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Socio-economic Assessment of Ginger Production in Jaba Local Government Area of Kaduna State, Nigeria

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Authors' contributions

This work was carried out in collaboration between all authors. Author DE designed the study, wrote the protocol and performed the statistical analysis. Author MOA supervised the work. Authors ALB, SBM and AH edited the manuscript and managed the literature searches. All authors read and approved the final manuscript.

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ABSTRACT

Ginger (*Zingiber officinale* Roscoe) is an herbaceous perennial plant belonging to the Order Scitamineae and the family Zingiberaceae. It is used for both medicinal and culinary purposes. it is a root crop and a typical herb extensively grown across the world for its pungent aromatic underground stem and rhizome which make it an important export commodity in the world trade. Ginger's origin is not well established though it is generally thought to be native of Asia, where it was first cultivated. It was also cultivated in tropical regions of America. Ginger was introduced to Europe by Arab traders from India the first century AD. Ginger was introduced to Nigeria in

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1927.The study was carried out to examine the socio economics of ginger production in Jaba Local Government Area of Kaduna State. The objectives of this study are to; identify the socio economic characteristic of ginger production, assess the extent of profitability of ginger production in the study area, and to determine the socio economic factors affecting the production of ginger. The data were obtained primarily by administering questionnaires to 60 farmers that were purposively selected from four wards, namely: Daddu, Samban, Nok, and sab-zuro. The data were analysed using descriptive statistics, multiple regression analysis gross margin and productivity. The result of the multiple regression shows that among 8 variables used in the analysis, only 3 variables significantly influenced ginger production education, credit, and farm size. The gross margin was calculated to be ₦177,756.69 and a return to naira of ₦1.21 was realized. The major constraints militating against ginger production in the study area are inadequate input, poor transportation facilities, high cost of labour and inadequate credit. It is recommended that extension services are needed in the study area to educate the farmer on the use of agro chemicals, input and agro practices toward increase in production and there is need for farmer to form cooperatives groups to help them provide credit to their member in good time and substantial amount.

Keywords: Ginger; socio-economic; assessment; multiple regression; gross margin.

1. INTRODUCTION

Ginger *(Zingiber officinale Roscoe)* is an herbaceous perennial plant belonging to the Order Scitamineae and the family Zingiberaceae. It is used for both medicinal and culinary purposes [1]. it is a root crop and a typical herb extensively grown across the world for its pungent aromatic under-ground stem and rhizome which makes it an important export commodity in world trade [1-3] Ginger's origin is not well established though it is generally thought to be native of Asia, where it was first cultivated. It was also cultivated in tropical regions of America. Ginger was introduced to Europe by Arab traders from India the first century AD.

The Arab also took the plant from India to East Africa in the thirteenth century while the Portuguese took it to West Africa and other part of the tropics in the sixteenth century. Ginger was introduced to Nigeria in 1927 [4-5]. The Spice was known to Germany and France in the nineth century. The plant is now cultivated in different parts of Nigeria, though the major producing areas include Kaduna, Nassarawa, Sokoto, Zamfara, AkwaIbom Oyo, Abia, and Lagos states although Southern Kaduna still remains the largest producer of fresh ginger in Nigeria in Kachia, Jabba, Jama'a and Kagarko Local government Areas [4,6,7]. The varieties produced in Nigeria are 'Taffi Giwa'and 'Yatsun biri' which are higher in monoterpene and oil, giving a more pungent aroma and pungency.

Therefore it is usually preferred for the production of oils and oleoresins [4,8]. Subsequently Nigeria became a major exporter of ginger to United Kingdom, Germany, Spain, France, Saudi Arabia United states of America among others. By 1959, 1582.8 tons were exported. This later declined significantly so that by 1984 only about 27 tons was exported (Annual abstract of statistics [1].

Information from the Nigerian trade showed that 846.7 tons of ginger valued at N2.24 million were exported in 1986 as against 1650 tonnes valued at 2.28 British terling in 1965 [1].

The absence of scientific research to back up the efforts of the farmers was among the factors that limited increased production [1]. Nigeria are then ranked first in term of percentage of total hectares of ginger under cultivation but her contribution to total World output is too low compared to other countries. This can be attributed to the fact that most of production is undertaken by smallholders and traditional farmers with rudimentary production techniques and low yields. In addition, the small holders farmers are constrained by many problems like the farmers do not see it as a business enterprise, therefore are not adequately focused on profit maximizing motive [9]. Therefore [10] opined that Nigeria has the potential to expand production in a medium to long term investment strategy that can develop into self-sufficient industry [11]. Efficiency measurement is useful in determining the magnitude of the gain that could be achieved by adopting improved production technology. Efficiency in resource allocation has a far-reaching impact on the observed farm output level.

The presence of shortfall in efficiency mean that output can be increased without using additional

conventional inputs and new technology [12-14]. Farmers possess the potential to achieve both technical and allocative efficiency in farm enterprises but inefficiency may arise due to a variety of factors some of which are beyond the control of the farmers [14-15]. In addition, inefficiency in production on the part of the farmers has variously been implicated as forces militating against ginger production. Factors such as technical knowledge constrained increased food supply, export and poverty reduction. This may be attributed to high inefficiencies because farmer lack access to information on efficiency and low literacy level limiting interpretation of such information to guide them in commercial production.

Total production of ginger can be increased by increasing the yield, increasing the total hectares, improving the economics of production and stimulating demand for the commodity. Ginger production in Nigeria today is laborious. Practically all operations are done manually. This has several implications as pointed out by [16], that it limits the hectares that each individual farmer can cultivate; production of the crop is unattractive and tedious; and production costs are relatively high due to the relative high cost of labour. He therefore concluded that improving the economics of production would involve mechanization of all operation in ginger production, weed control by means of herbicides and setts (seed) multiplication. The objectives of this study are to identify the socio- characteristic of ginger production, assess the extent of profitability of ginger production in the study area, and to determine the socio-economic factors affecting the production of ginger.

1.1 The Study Area

The study was conducted in Jaba local government area. It lies between latitude 9 N and longitude 8 E. in southern part of Kaduna State (Fig. 1) [17]. The local government shares boundaries with Zango Kataf local government area in the North, in the East by Jema'a local government area, in the West by Kachia local government area and in the South by Kagarko and Nassarawa State [6].

The population of Kaduna State is 6,066,562, people according to 2006 Census and the population of Jaba is 61,000 people [18]. It has a land area of about 368km^{2}the population of Kaduna state with a growth rate of 3.2% is 7,805,131 people in 2004.

The local government area has twenty one (21) districts. Among them are Gumkparo, Samban, Ankung, Angwan Rana, Daddu, Kurmin Jatau, Fai, Fuge, Angwal, Chori, Sub-zero, Ngarsu, Ngarkatera, Nok.In consultation with Kaduna State Agricultural project (KADP) Office and District Head.

The local Government area is in the Guinea Savannah with topography of 400 m – 600 m above sea level. The local Government is marked with two (2) distinct Dry and Wet seasons with a unimodal rainfall pattern of about 1000 mm-1500 mm annually. The dry season is between October to March. It has a temperature of about 28-32℃ (Annual Abstract of Statistic, 1995). Jaba local government area is endowed with abundant natural resources such as hills, streams, natural grassland dam and economics trees. Crop grown in the area includes Sorghum, Millet, Maize, Yam, Rice, Cocoyam, Groundnut, Acha, Beans, Ginger, Cassava, Soya Bean, Sweet Potatoes, Beni-seed and Sugar cane. During the dry season, farmers in Jaba local government area are involved in the production of vegetables such as cabbage, spinach, tomatoes and pepper. Livestock produced in the area include pigs, goats, poultry and cattle [19]. The major Ethnic groups in the area are Kadara (Adara), Jaba (Ham), Kuturmi, Kaje (Bajju), Samban, Atyap, Gbagyi, and Hausa-Fulani, Chori, Duya. Majority of the inhabitants are Christians. The major occupation of the inhabitants of local government is farming. Majority of the farmers practices small scale Agriculture with farm size ranging between 0.1-3ha. The soil type is clay-loam. The major occupation of the people includes fishing, hunting, weaving, trading, and others.

2. METHODOLOGY

2.1 Sampling Technique and Sample Size

A combination of purposive and simple random sampling was employed in this study. Jaba local government area of Kaduna state was purposively selected based on prior knowledge that it is a ginger producing area. Respondents were selected from four districts which include: Daddu, Samban, Nok, and sub-zero because of the high intensity and concentration of ginger farmers in the area [6]. And they represent 50% of the districts in the local government area. Fifteen (15) farmers were randomly selected from each of the purposively selected districts to give a simple size of 60 respondents.

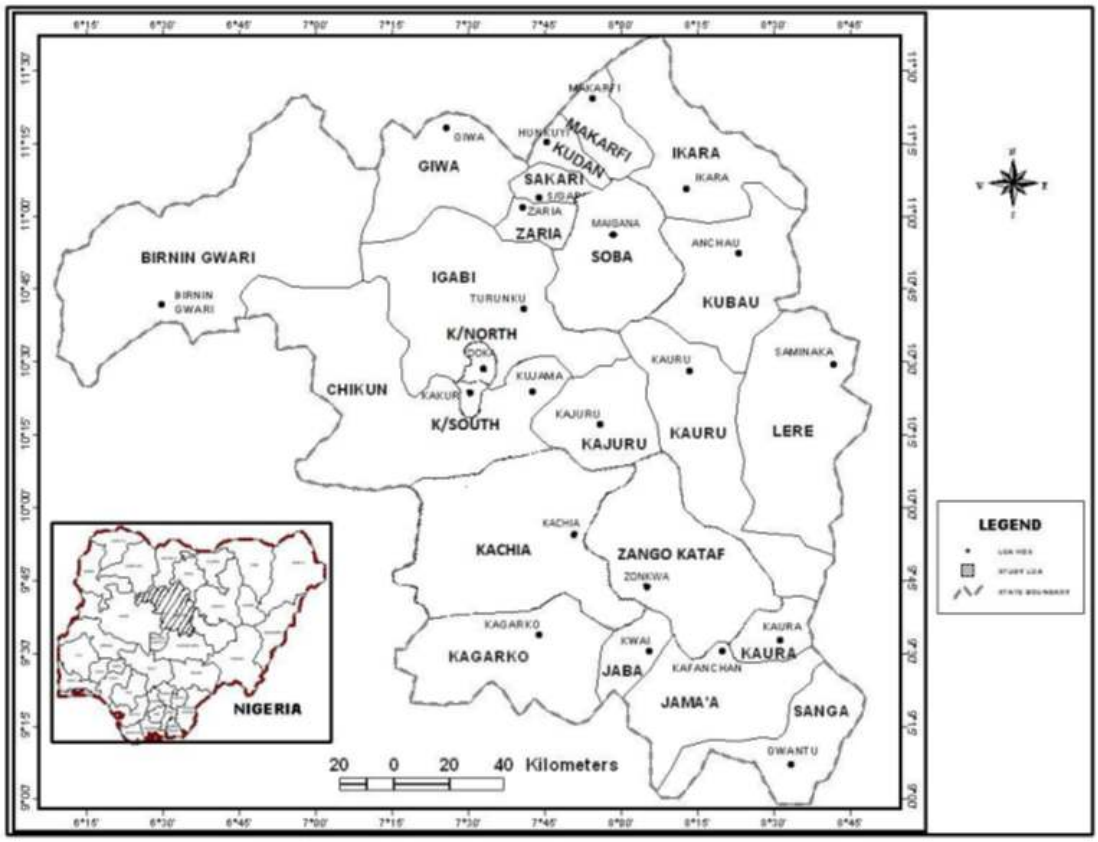

Fig. 1. Administrative map of Kaduna state showing the 23 local government council

2.2 Data Collection

Primary data were collected for the study. The primary data were obtained through structured questionnaires.

2.3 Analytical Tools

The analytical tools that were used in analysing the data are

i. Simple descriptive statistic
ii. Gross margin
iii. Productivity (Returns to Inputs)
iv. Inferential statistic in the form of simple linear regression

i. Simple descriptive statistics:- Simple descriptive statistics such as mean, percentages and frequency distribution tables were used in the analysis of data to achieve objectives v.
ii. Gross margin (GM):- Gross Margin such as gross farm income and total variable income where used in the analysis of data to achieve objectives i and iii. This is given as

GM = GI – TVC

Where

GM = gross margin (₦)
GI = gross farm income (₦)
TVC = total variable income (₦)

iii. Productivity = $\frac{\text{value of goods/services}}{\text{cost of resources}}$ such as value of goods and services and cost of resources was used in the analysis of data to achieve objectives ii.
iv. Inferential statistic will be used in the analysis of data to achieve objective iv Multiple regression analysis.

Inferential statistics particularly regression analysis was used. Regression is the measure of the functional relationship between two or more variables that are the dependent and

independent variables [20]. The dependent variable (Y) shows the output of ginger and is simply a variable that is dependent on an independent variable. While the independent variables (x) shows the socio economic factors affecting the production of ginger by the farmers like age of farmers, level of formal education, extension contact, output of each crop, method of acquiring plots, access to credit, sources of information on the ginger seed, method of acquiring seeds.

The strength of the relationship and the rate of responds of the relationship will be determined using the simple linear regression model.

Linear function; Linear regression assumes a linear relationship between the dependent and independent variables. It is implicitly specified as;

$$Y = f(x_1, x_2, x_3, \ldots\ldots\ldots\ldots\ldots xn)$$

Explicitly, the model for linear regression becomes;

$$Y = \alpha + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \beta_4 x_4 + \beta_5 x_5 + \beta_6 x_6 + \beta_7 x_7 + \beta_8 x_8 + e$$

Where

Y = Yield of ginger (kg/ha)
X_1 = Age of farmers (Number)
X_2 = Gender (Number)
X_3 = marital status (Number)
X_4 = Level of education (Years)
X_5 = Household size (Number)
X_6 = Years of farming experience (Years)
X_7 = Forms of land tenancy (Number)
X_8 = Availability to credit (actual amount in naira)
X_n = the value of the other independent variables
α = constant term
e = error term
$\beta_1 - \beta_8$ = Regression coefficient

3. RESULTS AND DISCUSSION

The results were analysed and discussed in line with the objectives of the study.

3.1 Socio-economic Characteristics of Ginger Farmers

The socio-economics characteristics of ginger Farmer such as age, house hold size, occupation, educational level, years of ginger farming experience, credit, extension visit etc. were examined.

3.2 Sex of Ginger Farmers

The result presented in Table 1 showed that 83.3% of the respondents were males while the remaining 16.7% where females. From this result, it can be deduced that majority of the farmers are males which implies that fewer females take part in the production of ginger. This may be due to the fact that women major more in processing while production on the other hand required a lot of energy and effort which most men are capable of handling. This is in line with the findings of [21] which indicated that domination of male in ginger production is due to high demands of time and effort requires to work in such enterprise.

Table 1. Distribution of ginger farmer based on sex

Sex	Frequency	Percentage
Female	10	16.7
Male	50	83.3
Total	60	100.0

3.3 Marital Status of Ginger Farmer

The result in Table 2 shows that majority (85.0%) of the farmers are married. The single one among the farmers are only 15.0%. The significance of marital status on agricultural production can be explained in terms of the supply of agricultural family labour. It is expected that family labour would be more available where the household heads are married since women and children are able to participate in crop production, processing and marketing.

Table 2. Distribution of ginger farmers based on marital status

Status	Frequency	Percentage
Married	51	85.0
Single	9	15.0
Total	60	100.0

3.4 Age of Ginger Farmers

Age is very important in agricultural production because it determines the physical strength of the farmer. Also the young people tend to withstand stress and put more time in various

farming operations, this will likely result to an increase in output. The result in Table 3 shows that the highest category (31.7%) of ginger production falls within the range of 46-55 years and the lowest (5.0%) age range of the farmers is between the ages of 18-25 years. It could be seen that majority of farmers are between 26-55 years and the mean age is 36.Therefore it could be said that (88%) middle-age people are more involved in ginger production in the study area than the elderly people. The result obtained is similar to the findings of [22], which state that majority of vegetable growers are below the age of fifty and therefore still in their active age. Agriculture is a very energy consuming occupation which can only be done by able men and this may be the reasons for the age distribution of the farmers. This agrees with the study of [23], on socio economic characteristics and adoption trend of artisanal fishers in Akwa Ibom state who showed that farmers within the active age groups will be able to withstand stress and put more time into various farming operations. This will result in increased output.

Table 3. Distribution of ginger farmers based on age

Age	Frequency	Percentage
18-25 years	3	5.0
26-35 years	17	28.3
36-45 years	17	28.3
46-55 years	19	31.7
56 years and above	4	6.7
Total	60	100.0

Mean= 36 years

3.5 Distribution of Ginger Farmers Based on Household Size

This result presented in Table 4 shows that majority (60%) of the respondents had 4-7 persons in their family. The farmers that had 20%had 1-3 members and another 20% had eight members and above. The family, size group of 1-3, 8 and above. This implies that farmers in the study might have advantage of family labour for farm operation if children could spend some time on farm. However, the implication of large household size is that it will increase household consumption expenditure which competes with production of limited financial resources within the household. According to [24] higher family size does not necessarily translate to higher use of family labour because some of the young able men prefer other jobs than farming.

Table 4. Distribution of ginger farmers based on household size

Household size	Frequency	Percentage
1-3	12	20.0
4-7	36	60.0
8 and above	12	20.0
Total	60	100.0

3.6 Major Occupation of Ginger Farmers

The result presented in Table 5 shows that majority of the respondents major occupation is other occupation (70%) such as civil servant, pastors, traders, transporters etc. According to [25] employment in non-farm activities is essential for diversification of sources of farm household's livelihood. It enables households to modernize their production by giving them an opportunity to apply the necessary input and reducing food shortage during the period of unexpected crop failures. The remaining (30%) had farming as major occupation.

Table 5. Distribution of ginger farmers based on occupation

Occupation	Frequency	Percentage
Others	42	70.0
Farming	18	30.0
Total	60	100.0

3.7 Educational Level of Ginger Farmers

The level of education affects the type of decision farmers take in agricultural production and determines the level of opportunities available to improve livelihood strategies and managerial capacity in agricultural production. The result presented in Table 6 show that about 6% of ginger farmers had primary education, 25% had up secondary school level of education and about 68% of the farmer went to tertiary institution which is the highest percentage of the farmers interviewed. This indicate that all (100%) of the total population of the farmers had one form of formal education or the other. Illiteracy is believed to have negative implication on efficient use of productive resources and adoption of farm innovation. According to [26] farmer's level of education is expected to influences adoption

agricultural innovations and decisions on various aspects of farming.

Table 6. Distribution of ginger farmers based on educational level

Educational level	Frequency	Percentage
Primary level	4	5.7
Secondary level	15	25.0
Tertiary level	41	68.3
Total	60	100.0

3.8 Farming Experience of Ginger Farmer

Farming experience plays a significant role in agricultural production. It is expected that the higher the farmer's experience the better will be the productive capacity of the farmer. The result in Table 7 shows that majority (38.3%) of ginger production farmers had between 1-10 years of experience in farming, about 30% had between 11-20 years' experience while 25.0%, 3.0%, 3.0% of the farmer had 21-30 years, 31-40 years and 41 years above years farming experience respectively. The result indicates that a great proportion (62%) of the farmers had more than 10 year farming experience in ginger production. The implication of this is that the farmers are more knowledgeable in the farming enterprise and can better combine factors of production that will give result to higher yield to attain optimum resources utility.

Table 7. Distribution of ginger farmers based on farming experience

Farming experience	Frequency	Percentage
1-10 years	23	38.3
11-20 years	18	30.0
21-30 years	15	25.0
31-40 years	2	3.3
41 years and above	2	3.3
Total	60	100.0

3.9 Access to Agricultural Extension Services of Ginger Farmers

The result presented in Table 8 shows that majority of the (61.7%) of the farmers had no access to agricultural extension services. The resultant effect of this can be wrong use of farm inputs such as fertilizers, chemicals, seeds "e.t.c" due to lack of extension on the usage of such inputs the absence of extension workers in the rural areas thus leading to low productivity of the farmers and hence, low income. The farmers that had access to extension were few (38.3%). This means that only the well to do or civil servants among the respondent have linked with the agricultural extension agents in the study area. According to [27], extension services are very essential to the improvement of farm productivity and efficiency among farmers.

Table 8. Distribution of ginger production based on access to agricultural extension services

Access to extension services	Frequency	Percentage
No access agric extension	37	61.7
Had access to agric extension	23	38.3
Total	60	100.0

3.10 Amount of Credit Obtained by Ginger

The result in Table 9 shows that majority of the farmers (91.7) obtain less than ₦26,000 credit which means that they use much of their own personals savings for all the farming practices, while (1.7%) obtained about ₦26,000-50,000, while (1.7%) obtained ₦51,000;75,000 and (5.0%) obtained ₦76,000-100,000 credit. Credit is a very strong important factor that is needed to acquire or develop farm enterprise [28].Therefore credit plays a very pivotal role if the farmers are to improve their efficiency and operate on the frontier [29-30]. According to the information gathered most of those that got credit are civil servants who have access to loans in their place of work.

Table 9. Distribution of ginger farmers based on the amount of credit obtained

Amount of credit services	Frequency	Percentage
less than 25,000	55	91.7
26,000-50,000	1	1.7
51,000-75,000	1	1.7
76,000-100,000	3	5.0
Total	60	100.0

3.11 Average Yield of Ginger

The average ginger yield observed among the sample farmers was 1274.1 kg and the average

farm size was 1.19 hectare. The results conforms generally to earlier research in Nigeria e.g. [10,14,29,31-33], there for the calculated yield of ginger in the study area is 1044.4 kg per hectare. This is far below worldwide yield of ginger as indicated by FAO 2008 in their report which showed that worldwide yield of ginger was 3800 kg/ha. In spite the level of profit realised by the farmer more profit would be realised if the yield of ginger farmer in the study are higher than what they realise presently.

3.12 Socio Economic Factors Affecting Ginger Production

Linear regression model was used to identify factors affecting ginger production in the study area. As the major focus of this study aims to assess the socio economic factors affecting ginger production; yield of ginger is considered as the dependent variables of the model, while independent variables were the socio-economic characteristic of the farmers.

The independent variable entered in the model were age, household size, occupation, farming experience, credit, extension visit and farm size. Out of all these variable only age, credit and farm size were found to significantly affect ginger production. Household size was found to have a negative relationship with ginger production. This implies that as the household size increases ginger production will decrease and it is contrary to apriority expectation. The expectation is that the larger the household size the more free farm labour available to the farmer which will consequently increase the production of all things been equal.

Credit was found also to have a negative relation with ginger production. This implies that low access to credit will increase ginger production and it is contrary to apriority expectation. Farm size was found to have a positive relation with ginger production. This implies that the more availability of farm land the more increase in ginger production which is not contrary to apriority expectation because of the positive relationship.

The R^2 value of .502 indicates that all the socio economic variables included in the model explained 50.2% variability affect ginger production in the study area while 49.8% of the variables do not affect ginger production in the study area.

3.13 Cost and Returns (Profitability) Analysis

3.13.1 Costs of production

Costs are generally of two types-fixed and variable. Fixed costs are those costs incurred on fixed inputs which do not change as production changes. Variable costs are those costs that relate directly to the level of production. In this study, only the variable costs were considered because in traditional agriculture fixed cost is very negligible and usually ignored. The variable costs considered in this study are costs incurred on inputs such as seeds, fertilizer, labour, pesticide, mulching and other cost items.

3.13.2 Cost of seed

Ginger sett (seed) used by the farmer in the study area were mainly unimproved seeds taken from the last harvest. Some obtained their seeds from the market; the cost of ginger production in the study area is ₦32481 per hectare which constitute about 22% of the total cost of production.

Table 10. Estimates of linear regression model for determinants of socio economic factors affecting ginger

Variables	Coefficients	Standard Error	Significance difference
Constant	294431.115	116934.652	.057
Age (x_1)	-1149.249	5614.013	.839
Household size (x_2)	-16827.804*	9496.258	.066
Occupation (x_3)	-1488.194	95640.856	.988
Education (x_4)	21325.681	76933.912	.783
Farming experience(x_5)	-4974.142	5841.874	399
Credit (x_6)	-4.867*	2.551	067
Extension contact(x_1)	17649.389	32762.042	592
Farm size (x_8)	242765.662**	76094.995	002
TC	-1.044	.358	.005

,, represents significant at less than 10%, and 5% respectively, Negelkerte R^2 = 50.2%*

3.13.3 Cost of mulching

The average cost for mulching incurred by the farmers amount to ₦10687 per hectare which constitutes about 7.0% of the total cost of production.

3.13.4 Cost of labour

Labour cost consists of family and hired labour input. The family labour was computed on the basis of opportunity cost principle in man-day. The wage rate varied according to the farm operation to be performed. An average wage rate of ₦ 350 per man-day was used, giving the average labour cost per hectare to be ₦67037. Constitute about 45% of the total cost of production.

3.13.5 Cost of fertilizer

The average cost of fertilizer in the study is ₦30511 per hectare which constitute about 20.74%.

3.13.6 Cost of chemical

The average cost of chemical used by the sampled ginger farmers was ₦5997.3 per hectare is about 4.08%

3.13.7 Other variable cost

Other cost incurred on variable inputs such as sack, transportation were computed to be ₦403.01 per hectare which constitute 0.27%

3.13.8 Total variable cost

The summations of variable costs incurred on variable input in ginger production are the total variables costs. Table 11 revealed that the total variable cost in ginger production in the study area was ₦ 147113.31 per hectare.

3.13.9 Gross income

The gross return was calculated by multiplying the total yield of each respondent by the average unit price. This gave a gross income of ₦ 324670 per hectare.

3.13.10 Gross margin

The gross margin per hectare is the subtraction of the total variable cost from the gross income per hectare (gross return). Table 11 indicates that ginger farmers obtained a gross margin of ₦ 177756.69 per hectare which implies that ginger production in the study area is profitable.

3.13.11 Return to naira

The average rate of return was obtained by dividing the gross income by the total variable cost. The average rate of return was calculated to be ₦2.21 implying that for every naira invested a profit of ₦1.21 was realised.

Table 11. Average cost and return of ginger production

Variables	Cost ₦/ha	Percentage
(1) Gross income	324670	
(2) Variable input		
(a) Seed	32481	22.03
(b) Mulching	10684	7.26
(c) Labour	67037	45.57
(d) Fertilizer	30511	20.74
(e) Chemical	5997.3	4.08
(f) Other	403.01	0.27
(3) Total Variable Cost	147113.31	100
(4) Gross Margin	177756.69	
(5) Rate of Return (GI/TVC)	2.21	

4. CONCLUSION

The findings have shown that ginger production is a very profitable venture in the study area as the result indicated that the farmers made more than 100% profit after the production period.

Furthermore, it could be concluded that household size, credit and land are the socio-economic factors affecting ginger production in the study area.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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