper farmers,
(ii) Analyze the gender differentials in costs and returns of pepper production,
(iii) Evaluate gender differentials in factors influencing output of pepper production,
(iv) Evaluate gender differentials in elasticities of production, and return to scale of pepper production, and
(v) Determine the constraints faced by pepper farmers in the study area.

MATERIALS AND METHODS

This research study was conducted in Kaduna State, Nigeria. Kaduna State lies between Longitudes 06^0 15| and 08^0 50| East of the prime meridian and Latitudes 09^0 02| and 09^0 02|North of the equator. The State has total land area of 4.5 million hectares. Kaduna State vegetation is divided into Northern guinea savanna and Southern guinea savanna. There are two (2) seasons in Kaduna State. The seasons are: dry and wet seasons, the dry season is between October to March, the wet season is from April to October, in between the dry and wet seasons is the brief harmattan period which span from November to February. The average rainfall is about 1,482mm, the temperature of Kaduna State ranges from 35^0C to 36^0C during the humid period to as low as 10^0C to 23^0C during the harmattan period. The population of Kaduna as at 2021 was 8.9 million people. They are involved in agricultural activities. Crops grown include: pepper, maize, ginger, sorghum, rice, yam, cassava, millet, and tomatoes. Animal reared include: cattle, goats, sheep, rabbit, and poultry. Multi-stage sampling technique was used. One hundred (100) pepper farmers were selected. Data collected from pepper farmers were of primary sources using well-designed and well-structured questionnaire. The questionnaire was administered to pepper farmers using well trained enumerators. Data were analyzed using the following analytical tools:

Descriptive Statistics: This involves the use of mean, range, percentages and frequency distributions to summarize the socio-economics characteristics of pepper farmers as stated in specific objective one (i).

Farm Budgetary Technique: The farm budgetary techniques used was Gross Margin Analysis (GM) and is defined as the difference between gross farm income (GFI) and total variable cost (TVC). This tool of analysis was used to determine the gender differentials in costs and returns of pepper production as specified in specific objective two (ii). The Gross Margin Model is stated thus:

$$GM = TR - TVC \dots\dots\dots\dots\dots\dots\dots\dots\dots (1)$$

$$GM = \sum_{i=1}^{n} P_i Q_i - \sum_{j=1}^{m} P_j X_j \dots\dots\dots\dots\dots\dots (2)$$

$$NFI = TR - TC \dots\dots\dots\dots\dots (3)$$

$$NFI = \sum_{i=1}^{n} P_i Q_i - \left[\sum_{j=1}^{m} P_j X_j + \sum_{k=1}^{k} GK\right] \dots\dots\dots (4)$$

Where
P_i = Price of Pepper ($\frac{₦}{Kg}$),
Q_i = Quantity of Pepper (Kg),
P_j = Price of Variable Inputs ($\frac{₦}{Unit}$),
X_j = Quantity of Variable Inputs (Units),
TR = Total Revenue obtained from Sales from Pepper (₦),
TVC = Total Variable Cost (₦),
GK = Cost of all Fixed Inputs (Naira)
NFI = Net Farm Income (Naira)

Financial Analysis: This is an analytical tool used to determine the gender differentials in profitability of pepper production. The financial analysis was used to achieve part of specific objective two (ii). Gross Margin Ratio according to Ben-Chendo (2015) is defined as:

$$Gross\ Margin\ Ratio = \frac{Gross\ Margin}{Total\ Tevenue} \ldots\ldots\ldots\ldots (5)$$

The operating ratio (OR) according to Olukosi and Erhabor (2015) is defined as:

$$Operating\ Ratio = \frac{TVC}{GI} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (6)$$

Where,
TVC = Total Variable Cost (Naira),
GI = Gross Income (Naira),
According to Olukosi and Erhabor (2015) an operating ratio of less than one (1) implies that the gross income from pepper enterprise was able to pay for the cost of the variable inputs used in the enterprise.
The rate of return per naira invested (RORI) in pepper production is defined as:

$$RORI = \frac{NI}{TC} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (7)$$

Where,
$RORI$ = Rate of Return per Naira Invested (Unit),
NI = Net Income (Naira),
$TC = Total\ Cost\ (Naira)$.

Cobb-Douglas Production Function Model: The model is defined as follows:

$$Log\ Y = \beta_0 + \beta_1 Log\ X_1 + \beta_2 Log\ X_2 + \beta_3 Log\ X_3 + \beta_4 Log\ X_4 + \beta_5 Log\ X_5 + \beta_6 Log\ X_6 + U_i \ldots\ldots\ldots\ldots (8)$$

Where,
Y = Output of Pepper (Kg),
X_1 = Age of Farmers (Years),
X_2 = Farm Size (Hectares),
X_3 = Labour Input (Mandays),
X_4 = Fertilizer Input (Kg),
X_5 = Seed Input (Kg),
X_6 = Chemical Input (Litres),
U_i = Error Term,
$\beta_1 - \beta_6$ = Regression Coefficients,
β_0 = Constant Term,

This was used to evaluate gender differentials in factors influencing output of pepper production as stated in specific objective three (iii).

Elasticity of Production and Return to Scale: Elasticity of production and return to scale of pepper production can be defined as:

$$RTS = \sum_i^n EP \ldots\ldots\ldots\ldots\ldots\ldots\ldots (9)$$
$$RTS = \sum_1^6 \beta_i \ldots\ldots\ldots\ldots\ldots\ldots (10)$$

$\text{RTS} = 1$, Constant Return to Scale
$\text{RTS} > 1$, Increasing Return to Scale
$\text{RTS} < 1$, Decreasing Return to Scale

Where
$RTS =$ Return to Scale (Units), and
$EP =$ Elasticity of Production Inputs (Units),
This was used to evaluate the gender differentials in elasticity of production and return to scale of pepper production as stated in specific objective four (iv).

Principal Component Analysis: The gender differentials in constraints faced by pepper farmers were subjected to principal component analysis. This was used to achieve specific objective five (v).

RESULTS AND DISCUSSIONS

Socio-Economic Characteristics of Pepper Farmers in the Study Area

The socio-economic characteristics of pepper farmers under considerations were age, gender, marital status, educational status, household size, access to credit facilities, contact with extension agents, years of farm experience, and farm size as presented in Table 1. The results show that 66% of sampled pepper farmers were between 21 to 50 years of age. The mean age was 43 years. This implies that pepper farmers in the study area were active, energetic, and resourceful in their youthful age. Mohammed et al. (2016) reported that younger pepper farmers were more flexible to risk and new ideas, therefore, they are expected to adopt innovations more readily than older farmers. Gender analysis in this research study classified pepper farmers into male and female. About 78% of pepper farmers were male, while 22% were female. This means that pepper farming was dominated by male counterparts. About 43% of pepper farmers had formal education, while 57% had non-formal education. Dennis and Kentus (2018) reported that illiteracy level among pepper farmers could affect negatively the ability to participate in extension training as well as adopt high level of innovations and improved practices of pepper production. Education acquired by pepper farmers is an important socio-economic factor influencing management decisions and adoption of new technology. Furthermore, 74% of pepper farmers had between 1 to 10 people as member of household. Averagely, there are 8 people per household. Mohammed et al. (2015) reported an average household size of 11 people for pepper farming household which implies that there is appreciable number of family labour supply to accomplish various farm operations. Similar to this finding, Sani et al. (2010) reported that larger household sizes among pepper farmers provide enough persons for family labour which signifies that little or less money will be needed to pay for hired labour. Also, 83% of pepper farmers had access to credit facilities, 35% do not have access to credit facilities. The low access to credit could be due to the fact that government seldom grant financial credit to farmers (Ekong, 2003). Access to credit is a very strong factor that is needed to develop any enterprise, availability of credit could determine the extent of production capacity (Mohammed et al., 2016). Access to micro-credit could improve productivity of pepper farmers and contribute to uplifting the livelihood of peasant resource-poor rural farming communities (Nosiru, 2010). Farm experience of pepper farmers is another important socio-economic factor that can bring about increase in pepper productivity. About 98% of pepper farmers had between 1 to 10 years' experience in pepper farming. Experience pepper farmers can correct past errors and can forecast future market situations of their products at higher prices to make better profits. Averagely, pepper farmers had 1.01 hectares of planted pepper farm land. They are small scale, smallholder, and resource-poor pepper farmers. Nigerian farms are classified into small scale (less than 5 hectares); medium scale (5 – 10 hectares); and large scale (more than 10 hectares). According to Ogunbo (2015), farm size may influence adoption of technology, scale of production, output level, and revenue accruable to pepper farmers.

Table 1. Socio-Economic Characteristics of Pepper Farmers in the Study Area

Variables	Frequency	Percentage	Mean
Age (Years)			
21 – 30	28	28.00	
31 – 40	19	19.00	
41 – 50	19	19.00	**43.61**
> 51	34	34.000	
Gender			
Male	78	78.00	
Female	22	22.00	
Marital Status			
Single	07	07.00	
Married	84	84.00	
Divorced	09	09.00	
Educational Status			
Primary	21	21.00	
Secondary	15	15.00	
Tertiary	07	07.00	
Non-Formal	57	57.00	
Household Size (Units)			
1 – 5	36	36.00	
6 – 10	38	38.00	**8.0**
11 – 15	21	21.00	
16 – 20	05	05.00	
Access to Credit Facilities			
Yes	65	65.00	
No	35	35.00	
Contact with Extension Agents			

Yes	83	83.00	
No	17	17.00	
Years of Farm Experience			
1 – 5	75	75.00	
6 – 10	23	23.00	**4.35**
11 – 15	02	02.00	
Farm Size (Hectares)			
0 – 0.99	40	40.00	
1 – 1.99	50	50.00	**1.01**
2 – 2.99	10	10.00	
Total	**100.00**	**100.00**	

Source: Field Survey (2021)

Gender Differentials in Profitability Analysis of Pepper Production in the Study Area

The gender differentials in costs and returns of pepper production was presented in Table 2. All costs incurred and revenue obtained were based on the market price as at the time of field survey. The variable costs incurred in pepper production for male and female farmers include: seed input, fertilizer input, herbicides, insecticides, bag sack, and labour input. The fixed cost, depreciated involved in pepper production for both male and female farmers include: land rent, sprayer, hoe, cutlass, and water pump. There was a significant difference between total variable costs involved in pepper production between male and female farmers. The average total variable costs in pepper production for both male and female were 155, 409.01 Naira and 122, 800.73 Naira and this accounted for 81.87% and 81.81% of the total cost of production per hectare respectively. There was also a significant difference between average total costs incurred in pepper production between male and female farmers. The male farmers incurred average total cost of 189, 824.06 Naira, while female farmers incurred 82, 418.15 Naira. Pooling the data for both male and female together, the average total cost incurred for both male and female farmers in pepper production was 134, 430.66 Naira. The gross margin analysis per hectare revealed that pepper production was profitable for both male and female farmers. The enterprise is worthwhile for both male and female pepper farmers. The gross margin was higher per hectare basis for male pepper farmers at 137, 556.51 Naira than female pepper farmers at 109, 711.77 Naira. The net farm income analysis also revealed level of profitability for both male and female pepper farmers. There was a significant difference between net farm income for both male and female pepper farmers. The net farm income for male pepper farmers was higher at 103, 141.46 Naira than female pepper farmers at 82,418.15 Naira per hectare respectively. Pooling the data together for both male and female pepper farmers, the net farm income was estimated at 98, 582.33 Naira. This implies level of profitability for pepper production in the study area. Financial analysis revealed that the gross margin ratios of pepper production for male, female farmers and pooled data were 0.47 each respectively. This implies that for one Naira invested in pepper production 46 kobo covered taxes, profits, expenses, and depreciation respectively. The rate of return on investment was higher at 0.55 for male pepper for farmers (return on investment for female pepper farmers at 0.54), this implies that for one Naira invested by male pepper farmers, additional 55 kobo was realized. Similar findings on the same group of vegetable production by Ajibade et al. (2021) reported that gross margin of tomato production at 67,083.64 Naira per hectare for male farmers, this was higher than the gross margin of tomato production at 34,325.38 Naira per hectare for female farmers in Abuja, Nigeria.

Table 2. Gender Differentials in Average Costs and Returns of Pepper Production per Hectare

	Male		**Female**		**Pooled**	
Items	**Amount (Naira)**	**Percentage**	**Amount (Naira)**	**Percentage**	**Amount (Naira)**	**Percentage**
Total Revenue	**292,965.52**		**232,512.50**		**279,665.85**	
Variable Cost						
Seed Input	1,480.10	0.779	1,280.01	0.852	1,436.08	0.793
Fertilizer Input	44,919.14	23.66	39,231.20	26.13	43,667.79	24.11
Herbicides	6,063.84	3.194	4,547.88	3.030	5,730.33	5.164
Insecticides	1,450.46	0.764	1,160.37	0.775	1,386.64	0.965
Bags Sack	1,989.06	1.047	1,591.24	1.060	1,901.54	1.050
Labour Input						
(a) Land Clearing	12,044.33	6.344	9,033.25	6.018	11,381.89	6.285
(b) Soil Tillage	13, 385.22	7.051	10,038.91	6.688	12,649.03	6.905
(c)Planting	11, 240.39	5.921	8, 430.29	5.616	10,622.16	5.865
(d) Manure Application	8, 275.86	4.339	6,620.68	4.411	7,911.72	4.369
(e)Chemical Application	8,122.17	4.248	6, 497.74	4.329	7,764.79	4.289
(f) Weeding	18,622.66	9.810	14, 898.13	9.923	17,803.26	9.831
(g) Fertilizer Application	8,029.56	4.230	5,620.69	3.744	7, 499.61	4.141
(h) Harvesting	15, 822.66	8.335	11,075.86	7.379	14,778.364	8.161
(i) Bagging	3, 963.55	2.088	2,774.48	1.848	3,701.96	2.044
Fixed Cost (Depreciation)						
(a) Land Rent	26, 256.16	13.83	21,004.92	15.999	25,100.89	13.86
(b) Sprayer	2,384.03	1.255	1,668.82	1.111	1,859.68	1.026
(c) Hoe	2,123.30	1.185	1,698.64	1.131	2,029.87	1.120
(d) Cutlass	238.73	0.125	190.98	0.127	228,23	0.126
(e) Water Pump	3,412.83	1.797	2,730.26	1.819	3,254.86	1.797
Total Variable Cost	**155,409.01**	**81.87**	**122,800.73**	**81.81**	**148,235.19**	**81.86**
Total Fixed Cost	**34,415.05**	**18.13**	**27,293.62**	**18.19**	**32,848.33**	**18.14**
Total Cost	**189,824.06**	**100.00**	**150,094.35**	**100.00**	**181,083.58**	**100.00**
Gross Margin	**137, 556.51**		**109,711. 77**		**134,430.66**	

Net Farm Income	**103,141.46**	**82,418.15**	**98,582.33**
Quantity (50 Kg)	**14.64**	**11.62**	**13.98**
Price	**20,000**	**20,000**	**20,000**
Operating Ratio	**0.53**	**0.52**	**0.53**
Rate of Return on Investment	**0.55**	**0.54**	**0.544**
Gross Margin Ratio	**0.47**	**0.47**	**0.47**

Source: Field Survey (2021)

Gender Differentials in Factors Influencing Output of Pepper (Capsicum species) Production in the Study Area

Gender differentials in factors influencing output of pepper production was presented in Table 3. The explanatory variables under consideration in the Cobb-Douglas production model were age(X_1), farm size (X_2), labour input (X_3), fertilizer input (X_4) , seed input (X_5) , and chemical input (X_6) . All the regression coefficients for male, female pepper farmers and pool data were positive. Age(X_1) , and fertilizer input (X_4) were statistically significant at ($P < 0.01$) for male pepper farmers, while age (X_1), labour input (X_3), and fertilizer input (X_4) were statistically significant at ($P < 0.01$) for female pepper farmers. Pooled data revealed that age (X_1), labour input (X_3), and labour input (X_3), were statistically significant at ($P < 0.01$). The coefficient of multiple determinations (R^2) was 0.81 for male pepper farmers and 0.56 for female pepper farmers. The coefficient of multiple determinations (R^2) for pooled data was 0.755. The coefficient of determinations (R^2) of 0.81 implies that 81% of variations in output of pepper produced by male pepper farmers were explained by the explanatory variables included in the model. Also, the coefficient of determinations (R^2) of 0.56 implies that 56% of variations in output of pepper produced by female pepper farmers were explained by the explanatory variables included in the model. The F-values were statistically significant at ($P < 0.01$) for male (225.71), female (196.21) pepper farmers and pooled data (219.22) respectively. This confirmed the explanatory variables included in the model as jointly responsible for variations in output of pepper produced by male, female pepper farmers and pooled data respectively. The regression coefficients of farm size and fertilizer input were 0.521 and 0.491 for male pepper farmers, while that of female pepper farmers were 0.020 and 0.001 respectively. This implies that 1% increase in farm size will lead to 52.1% and 02.1% increase in output of pepper production for both male and female farmers respectively. Similarly, Adeoye et al. (2014) reported that 1% increase in farm size will lead to 05.15% increase in pepper production among farmers under tropical conditions.

Gender Differentials in Elasticity of Production and Return to Scale of Pepper Production in the Study Area

Gender differentials in elasticity of production and return to scale of pepper production was presented in Table 4. The regression coefficients of the male, female pepper farmers and pooled data were the elasticities of production. The sum of elasticities of production gave the return to scale for male, female pepper farmers and pooled data respectively. The elasticities of production of fertilizer input was 0.491 for male, and 0.039 for female pepper farmers respectively. The elasticities of production of fertilizer input for pooled data was 0. 3916. All the elasticities of production for variable inputs included in the Cobb-Douglas production model were positive for male, female pepper farmers and pooled data respectively. The return to scale (RTS) of pepper production for male farmers was 2.798, which signifies increasing return to scale. This implies that a unit increase in any production input in pepper production will lead to more than proportionate increase in output of pepper produced. The return to scale(RTS) of pepper production for female farmers was 0.033, which signifies decrease return to scale. This implies that a unit increase in any production inputs will lead to less than proportionate decrease in output of pepper produced. The return to scale for pooled data was 2.206. Which signifies increase return to scale of pepper production. This result is similar to findings of Dossah and Mohammed (2016) who obtained return to scale (RTS) of 1.314 for male vegetable farmers (increasing return to scale), and 0.97 for female vegetable farmers (decrease return to scale) in Plateau State, Nigeria.

Table 3. Result of Multiple Regression Analysis of Cobb-Douglas Production Function Model

	Male			**Female**		
Variable	**Regression Coefficient**	**Standard Error**	**t-Statistics**	**Regression Coefficient**	**Standard Error**	**t-Statistics**
Age (X_1)	0.412	0.1141	3. 61***	0.035	0.011	3.21***
Farm Size (X_2)	0.521	0.2059	2.53**	0.020	0.008	2.57**
Labour Input (X_3)	0.361	0.1332	2.71**	0.006	0.002	3.64***
Fertilizer Input (X_4)	0.491	0.1323	3.71***	0.039	0.001	3.45***
Seed Input (X_5)	0.530	0.2070	2.56**	0.014	0.006	2.41**
Chemical Input (X_6)	0.483	0.2185	2.21**	0.012	0.005	2.56**
Constant	4.012	1.6786	2.39**	2.844	1.252	2.27**
RTS	2.798			0.033		
R^2	0.81			0.56		
Adjusted R^2	0.78			0.51		
F-Value	225.71***			196.21***		

Source: Data Analysis (2021)
*-Significant at 10% probability level
**-Significant at 5% probability level
***-Significant at 1% probability level

Table 4. Result of Multiple Regression Analysis of Cobb-Douglas Production Function Model

	Pooled Data		
Variable	**Regression Coefficient**	**Standard Error**	**t-Statistics**
Age (X_1)	0.3291	0.0093	3.52***
Farm Size (X_2)	0.4108	0.1624	2.53**
Labour Input (X_3)	0.2829	0.0972	2.91***
Fertilizer Input (X_4)	0.3916	0.1072	3.65***
Seed Input (X_5)	0.4165	0.1646	2.53**
Chemical Input (X_6)	0.3793	0.1663	2.28**
Constant	3.7550	1.3372	2.808**
RTS	2.2064		
R^2	0.755		
Adjusted R^2	0.720		
F-Value	219.22***		

Source: Data Analysis (2021)
**-Significant at 10% probability level*
***-Significant at 5% probability level*
****-Significant at 1% probability level*

Constraints Faced by Pepper Farmers in the Study Area

Table 5 shows the constraints faced by pepper farmers in the study area using principal component model. Principal component analysis (PCA) is an analytical technique that can transform many interrelated constraints of pepper farmers into few uncorrelated constraints. Constraints with Eigen-values greater than one (1) were retained by the principal component model. Constraints with Eigen-values less than one (1) were discarded by the model. Lack of fertilizers with Eigen-value of 3.2091 was ranked 1st among the constraints based on the perception of pepper farmers, and this explained 21.71% of all constraints retained by the principal component model. Pest and disease infestations was ranked 2nd based on the perceptions of pepper farmers, and this explained 21.60% of all constraints retained by the model. The other constrained faced by pepper farmers include: inadequate capital (3rd), high perishability of commodity (4th), poor soil fertility (5th), lack of improved seeds (6th), and lack of storage facilities (7th). The retained constraints faced by pepper farmers explained 83.76% of all constraints faced by pepper farmers in the study area.

Table 5. Principal Component Analysis of Constraints Faced by Pepper Farmers

Constraints	Eigen-Value	Difference	Proportion	Cumulative
Lack of Fertilizers	3.2091	0.4120	0.2171	0.2171
Pest and Disease Infestation	3.1020	0.3971	0.2160	0.4331
Inadequate Capital	2.9801	0.3651	0.1131	0.5462
High Perishability of Commodity	2.9107	0.3402	0.1001	0.6463
Poor Soil Fertility	2.8709	0.3101	0.0971	0.7434
Lack of Improved Seeds	1.8701	0.2907	0.0621	0.8055
Lack of Storage Facilities	1.6701	0.2770	0.0321	0.8376
Bartlett Test of Sphericity				
KMO	0.6701			
Chi Square	490.67			
Rho	1.000000			

Source: Data Analysis (2021)
****-Significant at 1% probability level*

CONCLUSIONS

This research study has shown that pepper production for both male and female farmers were profitable enterprise in the study area. Pepper farmers were active, energetic, and resourceful, in their youthful age. Pepper production is mainly dominated by male counterparts and farming household have large household size with an average of 8 people per household. They are small scale, smallholder, peasant and resource-poor pepper farmers with an average farm size of 1.01 hectares of farm land. Gender differentials in average costs and returns of pepper production shows that the gross margin of male pepper farmers was 137, 141.46 Naira per hectare higher than that of female pepper farmers with gross margin of 109,711.77 Naira per hectare. Net farm income of male pepper farmers was 103, 141.46 Naira per hectare higher than that of female pepper farmers with net farm income of 82, 418.15 Naira per hectare. Financial analysis revealed that the gross margin ratios were 0.47 for male and female pepper farmers respectively. This signifies that for every one naira invested in pepper production, 47 kobo covered taxes, expenses, profits, interest, and depreciation respectively. The rate of return on investment was higher for male pepper farmers at 0.55 than female pepper farmers who had rate of return on investment of 0.54. Gender differentials in factors influencing output of pepper produced shows that age, fertilizer input were the statistically significant factors influencing output of pepper produced by male farmers at 1% probability level, while age, labour input, and fertilizer input were statistically and significant factors influencing output of pepper produced by female farmers at 1% probability level. The coefficient of multiple determinations (R^2) was 0.81 for male pepper farmers and 0.56 for female pepper farmers. The return to scale was estimated at 2.798 for male pepper farmers which signifies increasing return to scale, while that of female pepper farmers was calculated at 0.033 which implies decreasing return to scale. Constraints faced by pepper farmers include: lack of fertilizers, pest and disease infestations, inadequate capital, and high

perishability of commodity, poor soil fertility, lack of improved seeds, and lack of storage facilities. This research study recommends the following:

- Farm inputs should be provided for male and female pepper farmers such as improved seeds, fertilizer inputs, and chemical inputs, to increase productivity.
- Women pepper farmers should be giving more access to credit facilities at low interest rate to increase productivity.
- Government should employ female extension agents to disseminate research findings and new technologies to pepper farmers.
- Government should encourage mechanized farming by providing equipment's such as tractors, motorized sprayers, and irrigation facilities etc. to increase productivity.
- Storage facilities should be provided for pepper farmers to solve the problem of high perishability of commodity.

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